JPS

Jamaica Public Service Company Ltd.

5 Year Business Plan

2019-2024

Abbreviations and Acronyms

AATDAT	-	Advanced Automated Theft Detection Analytical Tool
ADMS	-	Advanced Distribution Management System
ADO	-	Automotive Diesel Oil
AHI	-	Asset Health Index
ALRIM	-	Accelerated Loss Reduction Incentive Mechanism
AMI	-	Automated Meter Infrastructure
B	-	Billion
BBSO	-	Behaviour Based Safety Observation
CAIDI	-	Customer Average Interruption Duration Index
CBPM	-	Conditioned Based Predictive Maintenance
CCGT	-	Combined Cycle Gas Turbine
CCTV	-	Closed-Circuit Television
CHP	-	Combined Heat and Power
CRP	-	Community Renewal Programme
DA	-	Distribution Automated
DBMS	-	Database Management System
DER	-	Distributed Energy Resources
DERMS	-	Distributed Energy Resources Management System
DG	-	Distributed Generation
EAF	-	Equivalent Availability Factor
EAM	-	Enterprise Asset Management
EBS	-	Emergency Backup Site
EGS	-	Electricity Guaranteed Standard
ELS	-	Energy Loss Spectrum
EMS	-	Energy Management System
ESET	-	Energy Sector Enterprise Team

ESS	-	Energy Storage System
EV	-	Electric Vehicle
EFOR	-	Equivalent Forced Outage Rate
FCI	-	Fault Circuit Indicator
FLISR	-	Fault Location Isolation and Service Restoration
GDP	-	Gross Domestic Product
GHG	-	Green House Gas
GOJ	-	Government of Jamaica
GIS	-	Geographic Information System
GS	-	Guaranteed Standards
GT	-	Gas Turbine
GWH	-	Gigawatt Hours
HB	-	Hunts Bay
HFO	-	Heavy Fuel Oil
HGPI	-	Hot Gas Path Inspection
HPS	-	High Pressure Sodium
ICE	-	Internal Combustion Engine
IFRS	-	International Financial Reporting Standard
IPP	-	Independent Power Producer
IRP	-	Integrated Resource Plan
JPS/Licensee	-	Jamaica Public Service Company Limited
KPI	-	Key Performance Indicators
KVA	-	Kilo Volt Amperes
KWh	-	Kilowatt-hours
Licence	-	The Electricity Licence, 2016
LED	-	Light Emitting Diode
LIC	-	Loss Interface Committee

LNG	-	Liquefied Natural Gas
M	-	Million
MAIFI	-	Momentary Average Interruption Frequency Index
MED	-	Major Event Day/s
MDMS	-	Meter Data Management System
MSET	-	Ministry of Science Energy and Technology
MVA	-	Mega Volt Amperes
MW	-	Megawatt
MWh	-	Megawatt-hours
NEP	-	National Energy Policy
NEPA	-	National Environment and Planning Agency
NG	-	Natural Gas
NTL	-	Non Technical Losses
OEM	-	Original Equipment Manufacturer
Office/OUR	-	Office of Utilities Regulation
OH	-	Old Harbour
O&M	-	Operating and Maintenance
OMS	-	Outage Management System
OPEX	-	Operating Expenses (prudently incurred)
OSI	-	Open System Interconnection
OUR Act	-	The Office of Utilities Regulation Act, 1995 (as amended 2000, 2015)
PAYG	-	Pay-As-You-Go
PPA	-	Power Purchase Agreement
PPE	-	Property Plant and Equipment
PV	-	Photo Voltaic
RAMI	-	Residential Automated Meter Infrastructure
RCM	-	Reliability Centred Maintenance

RE	-	Renewable Energy
RF	-	Responsibility Factor
ROFR	-	Right of First Refusal
ROE	-	Return on Equity
ROI	-	Return on Investment
ROR	-	Rate of Return
RT	-	Rate
SAIDI	-	System Average Interruption Duration Index
SAIFI	-	System Average Interruption Frequency Index
SCADA	-	Supervisory Control and Data Acquisition
SCC	-	System Control Centre
SCGT	-	Simple Cycle Gas Turbine
SHMS	-	Safety and Health Management System
SJPC	-	South Jamaica Power Company
SPT	-	Single Pole Tripping
T&D	-	Transmission & Distribution
TL	-	Technical Losses
TOU	-	Time of Use
UI	-	User Interface
US$	-	United States Dollar
VRE	-	Variable Renewable Energy
VVC	-	Voltage Var Control
WTI	-	West Texas Intermediary

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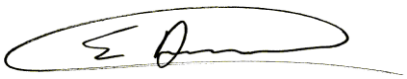
Message from the CEO

JPS' 2019-2023 Business Plan will usher in a new level of modernization of Jamaica's energy sector. With the implementation of the strategy and initiatives outlined in this plan, JPS will build on the momentum of achievements since the last comprehensive Rate Review, while embracing the opportunities presented by the dramatic transformations in energy globally.

JPS' Business Plan is strategically aligned with Jamaica's National Development Plan, which has fuel diversity and energy security among its primary goals. In this regard, JPS intends to build on its breakthrough accomplishments in fuel diversity achieved so far, while continuing to invest in technology to ensure power supply reliability and exceptional customer service. Advances in technology and the advent of the 'green revolution' have combined to influence consumer behavior, resulting in more of JPS' customers demanding and expecting cleaner energy, more service options from their utility provider and greater control over their energy choices. JPS has taken deliberate steps to meet these demands, investing over US$416M in capital projects, plus additional investments in a new US$330M joint venture natural gas-fired power plant.

The next five years will see JPS continuing to break new ground in meeting stakeholder demands. To this end, the Company will invest more than US$478M between 2019 and 2023. Our focus will be on five strategic priority areas: delivering exceptional customer service; ensuring the safety of the public and employees; achieving end-to-end efficiency; growing the business; and strengthening relationships with key stakeholders. Technology, improved processes and the people of JPS will be the key enablers, facilitating the delivery of value to our customers, our shareholders and the country of Jamaica.

My team and I remain committed to delivering the best service at the lowest possible cost. To this end, we will continue to improve operational efficiency, improve ease of doing business, and explore new horizons to provide the right options to meet the needs of our customers. On behalf of the JPS team, I give my full commitment to the implementation of this plan, to meet national development goals and deliver the quality service our customers expect and deserve.

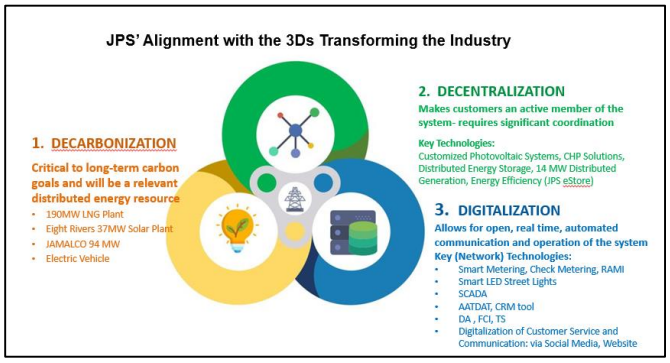


Emanuel DaRosa
President & CEO

1. Executive Summary

Energy systems around the world are undergoing rapid transformations that will change the way we fuel our transportation, power our homes and manage our industries. The dramatic changes are the result of a combination of factors, including climate change, new disruptive technologies, changing customer behaviour, changes in regulatory and policy frameworks, and competition where none previously existed. Declining cost and continuing incentives for renewable energy have hastened the growth and availability of clean power for utilities and customers alike. Customers and energy providers are leveraging technology in new ways to inform buying decisions, manage reliability and change customer engagement models. Frost and Sullivan's Global Power Industry Outlook, 2017 summed it up as the three "D's" disrupting the power industry- decentralization, decarbonization and digitalization. Increased decentralization of energy production, the need to decarbonize electricity generation, and digitalization to boost operational efficiency, comfort, convenience and control to end-users are driving market opportunities in the power industry.

Today's utilities are offering a growing portfolio of options to ensure diverse customer needs and expectations are met, such as ensuring transactions can be facilitated using smart devices. JPS is no different. The changes in the global energy sector are being felt locally, influencing both the business environment and customer behaviour. Technology is transforming the existing power system and creating a new power reality for individuals, businesses and the nation. The 'green revolution' has gained momentum, with the Government and customers alike prioritizing the environment and placing greater emphasis on alternative energy sources. Key impacts on the local electricity sector include increased customer interest in being a part of the green revolution (decarbonization), the adoption of alternative energy sources, an uptick in energy efficiency measures (decentralization), competition, use of smarter technologies (digitalization), changes in utility services and access to global support for growth in energy supply.



Renewables have become mainstream. With falling prices for solar solutions, in particular, more customers are pursuing renewables as an option to reduce their energy costs. The continuing expansion in rooftop photovoltaic systems and the spreading doctrine of energy efficiency are keeping downward pressure on kilowatt hour sales, despite signs of an uptick in economic activity in Jamaica. The improved economics of fuel prices is creating a tempting attraction to self-generation for large industrial and commercial customers lured by the prospect of avoiding

Transmission and Distribution (T&D) grid costs. As a result there is an increase in the number of suppliers of rooftop photovoltaic systems to both residential and commercial customers.

JPS has faced and continues to face potential loss of demand from self-generation options facilitated by the availability of natural gas (NG) on the island.

Fuel prices and foreign exchange rate volatility continues to negatively impact JPS' operations. In addition, the pervasive problem of electricity theft has severely impacted the cost of power delivery and the Company's bottom-line, with the Utility being penalized each year if system losses remain uncontrolled within the approved target level. The costs associated with achieving the target, drives up T&D cost. More than 18% of the electricity produced is stolen. Numerous studies have concluded that, electricity theft is largely a socio-economic problem, which can only be successfully addressed through a holistic approach, involving public and private sector partnerships.

Government policies and regulations continue to gently but firmly guide the energy sector towards a more competitive future, even as policy makers and the regulator proceed to operate within the boundaries of the current legal framework in which JPS holds a dominant market position, with the exclusive right to transmit and distribute electricity.

With a new power wheeling framework moving towards implementation, a Net Billing Programme controlled by the GOJ and the availability of natural gas (NG) enabling distributed generation in Jamaica, customers are perceiving options never before imagined in controlling their energy future. The development of an Electric Vehicle Policy is also on the horizon showing the Government's commitment to creating a diversified, environmentally sustainable and efficient energy sector that provides affordable and accessible energy supplies to Jamaicans[1].

Customers have become more demanding of the utility, expecting improved service and immediate responses to their queries or concerns. Changing customer behaviour has already prompted JPS to make changes to its service offerings, to provide greater convenience to customers. Today's customers are "fully connected", and want to be engaged on their own terms using a wide variety of channels, including: voice, webchat, email, video and social media. They expect the utility to be "always on", and ready to respond to them via whatever channel they choose to contact the Company. JPS has responded with improvements in its system reliability and will, over the next regulatory period, continue to modernize the grid. The Company will also continue to refine its product and service offering to meet the demands of its customers.

There are also new pieces of legislation that impact JPS' operation and strategic positioning, namely the Electricity Act, 2015, the Electricity Licence, 2016 (the Licence) and the Electricity Grid

[1] Jamaica Information Service (February 27, 2019). Government to Craft Energy Policy Retrieved from: https://jis.gov.jm/govt-to-craft-electric-vehicle-policy/

Code. Perhaps the most significant change in the Licence is the switch from a Price Cap to a Revenue Cap regulatory regime. The Licence has also introduced changes to the five (5) year rate review process, which will be executed in accordance with the Revenue Cap principle. It stipulates that the Revenue cap will be arrived at based on the (1) most recent Integrated Resource Plan (IRP); (2) Business Plan; (3) Final Criteria; and (4) Base year. In addition, the Business Plan should incorporate the final criteria, the IRP, and form the basis for the rate review process to establish the non-fuel rates. While the IRP, which is being developed by the Ministry of Energy, is unavailable to inform the Business Plan for the 2019-2024 Rate Review filing, JPS will proceed with the filing and make the necessary adjustments in a subsequent Extraordinary Filing once it is completed.

Over the next five years, the Company will continue to make deliberate steps to keep up to speed with Government and customer demands, technological advancements and competitive forces, while staying focused on supporting national development and providing value for its customers and shareholders.

The green world that is emerging is offering unprecedented opportunities for an organized JPS to take advantage of a new world of energy services.

In positioning itself to respond to, and to take advantage of the changes in the Jamaican energy market, JPS will build on the work already initiated while embarking on new horizons. To achieve this, the Company will focus on five strategic priority areas, namely: delivering exceptional **customer service**; ensuring the **safety of the public and employees**; achieving **end-to-end efficiency**; **growing the business**; and **strengthening relationships** with key stakeholders all of which are under-pinned by the key enablers of its people, processes and technology.

Safety

Safety is both a core value and a strategic priority of JPS. The safety of employees and the public is a critical factor in ensuring JPS' long term viability. JPS will continue to create and maintain a safe and healthy work environment, complying with all applicable laws, regulations, and sustainable business practices. To achieve these objectives, the Company has taken steps to ensure that its current operations as well as all expansion plans are in keeping with applicable policies, regulations, standards and guidelines. Additionally, JPS is implementing a framework for systematically managing safety elements in the workplace to prevent or minimize the occurrence of work-related ill health, injury or death. The Company is also seeking to embed a zero-harm philosophy in its operations. These objectives will be achieved through the implementation of a number of initiatives that are supported by policy, job descriptions, performance incentives and employee recognition.

Customer Service

JPS believes its success depends on intimate knowledge of, and partnership with its customers. Over the next five years, JPS will transform the way it serves its customers by being more deliberate in proactively identifying and addressing customer needs. The factors that matter most to JPS' customers are: affordable and reliable service, convenience, security, and service offerings designed to satisfy each customer's unique needs. Most of all, they want to feel that the value received is equivalent to, or greater than the sum paid.

JPS will seek to deliver customer value over the next five years, by focusing on three main themes: empowering customers; improving ease of doing business and service quality. JPS aims to use the opportunities provided by the changing marketplace to move the Customer Satisfaction Index from its current 60% in 2018 to 70% in 2023. With respect to Quality of Service JPS intends to improve its Q- Factor performance by 23% over the next five years. To achieve this, JPS will continue to modernize the grid by installing intelligent devices in strategic locations, standardizing voltage distribution and optimizing power flow; installing energy storage systems to minimize the impact of intermittency related to renewable power generation, expanding the grid to improve reliability, upgrading software and communication systems as well as conducting **routine maintenance** according to a scheduled programme. These initiatives also satisfy the dual purpose of **upgrading the T&D network** including substations to ensure **grid security and stability, and compliance with T&D Grid Codes and Design Criteria**.

Customer empowerment will be enabled through multi-channel service delivery, expansion of distinct service options tailored to meet specific customer's needs, and increased convenience for customers transacting business with the Company. To improve the ease of doing business, JPS aims to provide a consistently delightful customer experience at every touch point by pursuing a strategy of having seamless transactions, quicker resolutions and easy access to real-time information.

End-to-End Efficiency

In its pursuit of end to-end efficiency, JPS will seek to deliver customer value over the next five years, by streamlining its processes to eliminate inefficiencies and reduce operating costs, which will help to lower electricity costs for customers. This improvement will be defined in the context of an efficiency target or Productivity Improvement Factor to be achieved by JPS.

The main areas of focus for end-to-end efficiency will be lowering costs by a 1.9% productivity improvement factor, reducing system losses by 2.30% points and improving Heat Rate performance and plant reliability to 9,337 kJ/kWh at the end of 2023.

Significant improvements in service quality and long-term operating efficiencies are expected from the system diversification and expansion strategies being pursued, along with cost effective maintenance strategies for refurbishment of older generating units and the power delivery system. The initiatives include the roll out of smart meters island wide, the replacement of 292 MW of steam units in excess of 40 years old in the near term, and a further 167.5 MW of aged

inefficient capacity slated for replacement in 2023. JPS will also be implementing real time heat rate measurement in its economic dispatch by 2020. In addition, the Company will execute a maintenance programme that will take into account the condition-based assessments but adhere mainly to manufacturer's specifications to ensure that the generation fleet and T&D network perform as required to deliver service to customers.

The 2.30% points reduction in system losses is one of the most critical objectives being pursued by the Company. It will have the dual effects of eliminating waste and driving down the cost of electricity at the same time. Success in this area will require a number of initiatives, including a massive metering exercise to identify where losses exist and through the use of data analytics to identify with greater accuracy where electricity is being illegally abstracted, so that appropriate mitigating actions can be taken. This programme will also generate useful information that will guide process improvements which will generate greater customer satisfaction. The loss reduction strategy also includes a Community Renewal Programme, through which the Company seeks to convert 20,801 consumers to customers. The strategy will also address the reduction of technical losses through initiatives such as power factor management, voltage standardization, phase balancing and voltage regulation.

Growth

JPS recognizes that today's customers expect solutions that address their need for reliable and more affordable energy and that a failure to respond will result in a loss in customer value. The Company currently provides energy solutions in renewable or co-generation modalities, and supports energy efficiency programmes that enable customers to save on energy consumption.

JPS, in its continued efforts to provide solutions for the energy needs of every Jamaican aims over the next five years to maximize value to customers and other stakeholders. This will be done by successfully pursuing sustainable business growth in the evolving energy market through the following channels: developing utility scale renewables, delivering behind the meter energy services and solutions, pursuing electric vehicle penetration by supporting the lobbying effort and installation of charging infrastructure and offering energy management and data services and smart energy retail services.

Stakeholder Engagement

JPS manages a key component of the way life is experienced in Jamaica and the service it provides impacts all Jamaicans on a daily basis. As the main producer and the sole distributor of energy, the Company's decisions have a direct impact on all aspects of Jamaican life. As such, effective stakeholder engagement is critical to the Company's success. Stakeholder relationships span customers, business partners, policy makers, advocacy groups and other influencers. JPS strives to maintain positive and mutually beneficial relationships with all stakeholders and will continue to engage the various groups to incorporate their perspectives in strategy development and decision-making. The Company's approach is focused on creating an enabling environment for playing its role in national development through transparency and information sharing.

In this regard, JPS will embark on a programme of segmented engagement, educating its various stakeholders on its plans and positions on various issues affecting the industry and service delivery in Jamaica through direct and mass media communication, in formal and informal settings. The Company will engage the media, special interest groups, key customers, and trade associations, as part of its strategy to develop lasting partnerships.

In particular, JPS will strengthen its strategic partnerships with the Government and relevant social development groups as it rolls out its programme of activities to reduce losses with the Jamaica Social Investment Fund (JSIF) and Government of Jamaica (GOJ), and support national development as a responsible corporate citizen.

Enablers

A key component for achieving the Company's strategic goals over the next five years is the strategic alignment of its people, processes and technology with the overall business strategy. As JPS' business model transforms to meet the changes in market trends, so too will changes in employee skill sets, systems and processes be required. JPS will therefore pursue the right mix of suitably qualified and appropriately skilled employees, effective systems and aptly designed processes to enable the successful implementation of the Company's strategies.

Strategic Priorities and Key Initiatives

The table below provides an overview of each strategic priority and some of the supporting key initiatives.

Strategic Priority Areas	Objectives	Key Initiatives
Safety **Protecting Life and Property**	Improve Safety Management	▪ Integrated Safety and Health Management System
	Improve Organization's Safety Culture	▪ Safety Leadership Programme ▪ Safety Training and Certification
End-to-End Efficiency **More value, less waste**	Lower Operating Costs	▪ Business Process Optimization
	Reduce System Losses	▪ Metering Programme (Smart, Transformer, RAMI) ▪ Audits and Investigations ▪ Measurement Programme
	Improve Heat Rate and Plant Performance	**Commission:** ▪ 194 MW LNG Old Harbour (SJPC) ▪ 37 MW Solar Plant (Eight Rivers) ▪ 94 MW JAMALCO
Customer Service **Delivering value to our customers**	Improve System Reliability	▪ Energy Storage ▪ Grid Modernization ▪ Smart LED Streetlight Programme ▪ Voltage Standardization ▪ T&D Upgrade and Expansion

Strategic Priority Areas	Objectives	Key Initiatives
Customer Service Cont'd		▪ Life Cycle Asset Management
	Improve the Ease of Doing Business	▪ Outage Notification Automation ▪ Maximizing the benefits of smart meter technology (fewer estimations, quicker reconnections etc.)
	Customer Empowerment	Product and Service Offering Expansion: ▪ MyJPS Mobile App ▪ Bill Information Kiosks ▪ Pay-as-You Go (PAYG) Metering ▪ Customer Education Programme
Growth Grow today, secure tomorrow	Increase Revenue Generation Services	▪ Commission 14 MW DG ▪ Renewable Energy Growth Projects ▪ EV Charging Stations
Stakeholder Relationships Success through partnerships	Strengthen Partnerships with Key Stakeholders	Stakeholder Engagement: ▪ Partner to reduce losses (JSIF and GOJ) ▪ Partner to achieve EV Policy (MSET) ▪ Corporate Social Responsibility

Table 1: Key Initiatives – Business Plan 2019-2023

Current and Future Large Scale Innovation Projects

This section highlights the innovation projects that will further improve service quality and reduce costs.

Table 2: Current and Future Large Scale Innovation Projects

Strategic Priority Areas	Project 1: Smart Metering	Project 2: EV Charging Stations	Project 3: Grid Modernization	Project 4: Energy Storage
Customer Service			✓	✓
End-to-End Efficiency	✓			
Growth		✓		

Outputs JPS will deliver: Performance Goals

JPS' Business Plan will deliver 12 outputs in the five strategic priority areas as outlined below:

Strategic Priority Areas	Safety	Customer Service	End-to-End Efficiency	Growth	Stakeholder Relationships
Measures	**3**	**4**	**3**	**1**	**1**
Outputs	Reduce the Motor Vehicle Accident frequency rate by 10%	Reduce the average frequency of unplanned power cuts from 15.50 in 2018 to 11.96 in 2023	Reduce System Losses by 2.30% points	Maintain a growth rate at a minimum of 1% annually	Improve Brand Perception from 49% in 2018 to 60% in 2023
	Reduce Recordable Injury/Illness from 15 in 2018 to 5 in 2023	Reduce the average duration of unplanned power cuts from 32.89 hours in 2018 to 25.38 hours in 2023	Improve JPS Heat Rate (KJ/kWh) from 11,214 in 2018 to 9,337 in 2023		
	Litres Lost to the Environment from 148 litres in 2018 to 0 in 2023	Improve Guaranteed Standard compliance level from 91% in 2018 to 97% in 2023	Productivity Improvement: Reduce (T&D) Operating Costs by 1.9% annually		
		Improve Customer Satisfaction Index from 60% in 2018 to 70% 2023			

Table 3: Outputs- Business Plan 2019-2023

Average Annual Expenditure

JPS will deliver significant service improvements whilst marginally increasing annual **O&M expenditure** in the first two years with reductions thereafter resulting in an overall decrease in year five expenditure of US$3.5 M (2018 Adjusted compared to 2023).

The table below provides a summary of the expenditure profile over the next five years in addition to the base year (2018)[2] data. Information is broken down by the main category of expenses.

Operating Expenses by Nature:	2018	2018 Adj	2019 LE	2020	2021	2022	2023
Payroll, Benefits & Training	62,861	69,379	72,756	67,173	66,351	66,255	66,187
Third Party Services	15,842	17,877	19,314	21,924	18,967	18,584	17,913
Material & Equipment	4,340	4,340	4,618	4,558	4,010	4,035	3,990
Bill Delivery & Meter Reading	10,382	10,382	9,839	9,279	8,098	7,740	7,100
Technology & Telecoms	7,001	7,001	7,763	8,799	8,979	8,940	8,968
Office & Other Expense	7,898	7,899	7,411	8,246	8,209	8,181	8,252
Transport	8,234	8,234	8,433	8,492	9,121	9,164	9,229
Insurance Expense	5,152	5,152	5,140	4,695	3,632	3,695	3,759
Bad Debt Expense	8,672	10,899	9,364	9,038	10,624	10,538	10,794
GRAND TOTAL (000's)	**130,384**	**141,164**	**144,638**	**142,204**	**137,991**	**137,131**	**136,193**

Table 4: Business Plan O&M Expenditure Summary 2019-2023

JPS has aligned its **capital investment** activities to deliver on its strategic priority of delivering exceptional customer service, end-to-end efficiency, growth and safety to ensure that these priorities are achieved.

The table below outlines JPS' annual investment by strategic priority. JPS will invest US$478.7M, spending an average of US$95.7M per annum. JPS will invest 46% of its five year budget to improve customer service, 44% to improve efficiency across the business and the remaining 10% invested to deliver on safety and growth related objectives.

Strategic Priorities	2,019	2020	2021	2022	2023	Total	Percentage %
Customer Service	40,169	38,988	50,227	46,728	43,711	219,822	46%
Efficiency (End to End)	49,602	42,451	43,717	46,513	27,618	209,901	44%
Growth	10,308	9,440	7,643	8,635	6,361	42,386	9%
Safety	1,605	773	1,273	1,768	1,259	6,679	1%
Grand Total	**101,683**	**91,652**	**102,859**	**103,644**	**78,949**	**478,788**	**100%**

Table 5: Capital Investment Summary by Strategic Priority 2019-2023

[2] **Base year** represents the first year of the Business Plan; Base Year (2018) is the last 12 months of operations for which there are audited accounts.

2. Introduction

Jamaica Public Service Company Limited (JPS) is an integrated electric utility company and the sole entity licensed to transmit, distribute and supply electricity in Jamaica. The Company is engaged in the generation, transmission, distribution and supply (for public and private purposes) of electricity, and also purchases power from a number of Independent Power Producers (IPPs).

The Company owns and operates four power stations, nine hydroelectric plants, and one wind farm. JPS' Transmission & Distribution (T&D) network includes 51 substations and over 14,000 kilometres of lines across the island. While JPS currently has exclusivity on the transmission and distribution of electricity, Jamaica has a competitive process for the addition of new generation of electricity. JPS therefore has to compete with other players in the market for the installation of new generation. However, the Company has the Right of First Refusal for the replacement of its existing generating units.

Beyond the provision of electricity, JPS is a key partner in national development. The Company has a vibrant corporate social responsibility portfolio, and makes significant contributions in the areas of education and youth development. JPS also has a strong safety and environmental focus, and deliberately pursues a strategy of fuel diversification for clean energy production.

Marubeni Corporation of Japan and Korea East-West Power (EWP) jointly own majority shares (80%) in JPS. The Government of Jamaica and a small group of minority shareholders own the remaining shares.

During 2017, JPS incorporated a new subsidiary, South Jamaica Energy Holdings Limited, through which the Company holds investments in other projects.

The Office of Utilities Regulation (OUR), is the independent regulatory agency with responsibility for regulating the electricity sector.

The Business Plan covers the period 2019-2023. It forms an essential component of JPS' Rate Design and 2019 Rate Case Filing. The Electricity Licence, 2016 stipulates that the Business Plan, the most recent Integrated Resource Plan (IRP), the published final criteria, the Base Year and the cost of service study forms the basis for the rate review process to establish the non-fuel rates and comprise the justification for the rate proposal of JPS.

The Business Plan is underpinned by an extensive stakeholder engagement programme. It clearly sets out (1) JPS' outlook on the future (2) the value the Company will deliver and (3) the associated investments to deliver on its commitments.

2.1 JPS' Vision, Mission and Values

This five year Business Plan embodies the Company's Mission, Vision and Core Values.

OUR VISION	OUR MISSION	OUR VALUES
We are the people leading the energy revolution, unleashing Jamaica's growth and prosperity	Through inspired and committed employees, and innovative technologies, we deliver an energy solution to empower every Jamaican – fuel the growth of businesses, and support national development	**ASPIRE:** ♦ **A**ccountability ♦ **S**afety ♦ **P**assion ♦ **I**ntegrity ♦ **R**espect ♦ **E**xcellence

JPS in the development of its Business Plan factored the applicable goals and outcomes of the Vision 2030 Jamaica – National Development Plan (Vision 2030), Jamaica's National Energy Policy and Sustainable Development Goals among other things to ensure robustness, inclusiveness and alignment with national development.

The Business Plan includes five overarching strategic priorities, supported by key enablers, that will enable the utility to achieve its vision. These priorities lay out a comprehensive strategy to enable JPS to improve customer experience utilizing emerging technologies and navigate the market changes impacting the utility industry to deliver value to customers and shareholders.

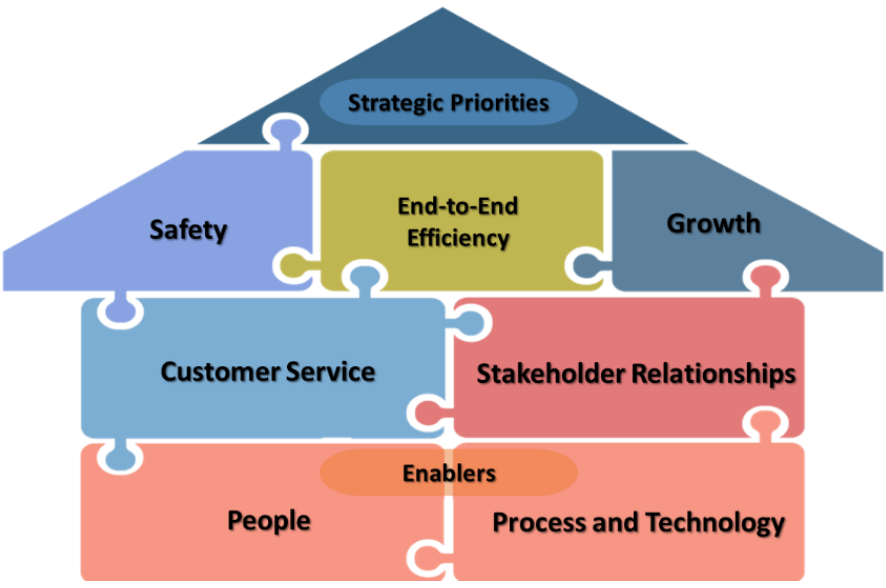


Figure 1: Strategic Priorities and Enablers

JPS will continue to drive the transformation of the energy sector in the medium term (2019-24) through the strategic priorities of:

- Partnering with key sector stakeholders to realize the National Energy Policy goal of secure, affordable and sustainable energy;
- Delivering customer value through customer service excellence with improved reliability and customer experience;
- Driving operational excellence through end-to end efficiency
- Delivering great value to customers and a reasonable return to shareholders

The Business Plan is divided into five main sections: (1) Business Performance Review; (2) Business Environment and Current State; (3) JPS' Strategic Direction; (4) Medium Term Financial Plan; and (5) Risk and Uncertainty.

The financial numbers are expressed in United States Dollars (US$) unless otherwise stated as JPS' financial are US$ denominated. Financial statement are quoted in nominal dollars i.e. includes the projected impact of foreign exchange and inflation rate movements.

BUSINESS PERFORMANCE REVIEW

JPS | Powering What Matters

BUSINESS PERFORMANCE REVIEW

3. JPS' Track Record

This chapter outlines the Company's performance and stewardship over the previous rate period 2014 – 2018. The performance has been categorized in four main areas: delivering customer value, operational performance, asset utilization and financial performance.

The table below outlines the historical performance of some key indicators in the main categories which will be highlighted in the ensuing chapter.

	2013	2014	2015	2016	2017	2018
Customer Value						
Customer Satisfaction Index (%)	40.40%	52.80%	68.40%	60.00%	60.00%	60.00%
Operational						
JPS Thermal Heat Rate (kJ/kWh)	12,034	11,457	11,332	11,570	11,330	11,214
System Losses (%)	26.64%	26.73%	27.00%	26.80%	26.45%	26.27%
SAIDI (Hours)	32.9	41.0	33.1	33.2	34.3	28.7
Asset						
JPS EAF (%)	75.0%	78.0%	78.0%	81.0%	86.8%	88.7%
Financial						
ROE (%)	2.8%	7.00%	7.88%	6.56%	6.22%	7.32%
Capital Expenditure (US$'M)	89.6	66.1	69.8	60.9	102.0	117.6
O & M Expenses (US$'M)	143.3	137.1	142.1	142.7	149.0	130.4

Table 6: Historical Corporate Performance Highlight

During the five year rate review period ending in December 2018, JPS progressively improved its performance as reflected in the metrics in Table 6. The Company also improved service delivery to its customers to provide a safe, reliable and cost-effective electricity supply. In this regard, JPS made significant investments in maintaining and improving its assets with capital investments of US$416.3M during the period. In 2017 and 2018, the Company made a record investment of US$101.9M and US$117.5M, respectively. Improved performance was noted in the following areas:

- Customer satisfaction index improved from 40.4% in 2013 to 60.0% at the end of 2018.
- The Company served the highest peak demand of 666.7 MW in 2017
- The most efficient conversion of fuel resulting in JPS hermal Heat Rate of 11,214 kJ/kWh in 2018 compared to 12,034 kJ/kWh in 2013
- System losses improved from 27.00% in 2015 to 26.27% in 2018
- Improvement in the duration of outages from 32.9 hours in 2013 to 28.7 hours in 2018, despite numerous uncontrollable weather element which impact performance during the period.

- Plant availability improved from 75.4% in 2013 to 88.7% in 2018 and achieved the lowest forced outage rate of 5.4% in 2018.
- Operating expenses reduced to its lowest in five years. In 2018 operating expenses declined by $18.6M or 12.5% compared to 2017. However, there were a number of changes which resulted in some expenses increasing over time.

3.1 Delivering Customer Value

Improving customer value has been a top priority for JPS over the past five years, and to this end, the Company implemented a number of initiatives, resulting in customers experiencing improved service delivery as well as lower electricity prices (in US$ terms) in the form of lower fuel and non-fuel tariffs. Additionally, JPS provided new service options such as prepaid metering and mobile apps and enabled its customers to be more energy efficient through the provision of energy audits, energy management training and access to energy saving devices through its eStore. JPS also expanded its customer education programme to help customers eliminate waste and use energy efficiently.

	2013	2014	2015	2016	2017	2018
Average Tariff						
Fuel	22.25	21.02	11.24	9.41	12.34	15.11
Non-Fuel	9.55	9.19	10.11	8.72	8.42	8.48
IPP	3.51	3.16	2.40	3.90	4.97	4.41
Total Average Tariff USc	**35.32**	**33.38**	**23.75**	**22.02**	**25.73**	**28.00**
Guaranteed Standard (%)	95.9%	97.8%	N/A	95.2%	96.8%	91.1%
Call Centre Service Level (%)	73.0%	80.0%	81.0%	94.0%	89.0%	93.0%
Billed Sales Growth (%)	-2.08%	-0.95%	2.10%	3.61%	0.79%	0.08%
Customer Satisfaction Index (%)	40.4%	52.8%	68.4%	60.0%	60.0%	60.0%

[3]

Table 7: Customer Value Performance

3.1.1 Electricity Rates & Sales

Electricity Rates:

Electricity rates averaged US¢33.38/kWh in 2014 and declined to US¢28.00/kWh in 2018 a reduction of 16%, driven primarily by fuel rates declining by 28% from US¢21.02/kWh to US¢15.11/kWh in 2018. This reduction have been as a result of:

- Fuel prices reduction

[3] 2015 Guaranteed Standards (%) not available due to system issues experienced in 2015.

- Improved operational efficiency
- Fuel diversification
- Increase in kWh sold driving tariffs down under the Revenue Cap regime

The fuel prices charged by JPS is indexed to the West Texas Intermediary (WTI), which declined from US$/barrel $97.91 in 2013 to $64.95 in 2018, representing a 30% reduction over the five year period. The average fuel prices for No. 6 Heavy Fuel Oil (HFO) declined by 24% from US$/barrel $104.45 in 2013 to $70.98 in 2018. Consistent with the downward trend, No. 2 Automotive Diesel Oil (ADO) declined by 20% from US$/Barrel $141.92 to $104.0 in 2018.

While fuel price reduction has been the most significant factor, improved efficiency as measured by Heat Rate also contributed to the reduction experienced. JPS' thermal Heat Rate improved from 12,034 kJ/kWh at the end of 2013 to 11,214 kJ/kWh at the end of 2018 representing an improvement of 820 kJ/kWh or 7.3%. The improvement in 2018 relative to 2017 (116 kJ/kWh) contributed to annual fuel savings of US$6.1M.

In 2016, JPS converted its Bogue 120 MW Combine Cycle generating plant to facilitate the introduction of Liquefied National Gas (LNG) to Jamaica. This was a significant step towards realizing the National Energy Policy goals of fuel diversity. Additionally, in 2018, the Company rehabilitated and converted its GT 11 unit at Bogue to utilize LNG in generating electricity. These two plants with a combined total of 140MW of generating capacity, generated a combined 946.5 GWh (21.7%) of Net Generation in 2018.

Jamaica's National Energy Policy has a target of generating 20% of the country's energy requirements from renewable energy sources by 2030. JPS has supported this target through the expansion of its own renewable facilities in 2014 when it commissioned a 6.3 MW hydro plant facility at Maggoty. This represents the largest hydro-electric development to be implemented since Independence (1962). JPS also facilitated the addition of approximately 80 MW of renewables in 2016, almost doubling the renewable energy contribution on the grid in a single year. This was made possible through Power Purchase Agreements (PPAs) with several Independent Power Producers (IPPs) for 36 MW of wind energy from BMR Jamaica Wind, 24 MW of wind energy from Wigton and 20 MW of solar energy from Content Solar.

Sales

Billed sales grew by 173.1 GWH or 5.7% between 2013 and 2018. In 2014, sales declined by 1%. However, since then sales grew each year, ranging from a growth rate of 0.1% to a growth rate of 3.6% (See Figure 2 below). In 2015, JPS achieved sales growth of 2.1% (63.3 GWH), reversing the trend of declining sales in the previous 4 years. In 2016, the Company achieved growth of 3.6% (110.9 GWH). However, JPS has since been experiencing lower rates of growth, attaining only a 2.5 GWH (0.1%) growth in 2018. The main contributor was the decline in the rate of consumption growth in the Residential (RT 10) and Small Commercial (RT 20) customer categories.

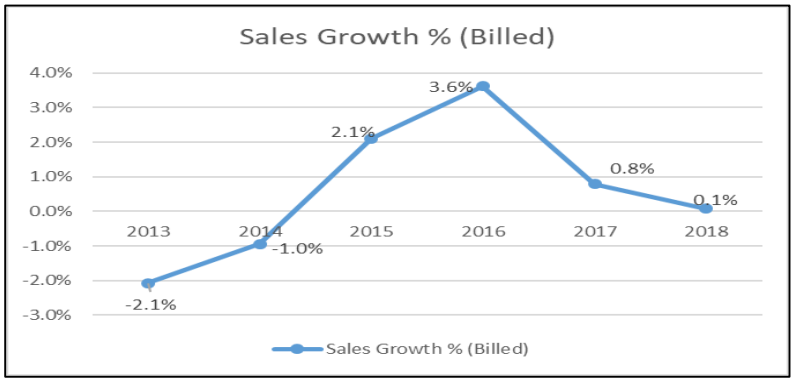


Figure 2: Sales Growth % (Billed)

Increasingly, the Company is facing the effects of customer conservations via the use of more energy efficient end-use products, the proliferation of renewable energy solutions such as roof top solar leading to load migration to self-generation as well as complete grid defection. The paltry level of sales increase in 2018 was partially driven by lower temperature relative to previous years, full year impact of customer defection, and a number of large customers being off at various times during the year for maintenance activities. Another contributor to the general decline in sales is the impact of replacement of the traditional mercury vapour and high pressure sodium streetlights with LED technology. This resulted in the reduction in consumption of approximately 46% with less than half the inventory of lamps replaced. At the end of 2018, there were over 42,000 LED streetlights across the system.

3.1.2 Customer Satisfaction

JPS is committed to improving its service delivery and creating positive customer experiences. The Company made significant progress in this regard since the last rate review, with a 20 percentage point improvement in customer satisfaction between 2013 and 2018. In 2013, overall customer satisfaction was 40.2%, while in 2018 customer satisfaction was at 60% based on the most recent *Customer Satisfaction (CSAT) Study* (2018)[4].

The findings of the 2018 CSAT survey are supported by a *2018 Cost of Unserved Energy Study*,[5] in which most customers expressed satisfaction with the quality of service provided by JPS. More than half of customers surveyed acknowledged that the service improved over time: 59% of residential customers and 53% of commercial customers. One-third of the customers indicated that the service remained the same, while 8% of residential customers and 14% of commercial customers surveyed said the service declined.

[4] JPS Customer Satisfaction Survey, 2018
[5] Cost of Unserved Energy Survey, 2018

This trend was also confirmed by surveys conducted by the OUR. The OUR's 2016 National Consumer Satisfaction Survey results indicated a significant movement in the level of satisfaction of JPS' customers, which moved from 4.4 in 2014, to 6.3 (of a possible 10) in 2016.[6]

JPS' efforts to improve service was recognized nationally, with the Company winning several customer service awards from the Private Sector Organization of Jamaica / Jamaica Customer Service Association in the following areas in 2017:

- Monitoring and Measurement
- Leadership and Strategy
- Service Excellence Charter & Standards
- Recognition and Reward
- International Benchmarking
- Overall Service Excellence Award for Large Businesses.

These achievements were the result of sustained efforts by the Company to address key points of customer dissatisfaction.

3.1.3 Reliability Improvement

Customer Average Interruption Duration Index (CAIDI), measures the average interruption duration per customer during a given period of time, in this case one year. This is calculated using two reliability indices, the System Average Interruption Duration Index (SAIDI) divided by the System Average Interruption Frequency Index (SAIFI). Over the five year period SAIDI improved by 30% while SAIFI improved by 37%**.** The CAIDI results is impacted by the rate of movement/improvement in one variable relative to the other. The average restoration time increased from 1.83 hours in 2014 to 2.03 hours in 2018 despite improvement in both SAIDI and SAIFI performance**.** Refer to details in section 3.2.5 System Reliability. JPS made several upgrades to its system over the five year period including the installation of smart devices which enables self-healing capabilities on the grid and facilitates quicker response from the utility. These include: distribution automation switches, reclosers, automatic trip savers, fault circuit indicators, and power quality monitors. JPS also continues its intense vegetation management and structural integrity programmes.

3.1.4 Service Standards

Electricity Guaranteed Standards (EGS) are minimum service levels that must be met by JPS in its interaction with each individual customer. Guaranteed Standards cover areas such as connections, customer complaints, and estimation of electricity charges. If the Company fails to meet a guaranteed standard, the Licence lays out requirements for automatic compensation payments to the customers affected.

[6] National Consumer Satisfaction Survey, 2016

JPS consistently maintained a compliance rate of over 90% with respect to the Standards. At the end of 2018 the overall average Guaranteed Service Standards compliance rate was 91.1%.

The Company made a deliberate effort to raise its compliance with the Guaranteed Standards, over the years, as a proxy of its overall service standard. The greatest challenge was with the frequency of meter reading (estimated bills), which at the end of 2018 compliance was 72.9%. Deliberate efforts were made to address the breaches and they have begun to produce improved results. These include the increased rollout of technology through the Smart Meter project, the upgrading of communication systems, as well as improved internal controls all geared at ensuring timely and accurate meter reading.

Electricity Overall Standards (EOS) are set service levels for more general areas of services that affect JPS' customer base as a group. These include areas of service such as: billing punctuality, responsiveness of the Customer Care Centre, advance notification of planned outages, and restoration of service after unplanned outages. These standards establish regulated service levels but do not offer individual service guarantees or compensation. However, JPS is still required to deliver these minimum standards of service to all customers.

The two Overall Standards that are currently being monitored quarterly by the OUR are: EOS 1 - Notice of Planned Outage and EOS 10 - Responsiveness of Call Centre. While performance on EOS10 is consistently above target of 90% (averaging 93.8 % in 2018), JPS is currently well below 100% target on EOS1 (averaging 53.8% in 2018).

The Company uses radio, social media, emails, text messages and outage cards to communicate advance notice to customers regarding outages. While all planned outages are communicated via these channels, more work needs to be done to ensure that the customer data base is consistently updated with customer contact information. In 2018, the Company spent in excess of J$24M to advertise outages on radio. While the efficacy of radio advertising is established, it remains a difficult challenge to determine if affected customers are actually getting the notification regarding the respective outages.

3.1.5 Customer Service Excellence

Over the past five years JPS implemented several initiatives to improve the way it serves its customers. The Company made deliberate and sustained efforts to deliver greater value to customers and address customer dissatisfaction. In this regard, JPS undertook a comprehensive organizational restructuring exercise, to ensure more efficient service delivery to customers, and greater accountability across the organization. Other initiatives implemented over the past five years include:

- Upgrade of the Customer Information System (CIS) which contributed to improved operational efficiency and customer satisfaction

- The introduction of Customer Advisory Councils, which improved stakeholder engagement and provided an effective feedback loop for the Company
- The introduction of a Top 50 Programme, to ensure structured engagement of business customers
- More channels for communicating with customers – including dedicated segments in the traditional media, social media, text messages and emails
- The introduction of Ebills, with 38% of customers (250,934) receiving their bills electronically as at the end of 2018
- The outsourcing of the Call Centre to improve service quality. The average service level for calls in 2018 was 89% (versus the industry target of 82%), compared to 62% prior to outsourcing.

JPS places great emphasis on customer engagement and expanded the platforms available for information sharing and dialogue with customers. The Company implemented a sustained customer education programme, expanded the channels for customers to contact the organization, as well as created opportunities for more targeted stakeholder messaging. JPS maintains a consistent presence in the traditional media, enabling customers to interact with its representatives on popular radio discussion programmes. Through an innovative PowerSmart Energy Challenge reality TV show (2016 and 2017), the Company engages Jamaicans in the sharing of conservation and energy efficiency information.

3.1.6 Customer Options

JPS continues to provide its customers with tools and options for managing their energy consumption and overall costs. The Company expanded the array of options available to customers for managing energy consumption, bill payment and interacting with the utility, as follows:

- The **Pay-As-You-Go (PAYG) prepaid meter solution**, which allows access to electricity for more persons, while improving awareness of the cost of electricity and giving greater control over actual consumption decisions. Since the introduction of a prepaid pilot in 2015, more than 5,000 customers have opted for the PAYG solution, with many using it as an energy management tool, with reported savings of up to 30% on their electricity costs. The prepaid services is also a channel of convenience for managing the responsibility for energy bills in rented premises, removing the administrative challenge of changing account names every time there is a new tenant.

- **Expanded channels** for customers to access information. This included the introduction of a digital solution in the form of a **Mobile App,** and placing greater focus on customer service delivery via **online platforms** – including Webchat, Facebook and Twitter. In 2018, more than

29,400 customer engagements were handled via web chat, while 24,035 customer cases were handled via Facebook and Twitter.

- **Self-help options**, to include online outage reporting, and service via an in-office kiosk that included providing bill balances.

- The launch of its **eStore,** which provides tangible ways of helping customers manage their energy cost and usage. The eStore provides customers with a range of energy saving devices, and services including energy audits and energy management training, as well as complete renewable energy production solutions to help customers, especially businesses, to reduce their operating costs.

3.2 Operational Performance

JPS continues to make strides in improving the value it delivers to its customers, by being more efficient in its overall operations, lowering risk and costs while making the grid more reliable and resilient. This is evident in areas such as the marked improvement in fuel diversification, grid modernization, improved efficiency in converting fuel to electricity as measured by Heat Rate, as well as reduced outages and systems losses.

3.2.1 Fuel Diversification

JPS is proud of the central role it played in achieving fuel diversification for the electricity sector and Jamaica. Fuel is the primary driver of the price of electricity as seen by the international correlation between the generation mix and electricity prices. For this reason fuel diversification is an integral part of Jamaica's National Energy Policy as the country seeks to reduce its heavy dependence on oil. After more than a decade of seeking to bring natural gas to Jamaica, in 2014, the Government gave JPS the mandate to lead the effort, as part of the national thrust for fuel diversity. The use of LNG, given the stability of its market price is expected to result in greater stability in the price of electricity for customers, which is a primary objective of JPS and the Government of Jamaica. LNG enables the production of cleaner energy and saves on maintenance costs, while new generation technology allows for more seamless integration of renewables. In addition, Jamaica will enjoy additional economic benefits, from the use of NG across a number of sectors and industries in the economy. JPS has successfully commissioned the following in the 2014-2019 rate period.

Bogue Plant Reconfiguration

In the JPS Tariff Review for period 2014 – 2019 - Determination Notice (2014 - 2018) Tariff Review Determination), the OUR approved a specific Bogue Plant Reconfiguration Fund (BPRF) to facilitate the conversion of JPS' 120 MW combined cycle plant, Bogue Power Plant to use natural gas. This plant was first commissioned in 2003. It was the newest plant in the JPS fleet. It was originally built to facilitate conversion to dual fuel.

Through an international bidding process, the Company forged a partnership with US-based gas supplier, New Fortress Energy for the introduction of natural gas to Jamaica. Less than two years later in 2016, Jamaica celebrated a significant milestone, when NG was officially introduced into the nation's fuel mix for electricity generation at a cost of US$23.2M, accounting for approximately 10% of the energy generation capacity available to JPS.

Bogue GT11 Rehabilitation and Conversion

The introduction of LNG presented an opportunity for the retooling of JPS' generation fleet utilising the Right of First Refusal (ROFR) granted under the Electricity Act, 2015 and the Electricity Licence, 2016. In 2018, JPS invested US$15.1M to rehabilitate and commission a 20 MW LNG operated plant at the Bogue Power station. The plant was out of commission for several years due to operating cost concerns while operating on ADO. This new addition increased the fuel mix for electricity generation using natural gas to 23% of JPS' production.

3.2.2 Grid Modernization and Technological Advancement

As part of its strategic plan for modernization of the nation's electricity sector and its Licence requirement for an intelligent network, JPS gave a commitment to create a smarter grid. In the past four years, the Company upgraded its Grid Control Systems to improve reliability and to accommodate the integration of more variable sources of energy such as solar and wind. Below are some of the initiatives which were completed or underway to achieve this objective.

Smart City Technology

In 2016, the country took the first steps towards the introduction of smart city technology in Jamaica's capital, with the roll-out of AMI smart meters in the New Kingston commercial district, smart streetlighting, and the implementation of a web portal energy management solution. The Company also unveiled the country's first smart home in Western Jamaica in 2016.

Smart Meter Technology

Since 2016, JPS installed over 144,000 smart meters in communities across the island at a cost of approximately US$28.3M. The smart meter roll-out is a critical component in the development of the smart grid. These smart meters will provide customers with their own "Energy Portal" that allows them to view and manage their energy consumption providing usage data in shorter time intervals, for example hourly as opposed to monthly. They also give customers the ability to observe how their habits contribute to their electricity costs and make adjustments where necessary. This offers other critical benefits of losses management and detection as it provides analytics which help to improve the Utility's ability to identify energy losses at all levels of the network and provide greater efficiency and flexibility for billing operations and improving service delivery to customers. Customers have been benefiting from fewer estimated bills, and more timely reconnections.

Smart Street Lighting

JPS launched a Smart Streetlight project in 2017. It installed over 42,000 Smart LED streetlights at the end of 2018 as part of a plan to replace the country's stock of approximately 105,000 existing High Pressure Sodium (HPS) streetlights over a three-year period. This project is expected to be completed by 2020. In addition to improved public safety, smart streetlights are expected to deliver tangible benefits to the country, in the form of reduced energy costs, improved energy efficiency, and a resultant reduction in the carbon emissions from power consumption. JPS has invested US$13.3M since the start of the programme in 2017.

Smart Devices

JPS has been leveraging various grid technologies to improve system reliability and efficiency. These include the installation of:

- 220 Distribution Automated (DA) switches
- 385 Smart Fault Circuit Indicators (FCI)
- 542 Dropout Reclosers (Tripsaver II) at sub feeder levels
- The Calibration of Feeder Reclosers with Single Pole Tripping (SPT) features – 64 feeders

These devices provide the benefit of isolating faults on the transmission and distribution system, thereby reducing the duration of outages and the number of customers impacted by faults on the system.

Table 8 provides a summary of key operational performance indicators for the 2013-2018 period.

	2013	2014	2015	2016	2017	2018
JPS Net Generation (GWh)	2,342.2	2,450.7	2,529.9	2,557.2	2,535.8	2,560.4
JPS Share of System Net Gen. (%)	56.6%	59.7%	60.1%	58.8%	58.1%	58.8%
JPS Thermal Heat Rate (kJ/kWh)	12,034	11,457	11,332	11,570	11,330	11,214
SAIDI (Hours) - Total System	32.9	41.0	33.1	33.2	34.3	28.7
SAIFI (Occurence) - Total System	19.3	22.4	18.9	17.5	17.5	14.1
System Losses %	26.64%	26.73%	27.00%	26.80%	26.45%	26.27%

Table 8: JPS Historical Operational Performance

3.2.3 Net Generation

JPS' share of Net Generation has remained above 58%, despite the increase in competition for generation. In 2018, JPS attained the highest level of Net Generation of 2,560.4 GWh, representing a 9% increase over the 2013 generating level (2,342.2 GWh). This demonstrates JPS' commitment to operating efficiently to meet the demand of the grid.

3.2.4 Heat Rate

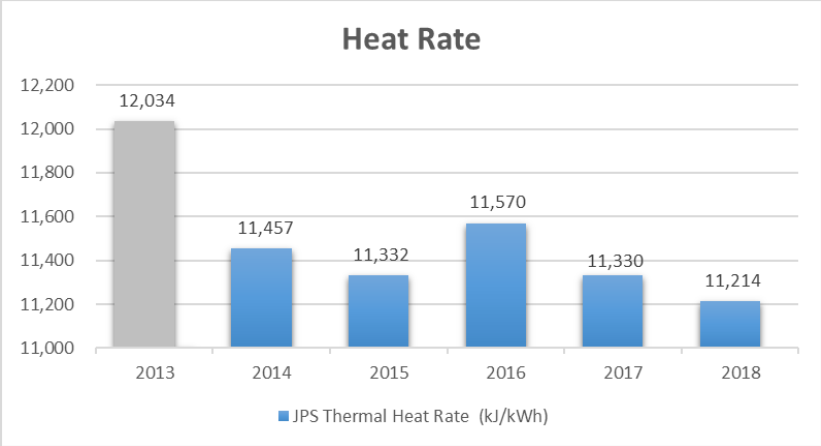


Figure 3: JPS Thermal Heat Rate

JPS spent the last five years retooling its generation fleet for efficiency through fuel conversions, rehabilitation, and expansion of the hydro system and executing on its programme of preventative maintenance. The result was the achievement of record strides in improving its efficiency in converting fuel to electricity as measured by Heat Rate. JPS' thermal Heat Rate improved from 12,034 kJ/kWh in 2013 to 11,214 kJ/kWh in 2018. This resulted in a reduction in the quantity and cost of fuel used to generate electricity and therefore lower costs charged to customers.

In 2016 the Heat Rate performance deteriorated to 11,570 kJ/kWh from 11,332 kJ/kWh in 2015. This was due to the combined cycle being offline for approximately three months to facilitate the Bogue Plant gas conversion implementation project. The performance was also impacted by higher than normal forced outages on other key base-load steam units during that year. Since then, performance improved from 11,570 kJ/kWh to 11,214 kJ/kWh, an improvement of 356 kJ/kWh over the two year period. The performance in 2018 was the best fuel to electricity conversion efficiency ever achieved by the JPS thermal fleet. In August 2018, rehabilitation works on the Bogue unit GT11 was completed contributing to the overall Heat Rate performance average of 11,600 kJ/KWh for the four month period.

3.2.5 System Reliability

JPS continues to focus its attention on improving the reliability and stability of the transmission and distribution grid. To this end the Company invested approximately US$185.4M over the five year period. This included the routine replacement of defective structures and equipment, voltage standardization and upgrade of the network including leveraging of various grid technologies. This resulted in an improved and more resilient grid and a reduction in the frequency and duration of outages as reflected in the SAIDI and SAIFI performance highlighted in Figure 4.

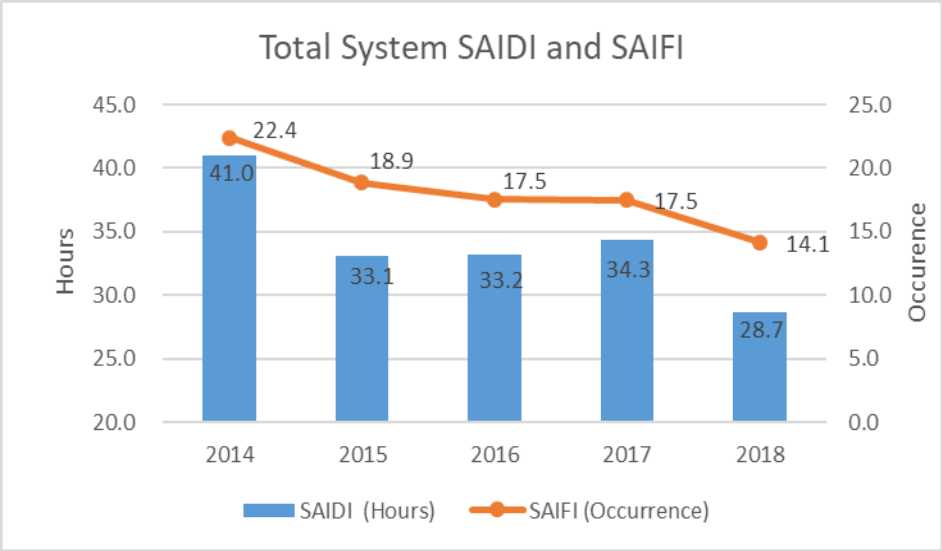


Figure 4: Total System SAIDI and SAIFI

Customers experienced fewer and shorter outages over the five year period. This was reflected in the SAIDI and SAIFI performance over the period. Total system reliability SAIDI[7] hours showed improvement from 40.99 hours in 2014 to 28.66 hours in 2018 (i.e 12.33 hours or 30%). In 2017 and 2018, the system was impacted by a number of severe weather impacting events, including flooding, severe winds and freak storm conditions that affected the level of improvement experienced. This contributed 6.66 hours to outage duration (5.1 hours in 2017 and 1.6 hours in 2018).

Customers also experienced reduction in the frequency of outages. Total System SAIFI[8] showed improvement over the five year period from 22.4 occurrences in 2014 to 14.1 in 2018 (i.e. 8.3 occurrence or 37%).

3.2.6 System Losses

System Losses continue to be an area of significant concern for the Company. Losses performance showed reductions over the five year period but was incommensurate with the effort and investment made by the Company. At the end of 2013 system losses was 26.64%, after which it deteriorated by 0.36 percentage point to 27.00% in 2015 before progressively improving each year to 26.27% at December 2018 representing a 0.73 percentage point movement.

At the end of 2018, technical losses represented 8.24% of total losses and non-technical losses represented 18.03%. The non-technical losses performance was greatly impacted by poor socio-economic conditions existing in the environment over which JPS had very little control. Despite this, the Company employed various strategies, including working with various Government

[7] SAIDI – System Average Interruption Duration Index – represents forced outages only based on IEEE standards
[8] SAIFI – System Average Interruption Frequency Index

agencies and Non-Government Organizations (NGOs) and using relevant technology to mitigate the high level of system losses.

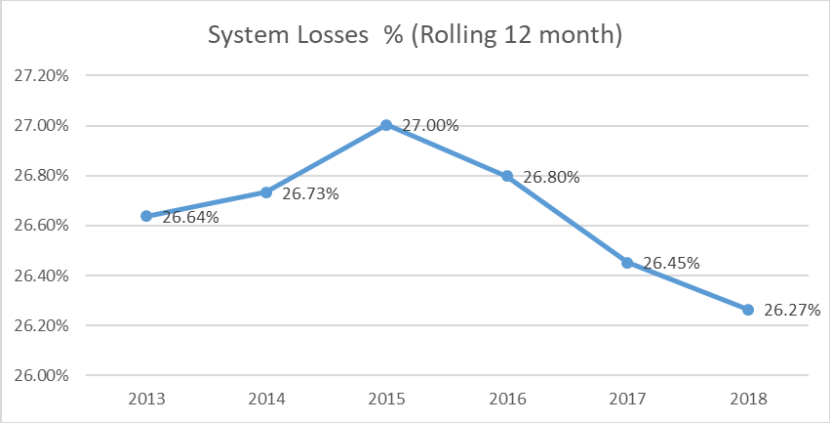


Figure 5: Systems Losses 2014-2018

The Company invested over US$51.2M in capital expenditure in addition to significant operating expenses over the five year period to reduce systems losses. Some of the key capital initiatives include the installation of over 144,000 Smart Meters costing US$28.3M, and the installation of 685 Check Meters in 2018, specifically designed for industrial and large commercial customers; installation of RAMI and total meters in various middle income communities at a cost of US$13.1M; investments in the voltage standardization programme (VSP) between 2016 and 2018 amounting to US$7.8M and meter upgrades of US$3.5M. See details in section 3.5 Capital Investment.

3.3 Asset Performance

The Company has significant assets deployed across the island, all of which are in varying stages of their respective lifecycles and conditions of repair. Continuous efforts are made to manage, maintain and operate a secure and reliable network to deliver positive company performance. This review will take a critical look at asset performance in the generating plants, substations, and transmission and distribution segments of the business.

3.3.1 Generation Plant Performance

Unplanned outages in our generating fleet measured by equivalent forced outage rate (EFOR) fell to the lowest levels in 15 years during the last regulatory period, from 13% in 2014 to 5.4% in 2018. There was similar improvement in the equivalent availability factor (**EAF**) which measures the availability of the plants for generating electricity. This moved from 75% in 2013 to 89% at the end of 2018.

There was a slight deterioration in EFOR during 2015 due to challenges at the Bogue Power station in relation to the operation of the gas turbines and an extended planned major overhaul on OH unit#3. However, performance recovered with steady improvements. See *Figure 6* below.

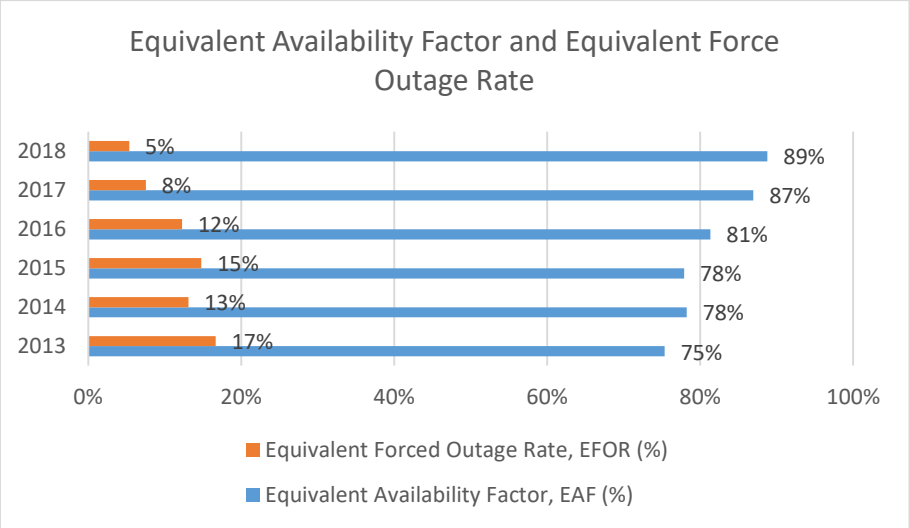


Figure 6: Equivalent Availability Factor and Equivalent Force Outage Rate

JPS invested over US$143M over the past five years on its generation fleet. This includes generation expansion, generation conversions and routine generation investments. The details of these investments are provided in section 3.5 - Capital Investment.

3.3.2 Transmission and Distribution Asset Performance

Significant efforts were made to improve grid security and the resiliency of the T&D network. This included the upgrade of the protection system, installation of new substation transformers and upgrades including Duncans Interbus; expansion of the Spur Tree Substation and voltage standardization of Roaring River and Ocho Rios feeders . These which were formerly 12 kV feeders and were converted to 24 kV.

Substations

There was a marked decrease in forced outages in substations over the past five years. Equipment failure contributed to over 70% of faults in the substations. This was due mainly to the failure of transformers and their component parts. Transformer related faults contributed approximately 23% to equipment failures while the contribution from breakers, insulators, arresters, protective devices and conductors ranged between 5% and 9%.

Transmission

Transmission Line Trip: Over the past five years, the transmission line experienced an average of 90 transient and 120 sustained trips per year. This is well above the Industry standard of six

trips per 100km per year. JPS line length of 1,207.6km, would give an equivalent of 73 interruptions per year.

Transmission Fault: Equipment failure contributed approximately 54% to transmission line faults. Other major contributors were lightning and other weather related events which accounted for 25%. Public trespass/encroachment events, which were mainly motor vehicle accidents accounted for 9%. The leading causes of forced outages over the period were failures involving: insulators - 30%, shield wires - 18%, conductors (jumper included) - 18% and cross arms - 10%.

Distribution

Distribution System Performance: The major known drivers for Distribution SAIFI are equipment failure - 39%, and vegetation encroachment - 17% while unknown causes account for 24% of occurrences. The Company is placing greater focus on reducing total customer outage across all feeders in the parishes to ensure equity of service among all customers.

The major drivers for Distribution SAIDI are equipment failure - 35%, vegetation - 25%, with 17% in the unknown category. In 2018, close to two thirds (60%) of parishes performed better than system average for SAIDI with more aggressive plans in place to bring all feeders within the system average.

Reinforcement and Rehabilitation of the T&D Network

This included:

- The installation of over 300 km of #2/0 medium voltage covered conductors to reduce the impact of vegetation
- Fuse coordination on over 10 distribution feeders to reduce the extent of outages on line sections
- Routine maintenance activities such as detailed and hazard patrol using ultra-sound and infrared technology to identify and correct defects on transmission and distribution circuits; lightning mitigation installations to reduce the impact of severe lightning strikes; structural integrity improvement including pole replacement and rehabilitation; pole and pad mounted transformer replacement; and intensified vegetation control.

In 2014, JPS started its transition from a traditional grid to a more modern grid with smart capabilities. During the period JPS installed components of an advanced distribution management system (ADMS) with fault location isolation and service restoration (FLISR).

In 2017, JPS began the implementation of an enterprise asset management system (EAM) with the aim of improving the way in which the Company's assets are maintained, thereby improving system reliability and further affecting control on cost. JPS will continue expanding EAM across the business to facilitate full coverage of Generation, Transmission and Distribution assets in an integrated manner to improve the lifecycle management of these assets.

System Shutdown

During 2016, the system suffered two major incidents in April and August, both of which resulted in system shutdown of 230 minutes and 337 minutes respectively. Following on investigations, the Company submitted a comprehensive report to the OUR. The Company developed action plans outlining lessons learnt, corrective actions, cost and timelines. The OUR, received periodic updates on the progress of the implementation of the action plans.

3.4 Financial Performance

This sub-section outlines JPS' financial performance over the five year period and gives an indication of the financial health of the utility relative to critical benchmarks. The table below outlines some of the key indicators and their performance over the period.

	2013	2014	2015	2016	2017	2018
Avg. fuel tariff (J$/kWh)	22.37	23.34	13.18	11.80	15.87	19.55
Avg. non-fuel tariff (J$/kWh)	12.68	10.23	11.83	10.93	10.81	10.98
Avg. exchange rate	101.26	111.54	117.48	125.77	128.28	129.53
Avg. fuel tariff (U.S. cents/kWh)	22.25	21.02	11.24	9.41	12.34	15.11
Avg. non-fuel tariff (U.S. cents/kWh)	13.07	12.35	12.51	12.61	13.39	12.89
Avg. monthly consumption per residential customer (kWh)	151.7	153.9	157.9	159.3	155.1	151.2
EBITDA margin	11%	13%	19%	20%	17%	17%
Net profit margin	0.63%	2.25%	3.49%	4.00%	3.36%	3.27%
ROE (Return on opening equity)	2.8%	7.0%	7.9%	6.6%	6.2%	7.3%
Capital expenditure (US$ Millions)	89.6	66.1	69.5	60.9	101.9	117.3
Dividends paid (US$ Millions)	0.00	2.19	2.15	2.17	2.33	10.33
Year-end exchange rate (J$:US$)	106.38	114.66	120.42	128.44	125.00	127.72
Total debt (US$ Millions)	368	373	356	344	380	402
Current ratio	1.10	1.18	1.21	1.23	1.17	1.47
Number of employees (permanent)	1,078	1,177	1,235	1,255	1,238	1,239

Table 9: Financial Key Performance Indicators

JPS consistently invested higher levels of capital expenditure in the business than the annual depreciation charge. Total capital investment over the five year period was US$416.3M compared to US$346M representing depreciation charges. The average capital spend for the first three years was US$62M and the last two years averaged US$109.7M peaking at US$117M in 2018. The equivalent average depreciation charge over the period was US$63M for the first three years and US$78.6M in the last two years.

The Company has been declaring and paying preference share dividend of approximately US$2.2M each year since 2014. However, the Company declared an ordinary dividend of US$10M in 2018 for the first time since 2012. It paid US$8M in 2018 and US$2M in January 2019.

3.4.1 Financial Statements

JPS prepares its financial statements in accordance with International Financial Reporting Standards ("IFRS") and has a financial year that ends on December 31 in keeping with Condition 5 (1) of the Licence. A selection of key financial information from JPS' audited financial statements for the 2014 – 2018 tariff review period is highlighted below. This represents total JPS performance (Regulated and Unregulated).

Income Statement

{US$ Thousand}	2013	2014	2015	2016	2017	2018	Total 2014-2018
Operating revenues:							
Fuel revenues	683,010	633,472	345,209	299,048	395,812	483,714	2,157,254
Non-fuel revenues	416,373	389,768	414,610	413,486	441,057	424,540	2,083,461
Total operating revenues	**1,099,383**	**1,023,240**	**759,819**	**712,534**	**836,869**	**908,254**	**4,240,716**
Cost of sales:							
Fuel	(728,745)	(651,880)	(367,291)	(306,389)	(390,892)	(477,553)	(2,194,005)
Purchased Power (excluding fuel)	(104,270)	(97,318)	(105,771)	(121,064)	(157,270)	(141,480)	(622,904)
eStore	-	(968)	(569)	(339)	(805)	(560)	(3,240)
Total cost of sales	**(833,015)**	**(750,166)**	**(473,631)**	**(427,792)**	**(548,967)**	**(619,593)**	**(2,820,148)**
Gross profit	**266,368**	**273,074**	**286,188**	**284,742**	**287,902**	**288,661**	**1,420,567**
Operating expenses	(143,265)	(137,063)	(142,093)	(142,729)	(148,969)	(130,384)	(701,238)
EBITDA	**123,103**	**136,012**	**144,095**	**142,013**	**138,933**	**158,277**	**719,330**
Depreciation	(49,168)	(54,077)	(57,949)	(77,607)	(76,589)	(80,666)	(346,888)
Net finance costs	(61,775)	(55,198)	(42,478)	(39,814)	(34,932)	(35,843)	(208,265)
Other income/(expenses) net	83	(4,578)	(12,840)	8,400	2,619	(1,882)	(8,281)
Taxation	(3,054)	847	(4,323)	(8,941)	(5,444)	(8,848)	(26,709)
Other Comprehensive Income Net of Taxes	(2,211)	0	0	4,469	3,534	1,490	9,493
Net profit/(loss) after taxation	**6,978**	**23,006**	**26,505**	**28,520**	**28,121**	**32,528**	**138,680**

Table 10: JPS Historical Income Statement 2013 to 2018

The Company made cumulative profits of US$138.7M during the five-year period from cumulative revenues of US$4.2B (which includes fuel and purchased power pass-through revenues). Non-fuel revenues accounted for US$2.08B, which was driven primarily by movement in sales quantity over the period. Energy sales increased by 5.7% or 173.1 GWh between 2013 and 2018. The 2014-2019 Tariff Review Determination notice made provision for JPS to earn an annual net profit of approximately US$30M if all conditions are met. However, net profits remained relatively flat over the period averaging US$27.7M annually. In 2018 the Company achieved the highest level of net profit at US$32.5M driven by extraordinary items. The lowest level of profit was US$23M in 2014. This net income includes income from IPPs and unregulated business as well as one off extra-ordinary items in some years. JPS achieved an average return on investment of 6.9% relative to the allowed 12.25%.

Total cost of sales of US$2.8B comprised fuel cost of US$2.2B and purchased power cost of US$0.6B. Fuel costs comprise mainly petroleum fuels and are driven by fluctuation in fuel prices over the period. Fuel costs decreased significantly between 2014 and 2015 due to the drastic reduction in fuel prices from an average West Texas Intermediary (WTI) of US$93.26 per barrel

to US$48.69 and has since started to increase, ending 2018 at US$64.9 per barrel. Natural Gas was introduced in 2016 and now accounts for approximately 21.5% of the total. Fuel cost is a direct pass through to the customers. The IPP costs increased due to the new IPPs (Blue Mountain Munro Wind, Wigton Rose Hill Wind and BRW Content Solar) added to the grid during the period.

JPS spent over US$701M in operating expense over the five year period. These costs trended up during the first two years of the review period, increasing in year four by US$6M then reducing significantly in 2018 by 12.5% or US$18.6M below that for 2017. This is testament to the Company's commitment to operate the business efficiently and deliver electricity to the consumer at the lowest possible price. O&M cost is the main item of costs over which management has real control in terms of driving down the price of energy.

Depreciation expenses over the five years totalled US$346.8M, which represents an average charge of US$63.2M per annum in the first three years and US$78.6M in the last two years. There was a significant increase in 2016 relative to 2015 of US$19.7M from US$57.9M to US$77.6M primarily as a result of the Company adjusting its depreciation rates to bring them in line with Schedule 4 of the Licence which was gazetted in January 2016. The modification in rates resulted in an impairment and acceleration in the depreciation and amortization charges for several of the Company's assets.

Net finance costs declined over the period except in 2018 when it increased by US$1M. It declined in 2015 by US$13M from US$55M to US$42M due to a reduction in net losses suffered on foreign currency US transactions and the decline in the rate of devaluation of the J$ to its US$ counterpart. In 2016, net finance cost decreased, driven by a decrease in interest expense primarily due to the lower overall debt portfolio in 2016 and increases in 2017 and 2018 due to an increase in debt portfolio ending the year at US$401.7M. In 2017, the Company experienced a foreign exchange gain of US$1.9M compared to a US$4.7M loss in 2016 due to the revaluation of J$ relative to the US$. In 2018, this was offset by an increase in interest income on GOJ and commercial accounts receivables from US$2M in 2017 to US$6.7M in 2018.

Other income/expense: - Net expenses declined by US$5M in 2015 due to income earned in 2014 from insurance proceeds and sale of wind energy studies not recurring in 2015 and offset by increases in other expense by US$3M. The increase in other income in 2016 of US$8M was due to income earned from project development fees related to the 194MW NG plant and increase in sales of salvage scrap during the year. The Company also benefited from the reduction in other expenses by US$13M due to a reduction in provisions for restructuring expenses and other costs incurred in 2015 which did not recur in 2016.

Balance Sheet

A review of the balance sheet demonstrates the significant capital investment that the Company made in Property, Plant, and Equipment as well as the significant amount of capital required to fund the business. As at December 31, 2018, the Company had fixed assets of more than

US$776M and a total debt of more than US$400M, making it one of the largest private sector companies in Jamaica in terms of asset base.

Property Plant and Equipment increased from US$704M to US$776.5M, representing a net increase of US$72.5M. JPS invested over US$416M in the business compared to depreciation charges of US$346M. The average capital spend during the period was US$85M annually, peaking at US$117M in 2018 while the equivalent average depreciation charge was US$69M. The Company's debt portfolio also grew by US$57.4M (16.7%) from the end of 2016 to the end of 2018. Similarly the gearing ratio increased slightly from 45% to 46.2% over the same period.

At the end of 2018, JPS made equity investments of US$38M in South Jamaica Power Company (SJPC).

During 2018, the Company collected on long outstanding receivables from the Government relating to streetlight services resulting in a significant reduction in the accounts receivables balance. Movement in accounts payable over the period was driven primarily by the movement in fuel and gas prices, the impact on balances outstanding for fuel payment and the timing of settlement of large supplier obligations at the end of the year.

US$'000	2013	2014	2015	2016	2017	2018
Current Assets						
Cash & cash equivalents	25,496	7,736	5,558	8,650	12,203	27,267
Accounts receivable	186,878	172,516	124,968	156,089	217,218	182,384
Inventories	40,870	33,652	30,710	32,143	41,405	40,072
Other	1,568	27,542	31,347	45,074	40,968	41,913
	254,811	**241,446**	**192,583**	**241,956**	**311,794**	**291,636**
Current Liabilities						
Short-term loans	1,938	-	-	-	25,924	20,000
Accounts payable & provisions	190,083	162,842	113,733	138,942	191,237	193,026
Current maturity on long-term debt	37,492	54,917	47,935	59,622	36,341	35,537
Other	-	1,702	1,924	660	-	943
	229,513	**219,461**	**163,592**	**199,224**	**253,502**	**249,506**
Working capital	**25,299**	**21,985**	**28,991**	**42,732**	**58,292**	**42,130**
Non-current Assets						
Property, plant and equipment	708,448	704,037	712,946	699,544	735,484	776,513
Employee Benefit Asset	20,389	21,290	27,652	32,167	41,730	46,454
Other	4,606	3,998	616	89	16,000	36,825
	733,443	**729,325**	**741,214**	**731,800**	**793,214**	**859,792**
Financed by:						
Shareholders' equity						
Share capital & reserves	281,687	265,931	265,931	265,931	266,546	266,546
Preference Share	27,688	27,688	27,688	24,688	24,688	24,688
Retained earnings	47,066	70,289	100,958	129,479	157,601	174,538
	356,441	**363,908**	**394,577**	**420,098**	**448,835**	**465,772**
Non-current liabilities						
Long-term loans	326,442	316,160	306,282	284,582	317,704	346,068
Customer deposits	26,827	25,732	25,054	24,294	27,150	29,989
Other long-term liabilities	49,032	45,510	44,292	45,557	57,817	60,094
	402,301	**387,402**	**375,628**	**354,433**	**402,671**	**436,151**

Table 11: JPS Historical Balance Sheet 2013 to 2018

3.5 Capital Investment

JPS made significant investment in maintaining and improving its assets, over the past five years. JPS invested approximately US$416.3M in this regard. This investment resulted in a more diversified generation mix, greater efficiency in the production of electricity and lower fuel bills; enabling a more resilient T&D network that is smarter. It also strengthened the Company's position in the fight against electricity loss through improved measurement and detection of illegal abstraction of electricity.

Generation:

JPS invested over US$143M over the past five years on its generation fleet. This includes generation expansion, generation conversions and routine generation investments.

- The overall efficiency of the generating fleet was enhanced by the addition of the Maggoty hydroelectric plant at the start of 2014.
- The generation conversion projects included Bogue 120 MW Combined Cycle Plant to natural gas in 2016 and Bogue 20 MW GT11 plant in 2018.

Routine investments included:

- Major overhauls on all steam units: Hunts Bay B6 unit in 2014, Old Harbour (OH) unit 3 in 2015, OH unit 2 in 2016, and OH unit 4 mini overhaul in 2017
- Annual maintenance, statutory testing, and inspections on all steam units
- Major overhauls on Rockfort units 1 and 2 each had two overhauls over the period 2014 to 2018
- Hot gas path inspections on GT5, GT12, and GT13
- Major inspections on GT13, GT7 and GT10

Transmission and Distribution:

JPS invested US$185M in the network resulting in a 30% improvement in outage duration between 2014 and 2018 and a 37% improvement in frequency. This included:

- The routine replacement of defective equipment and infrastructure
- Installation of covered conductors in high vegetation areas
- Expansion of the transmission and distribution infrastructure
- The introduction of LED streetlights and smart devices
- New Spur Tree Substation 69 kV expansion and modification at a cost of US$6.5M, which facilitated the secure interconnection of approximately 94 MW of wind energy from Wigton and BMR to the national grid.

The Company is in the process of completing a new distribution substation at Michelton Halt. Another major investment was in Jamaica's first grid-scale energy storage facility spending US$18.1M at the end of 2018. This is a significant step for Jamaica as it will enable the mitigation of outages caused by the intermittent nature of solar and wind energy, ultimately facilitating the incorporation of more of these renewable energy sources on the national grid when it is

commissioned in 2019. JPS also invested US$8.0M at the end of 2018 to facilitate the interconnection to the transmission grid of the new 194 MW natural gas fired power plant built at Old Harbour.

Loss Reduction:

JPS invested US$51.2M focussing on the metering infrastructure to improve measurement and detection of losses and reduce tampering. This included:

- The installation over 144,000 Smart Meters (US$28.3M) which is helping to address and improve JPS' ability to identify system energy loss at a circuit level by providing measurement visibility down to the customer level. It also provides greater efficiency and flexibility to the billing operations and reduces the need for meter reading estimates.
- Installation of 685 Check Meters in 2018, specifically designed for the industrial and large commercial customers. The implementation of these secondary meters will enable the Company to continuously measure and verify energy delivered relative to energy billed to these customers.
- Installations of RAMI and total meters (US$13.1M)
- Voltage standardization programme 2016 to 2018 (US$7.8M)
- Installation of Quadlogic and YPP/ENT meter upgrades (US$3.5M)

Support Services:

JPS invested in assets geared towards enabling the core business to deliver on its goals. This includes investment in technology, upgrading of its SCADA system and implementation of Enterprise Asset Management (InFor EAM) across all generating plants and transmission network.

This sustained level of capital investment has not led to the achievement of the allowed shareholder value as measured by Return on Equity (12.25% allowed compared to average 6.9%). This was primarily due to the inability of the Company to recover the incremental depreciation charges necessitated by the increased level of capital investment and the commensurate return that emanates from the improvement in the rate base. Both these anomalies will correct themselves in the new rate review period when all the provisions of the Licence will be observed. However the incremental depreciation suffered during the years up to 2018 will remain a permanent leakage on the business. Notwithstanding the Company has seen significant improvement in a number of key areas of the business delivering value to its customers.

3.6 Operating and Maintenance Expenditure

JPS spent over US$700M in operating and maintenance expenses over the five year period (2014-2018). This represented an average expenditure of US$140.0M per annum compared to US$143.2M in 2013 (the test year for the previous price cap regime). In 2018, JPS spent

US$130.4M, which is US$12.4M or 8.7% lower than 2013 reflecting successful cost containment initiatives. The main drivers of the net reduction noted are:

At the end of 2018, O&M expenditure was 12.5% (US$18.6M) below that for 2017 driven primarily by:

- Payroll and related expenses increased in the first half of the regulatory period to address contractual obligations and reflecting the net effect of pension fund adjustments. This category of expenses decreased by 9% between 2017 and 2018 to US$62.9M at the end of 2018, as headcount decreased from an average of 1,667 in 2017 to 1,561 in 2018 and the reduction in overtime expenses.
- Generation third party costs contracted by US$1.2M, due to improved reliability arising from fewer forced outage events
- Insurance expenses decreased by US$1M from US$5.7M in 2017, as the Company slowly recovered from the effects on premiums as a consequent of a major claim at Bogue. JPS successfully negotiated a change in the basis of coverage for the older generating units, resulting in lower premiums.
- Bad Debt reduced by US$3.2M to US$8.6M, the lowest in the five year period.
- Transport costs decreased from US$8.9M in 2017 to US$8.2M in 2018 due to fleet optimization initiatives implemented in 2018
- Reduced electricity costs US$4.4M in 2014 to US$3M in 2018, due to aggressive internal conservation initiatives and declining fuel prices.


Business Environment
& Current State
JPS | Powering What Matters

BUSINESS ENVIRONMENT AND CURRENT STATE

4. Market Analysis

This section provides an insight into the current market conditions, which may be described as an energy landscape in transition. It reviews and examines the global trends and outlook in the energy industry, the Jamaican economy and its electricity sector, JPS as an electric utility service provider and the global impact on the local electricity sector.

The findings from this review have helped to inform and shape JPS' strategic direction which will be explored in detail in the ensuing sections of this plan.

4.1 Global Trends And Outlook For Energy

The global electric utility sector is facing dramatic changes, as a result of a combination of factors, including climate change, new disruptive technologies, changing customer behaviour, changes in regulatory and policy frameworks, and competition where none previously existed. These can be summed up as the three Ds, disrupting the power industry- decentralization, decarbonisation and digitalization. Increased decentralization, the need to decarbonize electricity generation, and digitization to boost operational efficiency comfort, convenience and control to end-users are driving market opportunities in the power industry.

Since the establishment of the first power company in late 19th century, vertically integrated electric utilities have focused on building power plants and substations, installing transmission and distribution lines, billing customers, and earning a predictable return on investment. However the 21st century brought with it unprecedented disruption that is forcing utilities to rethink their business models to remain viable. Predictions are that utility business models will begin morphing into transactional marketplaces, migrating from a legacy industry into a technology-forward platform. To survive in a changing marketplace, the future utility model will deliver energy, and serve as a platform to connect its customers with valuable products and services that can increase their comfort, convenience, and control.

4.1.1 The Green Agenda - Decarbonization

There is a new paradigm of development, which prioritizes the environment, and is the driving force behind a 'green revolution'. At the heart of this revolution is a global imperative to reduce carbon emissions as a means to avoid the risk of irreversible, ruinous climate conditions and the impact on a country's economic resilience.

The energy sector is at the forefront of climate change concerns as it is the largest single source of GHG emissions[9]. Reducing the carbon intensity of energy has therefore propelled the movement of the energy sector to a new historical period – the advent of a low-carbon society. This is supported by the global climate governance which was developed with the adoption of the United Nations Framework for Convention on Climate Change (UNFCCC) in 1992; the 1997 Kyoto Protocol which sets the legally-binding emission reduction targets for developed countries; and the 2015 Paris Agreement which deals with GHG emissions mitigation, adaptation and finance as well as to provide support for developing countries.

All over the world, governments are taking measures to live up to their commitments under the Convention, which is one of the key drivers for the transformation afoot in global energy systems. National agendas are focused on energy efficiency, conservation and alternative energy sources as key pillars for climate change reduction. This provides the added benefits of a reduced import energy bill, lower energy costs to consumers, improved human health, increased energy security and reduced reliance on fossil fuels with the diversification of energy sources.

4.1.2 Disruptive Technologies

The proliferation of disruptive technologies, based on the key pillars of energy efficiency and alternative energy sources, have propelled significant growth in new energy technologies that are creating a more decentralized, distributed electricity sector. These include renewables, energy storage, cogeneration, electrification and smart technologies. All promise potential solutions to age-old utility challenges by creating a smarter electrical system that increases overall efficiency, resilience, security, and environmental sustainability. Advancements in technology, however, doubly threaten utility survival by placing the consumer in a position of power to choose various affordable power supply sources, thereby enabling them to take the "power in their hands" through the use of distributed energy resources. Utility providers are responding to this development with business model transformations aimed at harnessing new energy value.

Renewable Energy Technology

Among clean energy sources such as natural gas, renewables (solar, wind and hydro) and nuclear, renewables have become the main forces in new energy development globally, and are being rapidly deployed. In 2017, the deployment of renewable energy production facilities accounted

[9] World Energy Council (June, 2014). Climate Change: The Implications for the Energy Sector, Retrieved from: https://www.worldenergy.org/wp-content/uploads/2014/06/Climate-Change-Implications-for-the-Energy-Sector-Summary-from-IPCC-AR5-2014-Full-report.pdf

for an estimated 70% of net additions to global power capacity, with the power sector experiencing the greatest increases, particularly in developing countries and China.

Technology has made renewable energy generation a focal point of the global energy mix with what is seen as an unstoppable growth prospect. This is driven primarily by the declining costs in solar photovoltaic systems and wind generation technology, making them cost-competitive sources for electricity generation. The rapid reduction in energy storage system costs make such systems completely independent of thermal generation facilities, enabling the power to be kept on when the elements are not generating. The rising awareness of renewable technology's potential to reduce carbon dioxide emissions has also promulgated its use among government and customers alike. Investments made are in the form of utility-scale solar systems and behind-the-meter rooftop or ground mounted solar systems. Behind-the-meter options are enabling the trend of self-generation among business and residential customers, giving rise to *prosumers* - both end users and producers. Customers have now joined the utility in generating their own power.

With self-generation becoming prevalent, this form of distributed generation is reducing demand from the grid through customer defection though it has the complementary effect of supporting load growth particularly where it would be otherwise costly to add new infrastructure. Solar PV systems can also establish micro grids in areas lacking access to electricity or to facilitate localized supply of energy to large industrial customers.

Energy Storage Technology

Supporting the deployment of renewable energy and propelling the shift towards *prosumerism* is the nexus created by energy storage technology. This can provide a more reliable form of power at a lower cost than fossil fuel sources. Battery prices are falling fast, a trend that is expected to continue as production is scaled up in the US and China each year.

Utility, business and residential customers alike have recognized the value in this technology. It serves the utility in mitigating reliability issues and achieving greater operational flexibility. For the customer, low cost and high-performance batteries are especially convenient, allowing for the purchase of charged batteries from an energy provider to power a facility/house for limited periods. This energy provider would manage the logistics of the change and charge of the batteries using an economical source such as renewable energy or LNG powered generators. Additionally, Time-of-Use (TOU) customers are using batteries to store energy in off peak periods, which they use to offset the energy drawn from the grid during peak periods. If this becomes widespread, it could change the load profile on the grid in a way that may require the utility to

run peaking units at unconventional times. The increasing use of low-cost batteries by customers as a backup during outages could also change the load profile on the grid.

As the cost continues to fall it makes large-scale renewable power plants more economically feasible. This, combined with global trends to reduce emissions, means that more large-scale renewable power plants will emerge as direct competitors to the electric utility company.

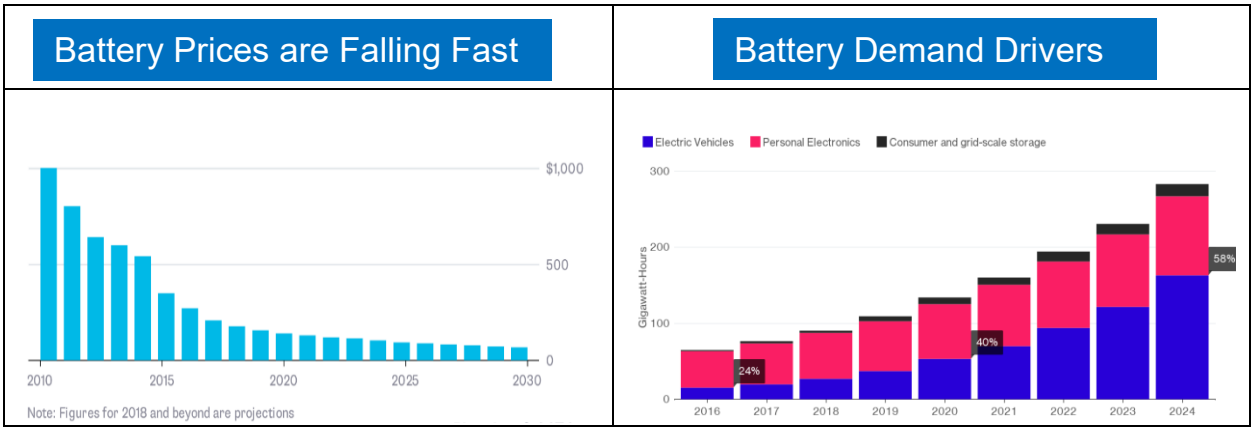


Figure 7: Falling Prices in Battery Storage Technology[10]

Cogeneration Technology

Like renewable energy technology, cogeneration technology has the potential to deliver reduced energy costs and mitigate risks associated with fluctuating energy prices. A Combined Heat and Power (CHP) system is a common cogeneration technology that is most often fuelled by natural gas, and as such emits fairly low levels of GHG. LNG is an easily accessible, relatively low cost source of energy, which is allowing existing and emerging competitors to offer turnkey, onsite cogeneration solutions to customers at a lower cost, and in some cases, a higher level of reliability than that received from the grid.

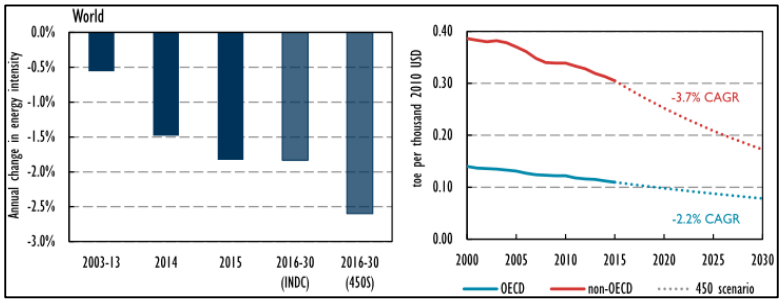
CHP has seen a sharp increase in attention in recent years driven by cost reductions, increased supplies of low-cost natural gas, state and policymaker recognition, and concerns about grid reliability[11]. Investors, industries and governments are awakening to the big potential for CHP projects to deliver mutual benefits to steam reliant industries and electricity customers, which will pave the way for significant market growth globally.

[10] *Source: Bloomberg New Energy Finance*
[11] *Hampson A., Rackley J. (2014). A White Paper: From Threat to Asset – How CHP Can Benefit Utilities.*

Smart Technology

Smart technologies are modernizing energy systems and leading the way for energy efficiency, globally. Among the leading smart products and processes are Smart Meters and intelligent appliances, grid automation, intelligent demand management, and power asset integration. According to the International Energy Agency's (IEA) Energy Efficiency Market Report 2016, the global economy is becoming less energy intense, with emerging economies improving their energy intensity more than industrialized economies. This is evidenced by the growth and adoption of smart technology and the digitalization of the energy landscape worldwide.

IEA Global Trends in Energy Intensity



Outside of the utility, smart products and devices are being increasingly deployed among residential, commercial and industrial customer segments. Utilities are making use of these technologies to increase system resiliency, achieve cost savings, and to facilitate real-time monitoring and communication for theft detection and voltage regulation, as well as improved outage management and restoration. Commercial, industrial and residential customers, on the other hand, are leveraging smart technologies to gain access to real-time energy data that gives a greater understanding of their energy use and consumption, and in turn driving the changes in their behaviour[12] that are leading to greater efficiencies.

Retrofitting has become a common approach among commercial and residential customers to achieve energy efficiency with the installation of energy efficient heating, ventilation, and air conditioning (HVAC) systems; LED lighting; energy monitors using in-home displays and building controls to lower the levels of energy consumption of building systems.

With the proliferation of smart technologies, utilities are forced to rethink the customer relationship and their overall business model. By continuing to leverage smart technologies, utilities can start to position themselves more broadly as a "service provider" rather than a "utility provider," leading to supplementary revenue opportunities.

[12] The PEW Charitable Trusts (2016). Energy Smart Technologies in the Evolving Power System.

Electrification Technology

With the shift in renewable sources, electrification creates further environmental benefits by shifting many end uses of electricity away from fossil fuel sources, and by increasing energy efficiency[13]. The greatest opportunities for electrification are in the areas of transportation, commercial/industrial applications and residential heating, which the World Economic Forum (2017) indicate are the largest polluters.

Electrification of transport is the area gaining most traction in the form of electric vehicles (EV) which have evolved rapidly over the last five years. This is due to the declining cost of batteries which is dramatically lowering the costs of EVs. In 2015, over one million EVs were deployed globally with popularly known low cost models such as Nissan Leaf and the Tesla Model 3. EVs are projected to represent a growing and significant portion of new car sales globally: 25% by 2030 and 35% by 2040; comprising 5% to 10% of total vehicle stock by 2030. This supports the International Energy Agency (IEA) estimates to reach the UNFCCC Paris Agreement target of 100 million electric vehicles by 2030.

EVs are predicted to become economically competitive but their successful adoption is dependent on several infrastructural requirements such as charging stations, which currently lag behind gasoline stations. Public infrastructure is also lagging behind due mostly to uncertainty related to the model of deployment, costs, and ownership and technical requirements. It is recommended that high-power charging stations, greater than 150kW, be positioned along highways as a good choice for public infrastructure. The deployment of charging technology and pricing signals must enable flexible and smart charging.

At a time when utilities are faced with increased revenue erosion, the adoption of EVs have the potential to increase electricity consumption and offer a great opportunity to optimize utilization of the grid, though the inability to handle the increased demand placed on the grid can potentially open the way for other players.

For some, EV adoption is advancing at a faster rate than others. Utilities must therefore conduct their own assessments and establish a roadmap supported by relevant regulations and laws that will drive the technology's adoption.

[13] *World Economic Forum (2017). The Future of Electricity: New Technologies Transforming the Grid Edge.*

4.1.3 Changing Customer Behaviour

As today's energy customers increasingly turn their attention to products and services enabled by technological advancements, they are more demanding than ever. They have more power than they used to; are smarter and have higher expectations than ever before[14]. In decades past, energy customers were considered passive users of energy. Customers were generally unconcerned about how energy was generated or the consequence of their consumption. Their only concern was that energy flowed when and where it was required. But times are changing.

According to customer service and experience expert Shep Hyken[14], great brands of the world have boasted, and deservedly so, about their excellent service. In so doing, they have educated the passive energy customers about what great customer service looks like, and now they have come to expect it. These brands have raised the bar of service for the energy sector.

For energy customers both in developing and developed societies, there is an expectation that the utility is to be "always on", with engagement on their own terms using a wide variety of channels to include voice, web, chat, email, video and social media. Customers are calling for unprecedented levels of transparency and accountability and more effective communication. They desire control and convenience, and have become more conscious of preserving the environment, with investments being made in green technology. Affordability and reliability needs have given rise to prosumerism and off-grid energy as customers move to produce their own energy and are doing so independent of the grid. This shifts the role of the utility to a back-up or secondary power provider.

With the changes in customer behaviour and expectations, electricity sales have generally stagnated or declined forcing utilities across the globe to make investments to improve reliability, provide easier ways of doing business, while at the same time empowering their customers to manage and control their energy consumption. For a utility accustomed to selling kWh and mailing out monthly bills to a guaranteed customer base, this can be challenging. Already, some have chosen to adopt to the changing behaviour of their customers by becoming active participants in the Distributed Energy Resource (DER) Markets. In a new energy future, utility companies will need to align their ambitions with those of their customers, ensuring their services are relevant to, and cost-effective for as many customer situations as possible.[15]

[14] Hyken S. (2018). What Customers Want and Expect.
[15] PwC Global Power & Utilities (n.d.). The road ahead – Gaining momentum from energy transformation

4.1.4 New Market Entrants

New technologies and changing customer behaviour propelling the transition to a distributed energy system are blurring the boundaries between non-traditional players and the power utility.

A number of new players have been attracted to the energy space in the form of telecommunications, entertainment and technology companies, who are taking advantage of changing market conditions to sell energy solutions directly to customers. Companies are also positioning themselves as suppliers of energy using a third-party brokerage model, as seen in other sectors such as insurance, travel and hotels. There is also an increase in the number of renewable energy firms, with non-energy businesses entering the energy sector through the renewables energy space.

With a wide gamut of growth opportunities emerging, these players are seizing the prospects of offering individual or bundled products and services that offer energy controls and demand management to save energy, local generation (both small and large scale) for greater efficiency and cost controls, and distributed storage that can shift loads to ultimately end grid dependency.

An even greater disruptive form of competition is the consumers themselves. Consumers are classified as new market entrants to the energy space where they have become power generators by engaging in self-generation using distributed energy sources. Customers are competing head-to-head with utilities as favourable market conditions continue to encourage the uptake of DERs.

With lower barriers to entry in the areas of the evolving energy value chain, it is predicted that markets will grow and become highly competitive as new entrants seek to break the dominance of integrated utilities.

4.1.5 Regulatory and Policy Environment

Policies and regulation in global energy sectors are progressing beyond the core business of the traditional network, to facilitate dynamic market services, fostering innovation and integrating new technologies. This transformation requires policymakers and regulators to embrace a new way of thinking about energy governance to guide their countries through the looming changes, and in regulating an energy sector facing significant disruptions. In most cases, however, governments are constrained to move as quickly, creating barriers to new technologies and business models that are becoming the future of energy.

While the changes in the sector do not mean a total abolishment of existing policy and regulation, there is a need to focus on transitional policies and regulatory arrangements to facilitate new markets, enable new forms of transactions and empower consumers. All this, while minimizing business risks for utilities; as well as the harmonization of rules and regulatory cooperation across borders[16]. Like JPS, utilities across the US and Canada have indicated that they are concerned with policymaking on distributed energy resources, including issues like net metering, interconnection policies, non-wire alternatives and DER ownership[17]. The results of The Utility Dive-State of the Electric Utility's 2018 online survey of 686 US and Canadian executives confirm regulatory policy uncertainty as the top issue for an uncertain future.

Many energy sectors around the world have already begun to move toward a regulatory and policy environment that better reflects new market conditions and allows utilities to take advantage of the growing service economy. Many utilities are seeking leeway and incentives from regulators to experiment and take technology and business risks while still shielding them from the worst financial consequences of risk and competition. JPS and the Regulator have been in dialogue on matters such as how to shield remaining grid-tie customers from a trend towards self-generation of large industrial and commercial customers that will ultimately hurt through price point adjustments. These solutions will go beyond more creative tariff designs to include options such as customer-sited co-generation that offer additional value add like steam and unregulated services that maximize rate-base assets and share the benefit with customers. Utilities like JPS are therefore envisioning a hybrid-regulation where they get to keep their ability to rate-base traditional investments while also finding innovative revenue streams. This is being driven by customer demand for new distributed resources on which utilities are desirous of capitalizing.

While energy markets differ from one country to another, the rate of transformation within the energy sector will be greatly influenced by a strong regulatory and policy framework, and government support. Also necessary, is the active participation of utilities to influence changes to allow for access to a new energy value.

4.1.6 Global Utilities Repositioning for the Future of Energy

With the transformations emerging and currently underway within the energy sector, the future of energy is characterized by a cleaner, more distributed system delivering comfort, convenience and control to end-users.

[16] EC-MAP (2018. New Policy for an Era of Energy Digitalization.
[17] Utility Dive (2018). State of Electric Utility

Consumers will take on a new role at the centre of the energy system. There they will have greater control and will place a high value on the benefits delivered from energy and not the units of energy delivered to them. This will determine the energy provider with whom they do business, with the energy-as-a-service model taking hold. This model leverages innovative technology and data management in ways that give customers more control over how much power they use and the cost.

Energy generation will therefore move away from large power stations to localized production with technologies such as storage, and digital technologies using big data analytics and cloud computing to support the management of energy produced by prosumers. Through the internet of things and connected homes, electronic devices will have the capability to all be connected to use energy at the best price or none at all where there is too much demand.

Already, the future of energy is taking shape and more than ever before, utilities are finding that the revenue downturn is persisting, even as they are facing increasing expectations to meet the demands of technology conscious consumers. The results of the Utility Dive State of Electric Utility's 2018 online survey of 686 US and Canadian executives confirm that utility executives are anticipating continued disruptions and are keen on seeking new ways to do business. Many however are divided as to the path forward as much depends on the direction of regulatory evolution which is a major concern for advancing change.

Notwithstanding, utilities globally are expanding out their regulated business model, finding new ways to reduce cost and figuring out how to transform themselves. Specific responses include:

- Increasing portfolio of offerings to include both regulated and unregulated business
    - Exploring additional value from rate base
    - Collaborating with regulators and other stakeholders in the ratemaking processes to address risk and uncertainty
    - Increased focus on tapping into behind-the-meter resources to balance the grid, improve efficiency, boost reliability and resilience, and defer or avoid some of the cost of investment in new generation, transmission and distribution assets
    - Forming alliances with non-traditional providers and market participants in a bid to secure new revenue streams and channels
    - Becoming agile at straddling multiple business models, as no single business model may be the answer
    - Becoming more customer-centric through the gathering, synthesizing, analysing, and converting of data from smart devices and the grid into actionable insight and foresight

- Becoming more innovative, with the realm of innovation needing to be expanded beyond a narrow focus on technology
- Transforming core capabilities into the type and level necessary to effectively compete in a disaggregated marketplace.

4.2 The Jamaican Economy

The fiscal performance of the Jamaican economy improved notably over the last few years, with the production and distribution of electricity representing positive gross value adds. With the expectation of accelerated economic activity, projections by the IMF are for real GDP to increase over the medium term, from about 1.2 percent in 2018 to approximately 2.2 percent by 2023[18], while the PIOJ expects growth to range between 2.0% to 3.0% per fiscal year over the medium term. Inflation is projected to remain stable at 5% over the medium term[19], based on the expectation of increasing domestic demand and anticipated increase in international commodity prices. The Jamaican dollar is expected to depreciate over the next five years at an average annual rate of 2.2%. The exchange rate is expected to end 2019 at JMD135 per USD with a yearly average rate of $134.48. It is expected to average $138.83 and $144.20 during 2021 and 2023 respectively, ending 2021 at $139.88 and 2023 at $145.81. Although some levels of currency appreciation are anticipated for each year, the overall trajectory is expected to be primarily characterized by an upward trend.

Higher levels of local and global output, facilitated by a stable economic environment and improved business confidence, is expected to positively influence the demand for electricity consumption over the medium-term. However, load and grid defection to self-generation and energy efficiency may mitigate or erode these possible gains for JPS. An increase in economic activity generally reflects higher levels of production in the economy, which generally translates to increased use of, and demand for, electricity by households and the various commercial sectors. A number of private and public sector led investment projects are also expected to positively influence the demand for electricity. On the other hand, because of its vulnerability to external factors, Jamaica's economy could be negatively affected by the uncertainty surrounding the political impact of the United Kingdom's exit from the European Union (Bruit), and other geopolitical risks, as well as ongoing contractionary impact of the GOJ's fiscal consolidation programme. Crime and violence, including electricity theft, delays in the implementation of projects in the public and private sectors, and an increase in the inflation rate as a result of

[18] International Monetary Fund World Economic Outlook Database, October 2018 https://www.imf.org/external/pubs/ft/weo/2018/02/weodata/weorept.aspx?sy=2016&ey=2023&scsm=1&ssd=1&sort=country&ds=.&br=1&pr1.x=49&pr1.y=11&c=343&s=NGDP_RPCH&grp=0&a=

[19] IMF Country Report No. 18/103

unanticipated increases in commodity prices, also have the potential to negatively affect the demand for electricity.

The impact of the volatility in fuel prices on the economy and electricity must be taken into account. Crude oil is projected to increase over the medium-term due to volatilities associated with political tensions and changes in the supply conditions by both the Organization of the Petroleum Exporting Countries (OPEC) and non-OPEC members. The Commodity Market Outlook and the IMF are anticipating average crude oil prices to be $70 and $53.3 per barrel by 2023, respectively, while BBVA Research is anticipating an average of $60 per barrel by 2022. The 194 megawatt LNG power plant being built in Old Harbour Bay, St Catherine to replace the existing oil powered plant, is expected to provide stable electricity prices to consumers. Given that crude oil prices are expected to decrease averaging US$56.51 per barrel[20] and NG is also projected to trend downwards averaging US$2.78/MMBTU[21] .

Details on the demand outlook over the 2019-24 regulatory period are included in Chapter 10 of the Rate Case filing.

4.3 Jamaica's Electricity Sector

Jamaica received electricity in 1892, a mere thirteen years after American scientist Thomas Edison invented the electric lamp. The island is now 98%[22] electrified, with power being accessible to almost all of the island's 2.7 million people.

4.3.1 Market Structure

The Electricity sector in Jamaica is organized around a single buyer model with JPS as the national grid or system operator. JPS is the sole entity licenced to transmit, distribute and supply electricity, however, the activity of electricity generation is liberalized allowing for the participation of Independent Power Producers (IPPs) who sell power to JPS through long-term Purchased Power Agreements. IPPs include Jamaica Energy Partner, West Kingston Power Partner, the Jamaica Private Power Company (JPPC), Wigton Wind Farm Limited, Content Solar Limited and BMR Jamaica Wind Limited. West Kingston and JPPC are associated with JEP and JPS also has a power interchange arrangement with Jamaica Aluminium Company Limited. The sector also includes private producers who generate electricity for their own use, primarily in the bauxite and alumina industry.

[20] West Texas Intermediate (WTI), April 2019, https://longforecast.com/oil-price-today-forecast-2017-2018-2019-2020-2021-brent-wti
[21] Henry HubNatural Gas Futures, April 2019, https://www.cmegroup.com/trading/energy/natural-gas/natural-gas.html
[22] World Bank (2016).

4.3.2 The Policy & Regulatory Environment

Regulation of the electricity sector is the responsibility of an independent regulatory agency, the Office of Utilities Regulation (OUR). The Ministry of Science, Energy and Technology is responsible for planning the system and issuing Electricity Licences. Outside of the ability of JPS to replace existing generation assets through the exercise of a right of first refusal, the procurement of generation capacity is the responsibility of the Government Procurement Entity.

Together with the World Bank, the Government of Jamaica (GOJ) has continued to collaborate on improving the regulatory framework to enhance the performance of the energy sector, increase private sector investments, advance the transition to cleaner fuels, and increase the number of renewable energy options. As a signatory to the United Nation's Sustainable Development Goals (SDGs) agenda, and the UNFCCC and its Kyoto Protocol and Paris Agreement, Jamaica places emphasis on energy as a critical infrastructure for the country's development. The SDG Goal #7 is geared towards ensuring access to affordable, reliable, sustainable and modern energy for all; and UNFCCC and its Protocol and Agreement seeks to achieve a low carbon economy.

Today's policy and regulatory environment in which JPS operates is therefore characterized by a strong agenda to propel Jamaica's move towards a sustainable energy future where:

- Jamaicans use energy wisely and efficiently
- Government Ministries and agencies are leaders in energy conservation and environmental stewardship
- Jamaica's industry structures embrace eco-efficiency for advancing international competitiveness and move towards building a green economy
- Jamaica is the regional leader in providing affordable and clean energy from waste environmentally friendly sources contributing to a sustainable future
- Jamaica's energy supply is secure and sufficient to support long-term economic and social development and environmental sustainability
- Jamaica realizes its energy resource potential through the development of renewable energy sources and enhances its international competitiveness, energy security whilst reducing its carbon footprint

This vision for Jamaica is set out in the Country's National Energy Policy (NEP) 2009-2030, a roadmap supporting the National Development Plan Vision 2030 which promulgates energy security and efficiency as a fundamental policy position. Emerging from the NEP the GOJ has developed a10-point energy priorities list as follows:

Competition	• Create a Competitive Energy Environment
Modernisation	• Modernise the nation's power generation
Diversification	• Continued diversification of energy sources with a strong emphasis on renewables
Regulation	• Overhaul all regulations to create a true 21st century framework combined with newer and relevant institutions which together provide the state infrastructure capable of delivering sustainability and innovation.
Energy Efficiency	• Transform the energy efficiency of the Jamaican economy to include amongst other things, world class conservation techniques
Inclusiveness	• Ensure that the National Energy Policy as part of the economic growth model addresses socio-economic issues to create inclusiveness in development
Carbon footprint	• Manage our carbon footprint to preserve Jamaica's natural environment and fulfill our international agreements and
Demand Reduction	• Set targets for the reduction of national demand for energy over a five-year period
Green Economy	• Market & BSJ standards for an adequate supply of energy efficient appliances • Enforce energy efficiency standards and codes with aim of i) reducing energy consumption in new buildings by 50% in 2020 ii) Ensuring that all new buildings use zero net energy – net zero by 2025
Fuel Pricing	• Revise the Refinery Reference Pricing system and JPS fuel pass through to ensure that Jamaican consumers enjoy the best prices for energy products – petroleum or electricity.

Table 12: GOJ 10-Point Energy Priorities

4.3.3 System Orientation and Performance Characteristics

Jamaica's total installed generation capacity is approximately 1,023 MW, while peak demand hovers at approximately 667 MW. Of the total installed capacity, 380 MW or 39% is provided by Independent Power Producers. This is shown in *Figure 8* .The generation stock is largely oil based with approximately 67% of electricity generated from Heavy Fuel Oil (HFO) and Automated Diesel Oil (ADO). This represents approximately 40% of petroleum consumption in Jamaica. Natural gas was introduced into the generation mix in 2016, and powers approximately 140 MW of the installed capacity, accounting for 17% of the fuel mix for electricity generation, while Renewables (wind, hydro, solar) account for 150 MW, or about 15% of installed capacity. In 2019, an additional 194 MW of capacity will be powered by LNG bringing the share of energy generated using NG to 41%.

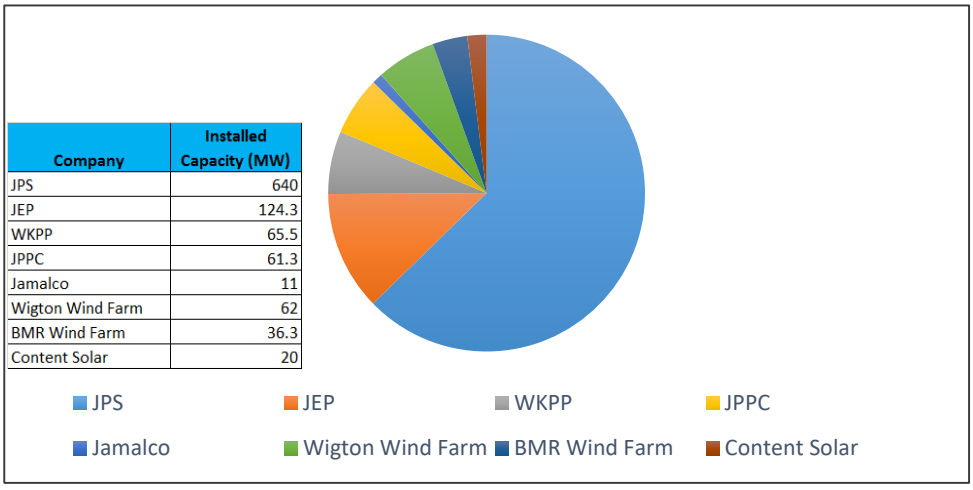


Figure 8: Ownership of Installed Generation Capacity

There are seven major generation locations across the island, with 51 substations. The national grid comprises approximately 14,000 kilometres of transmission and distribution lines. The electricity system serves approximately 658,000 customers with a Net Generation of 4,356 GWh in 2018 Figure 9 presents a graphical representation of key characteristics of the electricity system.

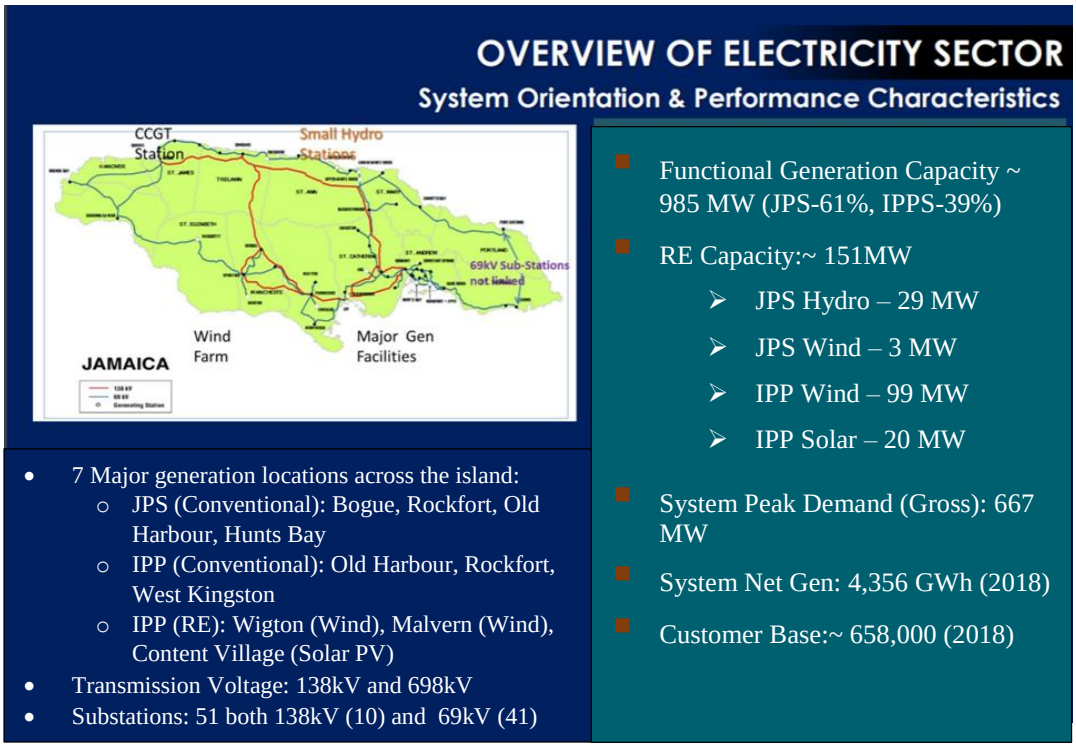


Figure 9: Electricity System Orientation and Performance Characteristics[23]

4.3.4 Sector Performance

The demand in the electricity sector increased marginally by 0.1% in 2019 relative to 2018, recording its second highest demand in history. The demand in 2017 of 4,361 GWh remains the highest on record. The marginal reduction was largely the result of cooler temperatures recorded in 2018 when compared to 2017, with monthly temperatures averaging at least 2 degrees Celsius lower than 2017. In real terms the demand in 2018 was 4,356 Gigawatt hours compared to a demand of 4,361 Gigawatt hours in 2017.

The electricity sector's performance over the last five years shows an increase in electricity consumption stemming from higher demand and evidenced by an expansion in other industries such as construction. As shown in Figure 10, output by Non-JPS sources fell by 1.76% or 32 GWh in 2018 versus 2017, while JPS' output increased by 0.95% or 24 GWH. The improvement in JPS'

[23] Development of Renewable Energy Market in Jamaica (2018). Office of Utilities Regulation (OUR)

output was influenced by efficiency gains from maintenance interventions completed in late 2017 to early 2018, the off peak season, which resulted in JPS recording the lowest forced outage rates at its power plants in 10 years at a rate of 5%.

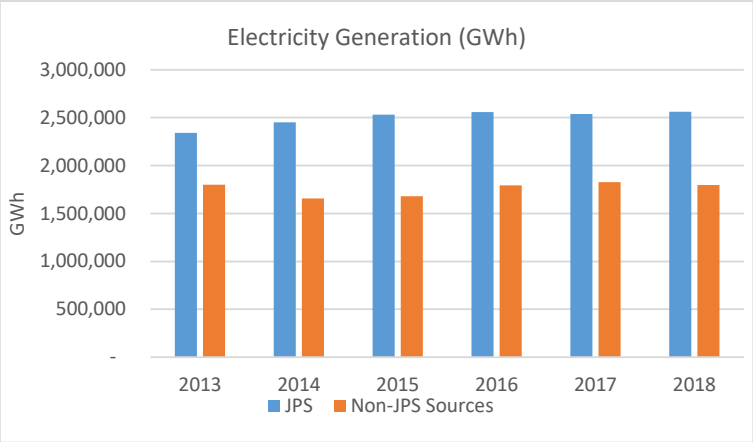


Figure 10: Electricity Generation by JPS and Non-JPS Sources, 2013-2018

4.3.5 Socioeconomic Impacts on the Local Electricity Sector

Jamaica has an unemployment rate of approximately 8%[24]. The unemployment rate for youth is considerably higher at 21.8%, and the average unemployment rate for women is almost double that for men – 18.6% and 9.6% respectively. The country continues to be confronted by critical social issues that negatively affect the employability of its people resulting in high levels of corruption, crime and violence and high incidences of electricity theft.

The local electricity sector is plagued with the pervasive problem of electricity theft, categorized as non-technical losses, with JPS subject to penalties each year for a problem over which it has little control. Electricity theft is one of the most prevalent crimes in Jamaica, which directly impacts the economy. It is an issue that requires the partnership of both the private and public sectors to successfully address.

More than 18% of the electricity produced is stolen. It is estimated that there are over 200,000 illegal connections to the grid – the equivalent of almost a third of the utility's legitimate customer base. Electricity theft cuts across geographical boundaries and social classes, and can be found right across the island: on residential properties as well as in business operations; among the affluent as well as the needy. The methods of illegally abstracting electricity range

[24] Statistical Institute of Jamaica (May 29, 2019). Labour Force Statistics. Retrieved from http://statinja.gov.jm/LabourForce/NewLFS.aspx

from the use of sophisticated technology, to the visible 'throw up' lines popular in some inner-city communities.

Over the years, JPS has used a combination of strategies to address the problem of theft, including: the deployment of technology to help identify and curtail theft, collaboration with the police for the arrest of electricity thieves, removal of illegal throw-up lines, account audits and investigations, public education and social marketing and the Community Renewal programme. From these efforts, there has been a downward trend in non-technical losses since 2016 with the ongoing regularization of consumers. JPS continues to advance efforts for loss reduction which is a major focus of the company as electricity theft remains a persistent blot on the national landscape, and a threat to the Company's viability.

4.4 JPS – The Electric Utility

4.4.1 Business Description

With a staff complement of 1,562 employees and a network of offices across the island, JPS is an integrated utility engaged in the generation, transmission and distribution of electricity. The Company owns 61% of the generating capacity of the country and therefore purchases power from a number of Independent Power Producers (IPPs). Electricity is produced at power stations across the island and delivered to customers through its transmission and distribution network.

JPS produces electricity using a mixture of steam, diesel, hydroelectric and gas turbine generating units. As of December 31, 2018, JPS owned and operated four thermal power stations, eight hydroelectric plants, one wind farm, 51 substations and over 14,000 kilometres of distribution and transmission lines.

Along with the provision of electricity, JPS is a key partner in national development. The Company has a vibrant corporate social responsibility portfolio and makes significant contributions in the areas of education and youth development. Through the JPS Foundation, JPS partners with the Ministry of Education to support the country's STEM (Science, Technology, and Engineering & Mathematics) agenda. This includes the establishment of a network of Energy Clubs in schools, and the issuing of bursaries for Industrial Technology and Electric secondary examinations. The JPS Foundation also partners with organizations like Junior Achievement Jamaica to pass on industry knowledge to primary schools students. JPS VOLTS (Volunteers on Location to Serve) provide mentorship for students, and support national and community outreach initiatives.

Through its Community Renewal Programme, JPS is focused on providing sustainable energy services to volatile and vulnerable communities. This is executed by way of improved customer

relationships and engaging local communities with the aim of building stronger communities through social interventions and initiatives to regularize energy supply through accessible and affordable solutions.

JPS has a strong safety and environmental focus and pursues a strategy of fuel diversification for clean energy production. The Company is also focused on delivering an array of energy solutions so that customers can better manage their energy consumption and, by extension, their utility bills.

JPS operates under the terms and conditions of the Electricity Act 2015, the Electricity Licence 2016 and is regulated principally by the OUR, whose main goals for the electricity sector are market efficiency, sector sustainability, improved customer protection and satisfaction.

Through the current regulatory framework JPS is expected to support the GOJ's policy objectives. This presents opportunities as well as challenges for the future of the utility. The improved monitoring that accompanies the implementation of the provisions of the Electricity Act, presents a clear opportunity for JPS to operate more efficiently, and ensure compliance with established standards. However, developments such as the move to create a more competitive environment, implement a wheeling framework and pricing mechanism, and establish an independent system operator could potentially threaten its survival. JPS is also required to take on additional responsibility as the primary provider of electricity to Jamaicans. Under its revised operating Licence, the Company supports and takes the lead on rural electrification, fuel diversification, and grid modernization, all of which require significant capital outlays.

The outlook is for government policies and regulations to transition the sector towards a more a more open market structure. As JPS charts the way forward, it will become imperative for the utility to influence regulatory and policy directives to ensure its survival while meeting its obligations.

4.4.2 Company SWOT

JPS has high credibility due to its extensive years of operation as an integrated utility. As the sole Transmission and Distribution (T&D) provider, JPS is the largest player in the electricity sector serving a fairly large customer base. The Company is served by a cadre of professionals with extensive knowledge and expertise in all areas of the business. Over the years, the Company has improved its delivery of service and has raised the profile of its brand among Jamaicans. While customers possess confidence in JPS' technical know-how, the high cost of electricity has diminished customers' trust in the Company. This has led to a public desire for competition in the

sector which energy transformations have given rise to. JPS is now up against fast movers who are vying for its place in the sector, and who have already begun to interest its customers in alternative energy supply sources. Despite its dominance in the traditional market, JPS is yet to fully penetrate the market with new energy solutions and services that will secure its place as the authority in the renewables market within the sector.

Figure 11 presents a summary of the Company's strengths, weaknesses, opportunities and threats.

Figure 11: SWOT of JPS

4.4.3 Market Position

Customer Perception and Satisfaction

Customers have a fairly positive perception of the JPS' brand and are moderately satisfied with the service provided by the electric utility.[25] Just over half of the customers participating in a recent study[26] reported that they were satisfied with the Company. The customers that were surveyed indicated that their interactions with the Customer Care Centre, and their experiences

[25] JPS (2017). Brand Perception Survey.
[26] JPS (2018). Customer Satisfaction (CSAT) Survey

in JPS' offices were generally positive with the Customer Relations Representatives being helpful and courteous. The key areas of strength that were identified by customers include quality of electricity received, timeliness of bills, the level of details provided on bills, and ease of paying bills. In general, customers acknowledge that JPS has made commendable strides over time, and is 'doing well' in several areas of service, however, work is needed to improve customer pain points, particularly the high cost of electricity.

4.4.4 Jamaica Energy Customers

Customer Profiles

JPS provides electricity to approximately 658,000 customers separated into two broad categories – Residential Customers and Commercial Customers.

Residential Customers

JPS' residential customer base comprises over 590,000 households with a typical composition of 1-4 members. The majority of residential customers are low to middle income earners[27]. As a result, customers are extremely sensitive to price volatility and actively practice energy conservation, as a way of reducing their energy bills.

Commercial Customers

JPS has just over 70,000 commercial customers, who fall in the categories of Small Commercial, Large Commercial, Industrial and Large Industrial and Government services (Street Lighting and traffic signals).

Customer Growth

JPS experienced consistent annual growth in its customer base. In 2018, the Company's customer base grew by 15,055 to 657,999. This increase in customer base can be attributed to initiatives employed by JPS to regularize informal consumers as well as new housing developments. Residential customers recorded the largest increase in customer base (by 13,134 to 587,592 customers) followed by Small Commercial and Industrial (by 1,878 to 69,752 customers) and Large Commercial and Industrial customers (by six to 169 customers).

[27] Jamaica Public Service (2016). Demand & Feasibility Report, Section 7: Use of Renewable Energy Systems & Energy Efficient Devices in the Home - Energy Solutions & Renewables [Residential].

4.5 Global Impacts on the Local Electricity Sector and the Utility

The changes in the global electricity sector are being felt locally, influencing both the business environment and customer behaviour. Technology is transforming the existing power system and creating a new power reality for individuals, businesses and the nation. Key impacts on the local electricity sector include:-

- **Increased Customer Interest -** This has been brought on by the Green Revolution (decarbonisation) resulting in a greater emphasis on protecting the environment.

- **Renewable Energy Adoption –** There is a national agenda to diversify the nation's energy mix to achieve "a more ambitious target (of) 50% of electricity generation from renewables by 2030[28]". Currently, the total capacity of utility scale renewable energy production facilities at the end of 2018 was 151 MW. JPS is evaluating opportunities to undertake utility scale renewable projects which would contribute significantly to achieving the GOJ's energy objectives.

- **Active Pursuit of Distributed Generation Options by Customers** - Already JPS has embarked on partnerships with customers to provide new energy solutions and will continue to do so.

- **Increasing Participation of Government, Commercial and Residential Customers in Energy Efficiency Programmes** - Energy consumption reduction measures undertaken include installation of inverter technology ACs, purchase of energy saving and LED bulbs and energy efficient appliances; as well as equipment retrofits, energy audits and guided load shifting. JPS has partnered with customers to assess needs and to provide these and other tailored energy solutions. Energy efficiency is also one of the Government's Top 10 priorities with a goal to reduce the public sector's energy use through the implementation of an Energy Management & Energy Efficiency Programme (EMEP).

- **Competition in the Local Energy sector** – There is an upsurge of renewable energy and cogeneration providers. JPS is an active player in the renewables market. For more than five years, the Company has been providing customer-sited renewable energy systems with just under one MW installed to date.

[28] Renewable Energy Caribbean (October 17 2018). Jamaican PM reveals personal ambition for 50% renewables by 2030. Retrieved from: https://renewableenergycaribbean.com/2018/10/17/jamaican-pm-reveals-personal-ambition-for-50-renewables-by-2030/

- **Access to Global Support for Energy Growth** - While the production of electricity from petroleum imports have reduced significantly from almost 95% to 66% in just over three years, LNG accounting for 22% and renewables 12%, the Government of Jamaica (GOJ) continues to intensify its efforts in seeking alternate sources of sustainable energy. Most recently, in November 2018, the GOJ signed the Framework to Strengthen Infrastructure Investment and Energy Cooperation with the United States which will see both countries cooperating to:
    - Further, diversify Jamaica's sources of energy to power the country's economic growth
    - Integrate cleaner energy sources, including natural gas and renewable energy, furthering Jamaica's environmental goals and making Jamaica's economy more competitive
    - Accelerate Jamaica's adoption of innovative power technologies, including renewables and related micro and mini-grid, and battery storage systems
    - Increase Jamaica's energy resiliency through energy source integration and catalysing investment in rural areas and at critical infrastructure facilities
    - Enhance the reliability, resilience, and efficiency of the national energy systems

The sector, which for years was characterized by high cost, low reliability, low power generation efficiencies and high system losses is making strides towards a new energy system that is socially, economically and environmentally sustainable. Government policies and regulations will continue to guide the electricity sector towards a more competitive future.

4.6 Responding to the Changing Energy Landscape (2014-18)

In recognition of the changing energy landscape, JPS continues to take deliberate steps to keep apace of Government and customer demands, technological advancements and competitive forces, while remaining focused on supporting national development and providing value for its shareholders. The Company took the lead in transforming the local energy landscape with the introduction of key strategies including fuel diversification, grid modernization, new business development, improvement in operational efficiencies, reduction in electricity losses and improvement in customer satisfaction. These investments were enabled by a capital investment of over US$400M since 2014.

The impact has been lower operating and maintenance costs: 22% improvement in system reliability, losses to its lowest in six years, the best fuel to electricity conversion in the Company's history and significant improvement in customer satisfaction.

4.6.1 Changes to the Service Offered

Customers are perceiving options never before imagined in controlling their energy future and are expecting the utility to respond to their changing needs. JPS has stepped into the renewables market positioning itself as a provider of distributed generation solutions as well as other energy efficiency services to respond to customer needs for more options. With respect to reliability, the Company has responded by improvement in its system reliability, taking steps to modernize the grid.

Potential impacts of grid modernization include strong future capital investment growth areas, which will manifest in higher rates of depreciation on communication-related technologies; emerging business opportunities e.g. telecoms, local areas services and the integration of loss detection capabilities.

4.6.2 Fuel Diversification

Liquefied Natural Gas (LNG)

Fuel diversification is at the top of the Government's energy agenda, and consistent with customer demand for cleaner less expensive sources of energy. JPS has played a pioneering role in fuel diversification, having developed hydro resources over 60 years ago, developed wind generation 10 years ago and introducing LNG to Jamaica in 2016 through the conversion of its 120 MW CCGT at Bogue. The Company made further investments to divert more production capacity away from petroleum fired generation to LNG by converting one of its 20 MW gas turbines in 2018 and developing the 194 MW CCGT at OH which is slated to commence operation in the second half of 2019. JPS also signed a Power Purchase Agreement with New Fortress South Power Holdings, for the purchase of electricity from a new LNG-fired 94 MW power plant to be built in Central Jamaica.

The inclusion of Natural Gas in the fuel mix for powering generation is expected to result in the stabilisation of fuel costs over the long term, while enhancing energy security and the integration of more renewables on the grid. The pursuit of fuel diversification will lower generation costs, reduce Jamaica's exposure to the volatility of world oil prices, and satisfy the objective of generating much cleaner and more environmentally-friendly energy.

The Company is actively planning the development of renewable energy resources using Wind and Solar technologies to further entrench the fuel diversification strategy and develop a more balanced generation portfolio. Should this project be approved, fuel tariffs would the diversified

generation mix would have developed an appropriate shield from significant volatility in the price of any single fuel source.

Renewables

JPS has embraced the expansion of renewables on the island. The Company is the oldest investor in renewables, and currently owns and operates 29 MW of installed hydro and 3 MW wind capacity. JPS also has Power Purchase Agreements (PPAs) with three operators that currently provide renewable energy to the grid: Wigton Wind Farm, BMR Jamaica Wind and Content Solar contributing a total of 118 MW.

A fourth, Eight Rivers Energy Company will add a further 37 MW of solar energy in the third quarter of 2019. The plant will be the largest solar facility on the island, and is expected to contribute to substantial reductions in carbon emissions from power generation.

In early 2018, JPS broke ground for a grid scale energy storage project. The 24.5 MW hybrid energy storage solution, will be completed in the third quarter 2019, and help to secure grid stability and reliability, from the growing renewable energy portfolio on the grid.

4.6.3 Grid Modernization

Since 2012, JPS has been investing in technology to transform the grid into an intelligent or smart network consistent with its Licence obligation. Already Jamaicans are benefiting by way of a significant improvement in the reliability of their power supply. Key grid modernization initiatives being undertaken include:

- The roll out of smart meters: as at the end of 2018 – 30% of smart meters penetration
- The creation of the Caribbean's first "smart city" pilot in New Kingston in 2016
- The implementation of a Smart Streetlight project, with a 40% Smart LED Streetlights penetration at the end of 2018
- The strengthening of its Transmission and Distribution network through automation of fault identification and response with tangible improvements in system reliability.

The smart technologies deployed by JPS will allow customers to take charge of their energy usage, and access a range of other services using the power delivery network.

4.6.4 New Business Development

In 2017, JPS included Business Development as part of its core strategy to generate business and establish dominance in the burgeoning renewable energy and energy efficiency markets. The

Company currently provides energy solutions, whether renewable or co-generative in nature, as well as to support energy efficiency programmes that enable customers to save on energy consumption and create greater value for them. JPS recognizes that today's customers expect solutions that address their need for reliable and more affordable energy and that a failure to respond will result in a loss in customer value. The Business Development arm therefore serves the purpose of identifying additional ways to serve the energy market, to provide a wider range of options for energy use and to drive innovative pursuits that will grow the business.

4.6.5 Improving Operational Efficiencies

JPS is aggressively pursuing opportunities to reduce operating costs resulting in improved operating efficiencies and the generation of a reasonable rate of return to shareholders. Significant improvements in service quality and long-term operating efficiencies are expected from the system expansion strategy being pursued and cost effective maintenance strategies for refurbishment of older generating units and the power delivery network.

The Company started to retrain its employees and reorient the organization to bring about improvements in operating standards and to develop the proactive business culture necessary to operate in a dynamic and competitive energy landscape. In addition, the Company started changing its culture to more effectively meet the requirements of the new business environment.

4.6.6 Reducing Electricity Losses

JPS deliberately and consistently implemented programmes aimed at reducing system losses and its impact on customers. The main area of focus is on Non-Technical Losses (NTL) resulting from electricity theft. Several initiatives are being implemented to aid in the reduction of NTL, including RAMI, Smart Meter, and Total Meter installations. These initiatives are coupled with the Advanced Automated Theft Detection Analytical Tool (AATDAT), Strike Force operations and Community Renewal projects.

Going forward, JPS intends to employ a greater use of analytics in the fight against losses. To achieve this, the Company is creating a smarter grid that will generate the data points that will enable the Company to capitalize on the opportunities for loss reduction presented by the advanced technological infrastructure.

4.6.7 Improving Customer Satisfaction

Over the last five years, customer service was elevated to the level of a strategic priority, with the Company making organizational changes and introducing new initiatives to re-focus on

customer needs and satisfaction.

The Company took bold steps to establish a culture of continuous improvement and service excellence. In an effort to empower its customers the Company introduced a suite of customer solutions, including prepaid Pay-As-You-Go (PAYG) service, digital solutions such as the JPS Mobile App, and energy solutions offered through the new JPS EStore to help customers better manage their electricity usage. Other initiatives implemented include:

- The upgrading of the Customer Information System (CIS) which contributed to improved operational efficiency and customer satisfaction
- Outsourcing the Call Centre to improve service quality
- Introducing Online Customer Service, to include web chat and social media
- Introducing Ebills, to improve customer convenience and reduce cost
- Introducing self-help options, to include online outage reporting, and service via an in-office kiosk that provided bill balances
- Introducing Customer Advisory Councils, which improved stakeholder engagement and provided an effective feedback loop for the Company

The implementation of these initiatives resulted in tangible improvements in the customer experience. Positive evidence of this trend was abundant in the 2014-2019 regulatory period. The Company's annual and quarterly surveys reflected consistent positive feedback from customers over the past five years, with the most recent Customer Satisfaction (CSAT) study (2018), indicating a 60% satisfaction rating from customers.

As JPS moves its business forward, the Company is seeking to go beyond delivering reliable, efficient and clean energy, to developing a platform to connect its customers with valuable products and services that can increase their comfort, convenience, and control. To operate in the new environment characterized by rapid advancements, JPS must be agile and flexible, responsive to developing trends and expand in new business areas over a variety of service options to generate and maintain a high level of customer satisfaction.

In positioning itself to respond to, and take advantage of the changes in the Jamaican energy market, JPS's strategic direction (discussed in chapters 7-14) will build on the work already initiated with a focus on five strategic priority areas- delivering exceptional **customer service**; ensuring the **safety of the public and employees**; achieving **end-to-end efficiency**; **growing the business**; and **strengthening relationships** with key stakeholders.

5. Planning Assumptions for the Business Plan

The energy industry has become increasingly difficult to predict especially as the Company plans for the medium term. In preparing the Business Plan (the Plan), there were a number of planning assumptions. This section provides the assumptions, their impact and the associated risks.

5.1 Integrated Resource Plan (IRP)

The IRP represents a key component in the rate review process. The licence stipulates that the IRP should be published by the Ministry of Science, Energy and Technology (MSET) at least 15 months before the 2019 rate review filing. However, at the point of preparing the plan (November 2019) a final IRP was not available. The plan therefore excludes projects and costs associated with the planning decisions to be informed by the IRP.

5.2 Macro-Economic Environment

Jamaica's growth prospects are expected to be strengthened by improvements in external competitiveness as a result of the structural and macroeconomic reforms being undertaken by the Government. Projections regarding key aggregates are improving in tandem with debt reduction and increasing stability.

The recently completed three (3) year precautionary Stand-By Arrangement with the IMF also serves to further strengthen the credibility of Jamaica's economic reform agenda. The IMF[29] anticipates that Jamaica's end of year inflation rates will remain at 5% over the medium term while inflation in the US is expected to remain at approximately 2% over the medium term.

The assumptions adopted by JPS over the period 2019-2023 are as follows:

- GDP will grow by an average rate of 2.0%, ending 2023 at 2.4%
- Jamaica's end of year inflation rate is expected to remain flat at an average annual rate of 5% over the rate review period
- United States end of year inflation rate is expected to increase by 0.1% over the review period, ending the 2023 period at 2.2%
- The Jamaican dollar is expected to depreciate against the USD by J$30.09 (23.6%), relative to 2018, ending 2023 at US$1: J$157.81, representing an average annual rate of depreciation of 4.3%.

[29] IMF Country Report No. 18/103

5.3 Fuel Prices

JPS' fuel prices projections are based on correlation to West Texas Intermediary from U.S. Energy Information Administration Short Term Energy Outlook and natural gas from Henry Hub Natural Gas Futures- CME Group.

West Texas Intermediary[30] – Average US$55.66 per barrel between 2019 and 2023

- ADO fuel prices are expected to decrease in 2020 and decline moderately each year thereafter over the period
- HFO fuel prices are expected to average US$ 65.10 and US$64.89per barrel in 2019 and 2020 and remain relatively flat thereafter over the period at approximately US$ 60 per barrel

Henry Hub LNG Futures prices are expected to average approximately US$3 /MMBTU [31]

- Bogue's LNG price is expected to be relatively flat during the period US$10.49/MMBTU
- Old Harbour 194 MW NG prices – Average US$11.90/MMBTU
- Prices excludes demand and facility charges

5.4 Demand Forecasts

5.4.1 Billed Sales

Billed energy sales are expected to increase by 4.6% over the period (3,361.0 GWh vs 3,212GWh in 2018). The main drivers are:

- Residential Rate Class (RT10)
  - Reduction in average consumption due to growth in ownership of energy efficient appliances
  - Growth in household consumption due to reduction in illegal connections
- Small Commercial Rate Class (RT20) - reduction in average consumption due to growth in ownership of energy efficient appliances
- Industrial & Commercial Rate Class (RT40 & RT50 & RT70) - growth in large loads and industries
- Streetlight Rate Class (RT60) - introduction of more efficient lamps
- Sales will be impacted by the continued proliferation of roof top solar and load/grid defection.

5.4.2 Billed Customers

Customer growth of 9% over the period, which anticipates a count of 717,322 at the end of 2023. The main drivers are:

[30] Fuel Price Source: 1. West Texas Intermediary- U.S. Energy Information Admin. Short Term Energy Outlook (April 2019)
[31] *LNG prices does not include demand charge (approx. $2.50/MMBTU).*

- Residential Rate Class - Growth in the number of households, reduction in illegal connections and growth in new customers
- Small Commercial Rate Class - New customers
- Streetlight Rate Class
- Offset customer defection across rate classes in response to alternative options

5.5 Generation

The electricity generating landscape is expected to experience a number of significant changes over the next review period. Some key assumptions are:

5.5.1 New Generating Capacity

The following will be commissioned over the period:

- 194 MW CCGT Old Harbour Plant (SJPC) using LNG by December 2019
- 37 MW Solar Plant (Eight Rivers) commissioned June 2019
- 94 MW CHP Plant at JAMALCO using LNG by March 2020
- 14 MW Distributed Generation by 2020
- 24.5 MW Hybrid Energy Storage Facility by November 2019

5.5.2 Plant Retirement

Retirement of aged plants over the period:

- Old Harbour Steam units #2, 3, 4 – 193.5 MW in 2019
- Hunts Bay Steam unit (B6) – 68.5 MW in 2020
- Hunts Bay Gas Turbine units #5 and unit #10 - 54 MW at the end of 2023
- Rockfort Diesel units #1 and #2 – 40 MW at the end of 2023
- Bogue Gas Turbine units #3, #6, #7 and #9 – 73.5 MW at the end of 2023

5.5.3 Other Generation Assumptions

- Unknown date for Final IRP generation to inform generation demand in Jamaica. It will guide choices for power technology and energy mix going forward. In the absence of the IRP there will be no clear view of new variable of renewables or storage required for the grid.
- JPS plans to replace the second tranche of 171.5 MW of currently owned capacity under ROFR provisions by 2023 based on the Retirement Schedule approved by the System Planner (the MoE)
- Achieving and sustaining an average EFOR of ≤ 8% and JPS EAF of 86% over the period
- Realize regulatory Heat Rate target each year
- JPS Thermal Heat Rate is projected to the end 2023 at 9,337 kJ/kWh

- The Power Wheeling Regulation when implemented by the OUR will have adverse effect on JPS' generation dispatch due to a decline in load demand
- Plant are maintained based on OEM requirement

5.5.4 Plant Decommissioning

- Plant with mandatory retirement plan will be decommissioned as per approved schedule

5.6 Customer Service

5.6.1 System Reliability

23% improvement in system reliability indicators over the next five years (Avg. 4.6% improvement per annum)

- Q-factor baseline is based on the average of the past three years (2016-2018) system reliability performance
- SAIDI improvement[32] of 450.29 minutes or 7.29 Hours
- SAIFI 3.54 fewer customer outage interruption

5.6.2 Customer Service Delivery

JPS will improve its customer service delivery to better meet the needs of its customers.

- Increase Customer Satisfaction Index (CSI) from 60% to 70% by 2023
- No new Guaranteed Service Standards
- Guaranteed Standards Compliance – 96.7% by 2023
- Overall Standard EOS01 and EOS10 – 95% by 2023
- Increased competition from providers of renewable and other off-grid solutions
- Smart meter technology roll-out to over 98% of customers, enabling real time access to information, quicker reconnections and other services
- Full closure of at least three customer service offices, resulting in more customers accessing services online or via Call Centre.
- 50% digitalization of customer service and communication: via Social Media, Mobile Apps, Website, etc.

5.7 Transmission and Distribution

JPS will improve load transferability and grid security, asset health as well as facilitate customer growth as follows:

- Voltage Standardization - Upgrade of 12 feeders (12 kV &13.8 kV) to 24 kV – 94% feeders standardized over the five year period
- Increase the amount of ring transmission lines to 95% by conversion of radial lines by 2023

[32] 3-Year average (2016-18) used for the baseline. For details see Rate Application Chpt. 7: Quality of Service - Table 7-9 Calculation of Baseline

- Reduce the number of feeders with more than 10,000 customers from 20% to 11%
- Reduce the number of heavily loaded distribution transformers from 24% to 10%
- Increase installation of smart devices across the grid (DA switches, FCI, TS etc.)
- Complete roll out of smart LED streetlights to achieve 100% penetration by 2021

5.8 System Losses

Total loss reduction of **2.30% points** is projected over the five year rate review period with greater levels of reduction over the period as the technology investment is expected to yield results.

- Regulator accepts new system energy loss spectrum
- Check meters installed at all rate 40 customer locations and select large rate 20 customers
- Technical Loss Reduction through:
    a. Voltage standardization on 12 feeders from 12 kV to 24 kV over the five year period and 21 feeders over the 10 years
    b. 40 MVAr of bulk capacitor banks installed at selected substations to improve bus voltages and power factors
- Community Renewal Programme:
    a. House wiring assistance to 10,000 homes per year through external partners or allowance through the system benefit fund
    b. Social tariff subsidy approved by GOJ
    c. Partnership with the GOJ on the identified GOJ roles to reduce losses
- Audits and investigations
    a. Conduct 455,000 data driven audits facilitated by Smart Metering data spread over the rate review period
    b. Achieve strike rate of 25%

5.9 Technology

- Technology prices will remain relatively flat and/or decrease over the planning period.
- Vendors will push companies to service based consumption of technology resources.
- JPS will retain its existing telecommunication licence.
- Greater proliferation of internet enabled mobile devices will lead to 50% digital customer interactions.
- Continued regulatory support of JPS Smart Grid Strategy will result in 98% of customers equipped with smart meters over the five year period.
- Modernization of core technology platform and applications will be in line with software and technology lifespan.
- Technology will continue to evolve at the current rate with specific areas of increased disruptions.

5.10 Financial Assumptions

5.10.1 Key Financing Assumptions

The following key high-level financing assumptions are used to underpin our business plan:

- JPS will raise additional debt to sustain the business operation.
- Capital expenditure will be 50% debt financed.
- JPS will maintain debt to equity ratio.
- Dividends will be declared and paid annually in respect of both ordinary and preference shares.
- Interest rates
  a. 3 Month LIBOR average 2.99% over the five year period
  b. 6 Month LIBOR averages 3.09% over the five year period

5.10.2 Operating & Maintenance Expenses

- Multi-year Collective Bargaining Agreements will be applied during the period.
- Generation Plant closures will result in reduction of headcount.
- Installations of smart meters will result in reduction of meter reading costs.
- Technology and telecoms expenses will increase due to the rollout of additional applications as well as significant increases in the number of smart devices on the system.
- Insurance expense will be reduced due to plant closure Old Harbour and Hunts Bay B6.

5.10.3 Tariff & Regulatory

- Tariff adjustment is assumed to be effective May 1, 2020.
- The 2019 Rate Case with forward looking five year Revenue Requirement.
- JPS' Thermal Heat Rate performs to OUR target.
- System Losses performance targets set by the OUR are reasonable and achievable.
- Q-factor baseline using three year historical (2016-2018) average system reliability performance
- Productivity factor 1.9% per year on controllable Opex
- 50,000 Smart Meters will be funded by the OUR through ALRIM Fund $9.25M (Net of taxes) in 2019.

5.10.4 Depreciation

- Depreciation is in accordance with the 2018 depreciation study
- Lease assets depreciated in accordance with International Financial Reporting Standards (IFRS) 16
- Accelerated depreciation will be applied for Phases 1 and 2 Plant Retirement (Bogue, Hunts Bay and Rockfort)
- Decommissioning cost of Plants - Old Harbour, Hunts Bay and Bogue

5.10.5 Working Capital

- Working capital will be as deployed -reflective of the normal operations of the business

5.10.6 Extra-Ordinary Costs

- Employee separation costs due to plant closure and ongoing organization review.

JPS' Strategic Direction

JPS | Powering What Matters

JPS' STRATEGIC DIRECTION

6. Medium-Term Strategic Priorities and Enablers

This section highlights JPS' Strategic priorities and its position in a rapidly changing energy landscape. It outlines the sector wide considerations of the Vision 2030: Jamaica - National Development Plan, the National Energy Plan and the United Nations Sustainable Development Goals among other things, all of which help to shape the Company's strategic position and alignment.

JPS' strategic direction is centred around five strategic priorities - delivering exceptional **customer service**, ensuring the **safety** of its employees and the public, achieving **end-to-end efficiency**, **growing the business** and **strengthening relationships** with our key stakeholders, all of which are underpinned by key enablers – our people, process and technology. The Table below shows the alignment of JPS' Strategic Priorities, Strategies and Initiatives with National Goals, Priority National Outcomes and Sustainable Development Goals.

National Goals/National Outcome	National Energy Policy Goals	UN SDGs	JPS Strategic Priorities 2019-2024	JPS Priority Area/Strategy 2019-2024	JPS Strategic Initiatives 2019-2024
Goal 3: Jamaica's Economy is Prosperous **Outcome 10:** Energy Security and Efficiency - **New sources of energy;** - **Energy conservation** - **Modernized energy infrastructure;** - **Decrease the cost of energy**	**Goal 1:** Energy Conservation and Efficiency **Goal 2:** Modernized and expanded energy Infrastructure **Goal 3:** Development of renewable sources **Goal 4:** Energy supply is secure and sufficient	**Goal 7:** Ensure access to affordable, reliable, sustainable and modern energy	**End-to-End Efficiency** NG3,G1, G3, G4, G7	▪ Diversify the energy supply - Generation Replacements ▪ Reduce System Losses ▪ Efficiency Improvements	▪ Commission a 194 MW LNG plant units ▪ Enterprise Asset Management ▪ Business Process Optimization ▪ Organization Transformation ▪ Smart Meter Programme ▪ Check Meter Programme ▪ RAMI
			Customer Service NG3, G2, G3, G4, G7	▪ Grid Modernization; ▪ Asset Rehabilitation ▪ Renewable Energy Integration	▪ Smart LED Street Lights ▪ Energy Storage ▪ Distribution Automation ▪ Fault Circuit Indicators ▪ Trip Savers
			Growth NG3, G1, G3, G7	▪ Increase use of renewable energy ▪ Energy efficiency and conservation	▪ Renewable Developments (wind, solar, hydro, biomass, waste to energy) ▪ Electric Vehicles and charging stations ▪ Distributed Generation ▪ eStore
			Safety NG3, G2, G4, G7	▪ Employee and Public Safety ▪ Compliance with laws, regulations and standards relating to Health, Safety Environment & Climate Change	▪ Safety and Health Management System Implementation ▪ Public Education Campaign

Table 13: JPS' Strategic Alignment to National Development

It is intended that at the end of this regulatory cycle, JPS will be a more efficient Company, delivering more reliable and improved products and services to its customers; perceived as the energy provider of choice; caring for our customers, employees and the environment; and a facilitator of national development.

The ensuing chapters (chapters 8-13) provide detailed insight into each Strategic Priority, outlining the strategic objectives to be achieved, the strategies that will be employed and the key programmes and initiatives that will drive performance. They also detail the key performance measures that will track and measure the impact of key initiatives and the progress in meeting the objectives that support JPS' strategic priorities.

In addition, this section highlights how JPS supports national development by providing secure, affordable and sustainable energy for the citizens of Jamaica. This requires an examination of the demand forecast to understand the generation system requirements over the medium-term and balancing that with the generation plant maintenance, retirements and replacement plans as will be determined primarily through the IRP when it is published.

6.1 Secure, Affordable and Sustainable Energy

6.1.1 Demand Forecast

This section presents the projections of total system demand over the medium-term. It outlines the projected growth in Energy Sales, Peak Demand and Net Generation for the period 2019-2023. It reflects the system losses profile that is expected to be achieved from planned loss reduction initiatives[33] and the demand profile that JPS anticipates, given trends in customers' consumption patterns.

	2018	2019	2020	2021	2022	2023
Sales (GWh)	3,212	3,215	3,246	3,284	3,322	3,361
System Losses (GWh)	1,144	1,126	1,113	1,099	1,082	1,059
Net-Generation (GWh)	4,356	4,341	4,359	4,384	4,404	4,420
Peak (MW)	655	660	657	659	661	662

Table 14: JPS Demand Forecast for 2019-2024

The total system demand is estimated to increase from 4,356 GWh recorded in 2018 to 4,420 GWh in 2023, an increase of 64 GWh (See Table 14). The increase is primarily driven by the projected annual growth[34] of 1% in total sales and the anticipated decline in system losses. Total sales are projected to reach 3,361 GWh in 2023 from the recorded 3,212 GWh in 2018. The primary components of System Losses, non-technical and technical, are expected to decrease

[33] See Chapter 10 for detailed initiatives
[34] Compound annual growth rate

from the recorded 18% and 8.2% in 2018 to 15.9% and 8% respectively by 2023. The decline in technical and non-technical losses is estimated to reduce total system losses by 2.3% points at the end of 2023. The overall impact on the peak is projected to be an increase of 7 MW in 2023 relative to 2018.

6.1.2 Generation System Requirements

In the absence of the IRP to inform this five year plan, JPS has sought to ensure that it maintains alignment with the Vision 2030 Jamaica – National Development Plan, Jamaica: National Energy Policy 2009-2030 and United Nations Sustainable Development Goals in developing its strategic objectives. JPS has been proactive in its efforts to support national development and has recently made significant progress toward increased sustainability, lower operating costs and rates, and reduced dependence on liquid petroleum (HFO and ADO) by replacing HFO fired steam generation with natural gas (NG) fuelled Combined Cycle Gas Turbines (CCGT). The generation portfolio over the medium to long term will therefore support the national goals and the IRP, by optimizing electricity supply at least cost. JPS will incorporate the known projects outlined below and work with the OUR and the GOJ to address any additional generation and network investment requirement under the provisions of the Electricity Licence, 2016.

6.1.2.1 Committed Projects

New 194 MW Gas-Fired Plant

JPS through its subsidiary, South Jamaica Energy Holding Ltd. holds investment in SJPC, which will commission a 194 MW natural gas fired power plant, by December 2019. This plant, combined with the Bogue plant will bring JPS' energy production from natural gas to approximately 55%.

This new plant will replace JPS' aged steam generation power plants at OH, significantly contributing to the modernization of the JPS generation fleet. With the retirement of the older, less efficient units, and the incorporation of more natural gas, the cost of electricity is expected to become more affordable for Jamaicans.

JAMALCO

More natural gas will be utilized in the country's overall generation mix as, through a Power Purchase Agreement between JPS and New Fortress South Power Holdings established in 2017, the Company contracted for the purchase of 94 MW of capacity from a new 100 MW natural gas fired power plant being built in Central Jamaica.

Eight Rivers Energy Company

In 2017, the Company signed an agreement (PPA) with an Independent Power Producer (IPP), Eight Rivers Energy Company for the purchase of power from a new 37 MW solar power plant, being built in Western Jamaica. The plant is due to be commissioned into service by July 2019.

The implementation of these projects should result in customers experiencing lower fuel bills as more efficient plants are used in the generation of electricity, using lower quantities and fuel costs to generate electricity. The stability of natural gas prices should also bring more predictability to electricity rates, thereby satisfying another customer requirement.

6.1.3 Plant Retirements

In an effort to deliver reliable, efficient, safe, low-cost energy to customers, JPS is cognizant of the need to operate a sustainable portfolio of generating assets. In this regard, retiring aged and inefficient assets is a key operational imperative going forward.

In accordance its operating Licence, the Company has a "Right of First Refusal" (ROFR) to replace generation capacity currently owned by the Company upon their retirement. In this regard, JPS intends to replace certain aged generating assets proposed for retirement within the next five years on a phased basis. Over this regulatory period (2019 to 2023) plant retirement is expected to be carried out in two phases, as set out below.

The first phase includes the retirement of the 292 MW steam generating plants at Old Harbour (OH1, OH2, OH3 and OH4) totalling 223.5 MW and 68.5 MW at Hunts Bay (HB6). A ROFR was granted for 194 MW of the 292 MW in 2016, via South Jamaica Power Company (SJPC). The remaining 98 MW will be pursued by JPS under the ROFR clause using technology to be determined by the IRP.

As per the planned schedule maintained by the Minister, the second phase of 171.5 MW will be ready for retirement by 2023. JPS will take the necessary actions to ensure that this schedule is achieved. Table 15 below provides a breakdown of the planned schedule published by the Minister.

POWER GENERATING UNITS	COMMISSIONED DATE	CAPACITY (MW)	RETIREMENT 2019 (MW)	RETIREMENT 2020 (MW)	RETIREMENT 2023 (MW)
			Phase 1		Phase 2
OHPS UNIT #1	1967	30			
OHPS UNIT #2	1968	60			
OHPS UNIT #3	1971	65			
OHPS UNIT #4	1972	68.5			
HBPS UNIT #B6	1976	68.5			
ROCKFORT UNIT #1	1985	20			
ROCKFORT UNIT #2	1985	20			
GT5	1973	21.5			
GT10	1993	32.5			
GT3	1972	21.5			
GT7	1990	18			
GT6	1990	18			
GT9	1992	20			
TOTAL MW		463.5	223.5	68.5	171.5

Table 15: Phase 1 & Phase 2 Plant Retirement Schedule

Impact of Retiring 292 MW Capacity by 2020

Given that OH#1 generating plant is currently not providing energy to the grid, only 262 MW will be removed from service between 2019 and 2020. The retirement of this capacity will result in an average improvement of 6% in EFOR and 2% in EAF across the JPS fleet over the period 2019 to 2023. Retirement of the stated capacity will result in a significant decline in JPS' base-load asset portfolio (45%) in the 2019 to 2020 period. This will make way for the SJPC Old Harbour 194 MW CCGT plant scheduled to be commissioned in December 2019 (original expected commercial operation date was July) and the additional capacity of 94 MW from the NFE South Power Holding's CCGT Combined Heat Power (CHP) Plant that is to be commissioned in the first quarter of 2020. This will result in Bogue CCGT and Rockfort Units 1 & 2 being the only JPS facilities remaining in the base load plant fleet. The remaining SCGTs (HB: GT10, GT5, BG: GT3, 6, 7, 9 &11) will continue to maintain grid security in their intermediate and peaking roles. Figure 12 below illustrates the allocation of generation capacity between JPS and the IPP group over the period 2018 to 2023.

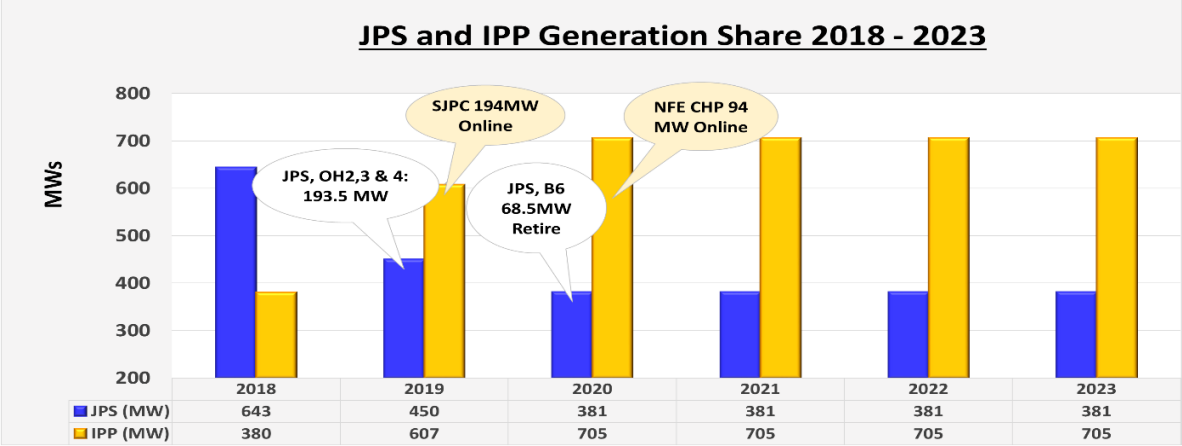


Figure 12: Generation Share on the Grid by JPS and IPPs , 2018 to 2023

6.1.3.1 JPS Asset Decommissioning

Approximately 54% of JPS' generating capacity was commissioned between 1967 and 1973, comprising 292 MW of steam powered generation plants at Old Harbour and Hunts Bay, and 43 MW of gas turbines at HB and Bogue. Between 1985 and 1992 a further 124.5 MW was commissioned, comprising 40 MW of slow speed diesel at Rockfort and 84.5 MW of gas turbine generation at Bogue and Hunts Bay. These plants have operated well beyond their initially designed useful lives, and are now economically and operationally at their end of life.

In instances, their heat conversion rates are twice as much as newer technology currently available, whose heat rates approximate 7,500 kJ/kWh. To address this concern and to improve the cost efficiency of the generation function in the long run, JPS has made submissions to MSET for the retirement and decommissioning of 459.5 MW of generation capacity as indicated in the proposed retirement schedule below.

It is proposed that the decommissioning exercise be carried out in two phases to minimize disruption to operations and ensure reliability of supply during the transitional period.

- **Phase 1:** comprises the decommissioning of 292 MW of steam generation capacity operated by JPS at Old Harbour and Hunts Bay with replacement, under the ROFR clause, by new generating plants to be operated by SJPC (194 MW). Included in this phase is the decommissioning of GT8 (14 MW) at Bogue, previously retired. The replacement generating capacity will be provided by combined cycle gas turbine technology and the plants are already under construction. They are expected to be completed prior to the scheduled decommissioning dates.

- **Phase 2:** comprises the decommissioning of 171.5 MW of slow speed diesel (40 MW at Rockfort) and gas turbine (131.5 MW) generating capacity located at Bogue

and Hunts BayThis phase will be validated by the IRP currently being finalized by the MSET and research is currently ongoing in relation to the technology that will be used to replace these plants.

For additional information see JPS' Rate Case Application, Chapter 18: Decommissioning Study

6.1.4 Generation Replacement Plan

The 194 MW SJPC is currently under construction and is scheduled to commence operation in November, 2019. Over this planning horizon it is anticipated that 171.5 MW of generating capacity will be retired and replaced under Phase II of the proposed retirement schedule, subject to the Minister's approval. The table below provides a high-level summary of the generation replacement schedule for the period 2019-2024.

JPS GENERATION DIVISION PROPOSED ASSET REPLACEMENT SCHEDULE 2019 - 2024																					
POWER STATIONS	UNIT TYPE	Rated Capacity (MW)	REASON	2019				2020				2021				2022				2023				2024			
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
SJPC Old Harbour	CCGT	194	Mandatory Replacement 194 MW of JPS Steam Units																								
Hunts Bay	CCGT	131.5	Retirement of of SCGTs Under ROFR																								
TBD	SCGT/RICE	40	Retirement of Rockfort Power Plant under ROFR																								

Table 16: Generation Replacement Schedule 2019-2024

The figure below reflects JPS' generation plant portfolio (fuel mix) at the start of this planning horizon (2019) and at the end (2023).

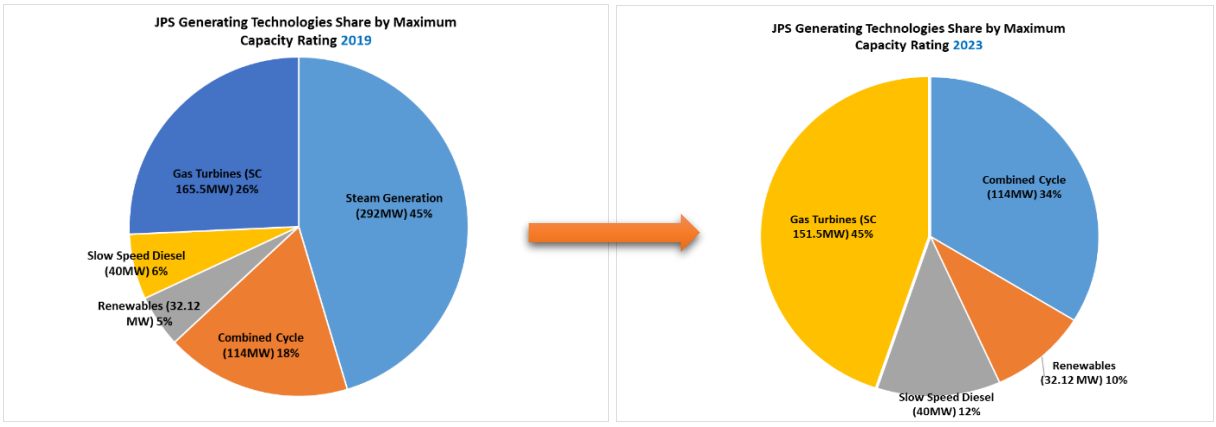


Figure 13: Current and Future Generation Portfolio

PRIORITY 1.

SAFETY

Ensuring the safety of employees and the general public

PRIORITY 1: SAFETY

Strategic Direction "attain, sustain a culture of safety leaders"

Safety is both a core value and a strategic imperative of JPS and is at the heart of everything the Company does. The Company recognizes the importance of a safe and healthy work environment to its success and has relentlessly pursued improvements in its overall safety performance.

JPS has initiated a Safety and Health Management System (SHMS) to provide the framework, structure and systematic approach to prevent or minimize any work-related ill health, injury or death by managing various safety elements in the workplace. The approach involves identifying, assessing and controlling safety and health risk to employees in all workplace operation and to assist the Company in continually improving its safety performance, and compliance with health and safety legislation and standards. Utilizing a systems-based approach to safety and occupational health will propel the organization towards realizing its safety aspirations.

The SHMS operates under the Plan-Do-Check-Act model and is the process for continuous improvement to ensure positive impact of the safety programme performance.

Figure 14: Plan-Do-Check-Act Model

A changing safety culture

JPS is working towards a systematic framework to develop all employees into "Safety Leaders" who actively care for their fellow colleagues, customers and themselves. This effort will be achieved through encompassing the following elements:

- Integrate emerging technologies to improve operational safety and environmental management within the Company
- Develop safety leadership competencies at all levels to maintain a safety consciousness that ensures proper case management where incidents occur
- Improved contractor management to include adhering to all the safety practices prescribed by the Company
- Improve risk mitigation

- Communication to ensure clarity and understanding
- Increase safety signage across the Company to global standards thereby improving public awareness and safety
- Continuous monitoring and improvement of the SHMS
- Recognition and reward for safety excellence
- Fleet Vehicle (Motor Vehicle) Accident Prevention – through an enhanced safe driver programme which includes the use of the Smith System and defensive driving techniques.
- Compliance with all HSE laws, regulation and implement sound standards where none exist

7.1 Objective: Improve and Maintain a Safe and Healthy Work Environment

JPS' safety and health programmes are geared towards reducing risks in the Company's operations and to attain and sustain a high degree of safety consciousness that will be an inherent part of the organization's culture. Through the SHMS, these programmes are structured to:

- Recognize the hazards and reduce risks through an improved risk management culture
- Promote visible leadership and accountability in safety; allow for the periodic and effective management review process
- Empower the work force. Promote safety leadership by all stakeholders, at all levels
- Effective communication and stakeholder involvement in planning and feedback programming
- Continued measurement and mitigation programmes

7.1.1 Strategy

The safety and health objectives will be achieved through the assessment of hazards and risks and establishing the necessary organizational structures, supported by a defined set of policies and procedures to generate accountability, and to eliminate or limit their impact on employees' safety and property. In addition, processes to communicate and periodically review the effectiveness of the system, and remedial action implemented in response to feedback on the various elements will lead to continuous improvement.

7.1.2 Initiatives and Programmes

The key initiatives and programmes are as follows:

- Continued review of all safety procedures to ensure they reflect current regulatory requirements and best practices
- Increased risk assessment through visible and integrated multidisciplinary audits and assessment programmes
- Stringent risk analysis prior to job undertaking
- Contractor management

- Implement a Personal Protective Equipment (PPE) programme to ensure that appropriate and approved protection is available to reduce personnel exposure to risks
- Support and monitor the implementation of various projects throughout the Company (for example new generation, decommissioning activities for facilities, vegetation management)

7.2 Objective: Embed Zero Harm Philosophy

Embedding a zero-harm philosophy is centred on ensuring every one returns home safely at the end of each day. This requires shared responsibility at all levels company wide as well as management commitment. The achievement of this ideal is realized when every employee holds himself accountable for the safety of himself and his environment and in so doing calls his fellow employee to a higher standard of behaviour.

7.2.1 Strategy

To embed the zero harm philosophy, JPS will expand the implementation of its behaviour based safety observation (BBSO) programme, engage in rigorous assessment of outcomes (behaviours or culture) and implement the necessary corrective action through ongoing engagement. JPS will establish corporate and individual goals to achieve 'a no one gets hurt culture'. The shared safety responsibility will help build the safety culture and promote safety leaders across the Company. This includes continued engagement and safety training to ensure safety is built into all activities and the development of competencies to identify hazards and ensure risks are appropriately controlled. The improvement of data gathering and analysis, through the use of appropriate technology will enhance the evaluation process of proactive leading indicators and root cause analysis of incidents, which will enhance the various Safety Programmes.

7.2.2 Initiatives and Programmes

Perform ongoing robust assessment to determine the effectiveness of its programmes through:

- Perform audits/inspections and management reviews (internal and external) to proactively anticipate and mitigate risks identified and to implement action plans where gaps are identified
- Conduct continued and regular culture surveys to monitor the effectiveness of our programmes
- Encourage committees to review, discuss and provide actionable items to address issues relating to all leading and lagging indicators
- Educate and further develop safety leaders at all levels in the organization

7.3 Objective: Improve and Manage Regulatory Compliance

JPS has made Health, Safety and Environmental (HSE) Management one of its highest priorities, with a commitment to creating and maintaining a safe and healthy work environment, complying with all applicable laws and regulations, and adhering to sustainable business practices. To

achieve this objective, the Company has taken steps to ensure that its current operations, as well as all expansion plans, are in keeping with applicable policies, regulations, standards and guidelines. In addition to government regulations, credit agreements contain covenants that require compliance of facilities and certain activities with governmental regulations.

JPS has continued to keep pace with existing and emerging regulations and has brought its facilities in line with HSE Regulatory requirements. JPS has Factory and Fire Certification for Power Plants, 13 licences from Water Resources Authority for water abstraction (wells) and diversion (Hydro Power Plants), 12 licences, 22 permits and 36 pending permits from National Environment & Planning Agency. Certain licences (e.g. Beach Licences) are renewed annually or every five years (e.g. Air Quality), while NEPA permits and WRA licences are renewed every five years. Fire and factory recertification are conducted annually. There are fees associated with some of these licences.

The Company has made compliance management part of the business imperative, with a commitment to comply with all applicable laws and regulations and to promote cost-effective energy management programmes among employees and customers. Adherence to regulatory requirements is very important and in many instances may be the prerequisite for obtaining approval for implementing a number of business initiatives. This is achieved by ongoing monitoring and reporting of permit and licence conditions on a timely basis.

7.3.1 Strategies

Continuous review of JPS' operations, changes in the business, safety, health and environmental regulations and standards to ensure procedures and programmes are updated to reflect changes. The changes are communicated to all stakeholders and the necessary training is conducted to ensure full compliance to avoid litigation that would affect the Company's image or record.

7.3.2 Initiatives and Programmes

The key initiatives and programmes are:

- Acquire required permits and licences in accordance with prescribed enterprises for new projects, modification of existing infrastructure, processes and decommissioning activities
- Continuous training and communication: environmental management strategy
- Ongoing removal of Hazardous Waste including POPs (PCB) and materials in accordance with relevant local and international regulatory and convention requirements
- Compliance monitoring and reporting monthly, quarterly and annually
- Continue to monitor any changes in the legislative landscape to implement the necessary compliance strategy

The following legislations and policies are expected to be enacted in the near term: Jamaica Occupational Safety and Health Act (JOSHA), Protected Areas Act, and Environmental Impact Assessment Regulations and Policy for the Environmentally Sound Management of Hazardous Waste.

Environmental Stewardship

7.4 Objective: Promote and Lead Environmental Stewardship

JPS remains steadfast in its commitment to be a good steward of the environment through its environment and energy management programmes. This is done through partnerships with environmental groups and communities. JPS will lead energy efficiency and conservation initiatives, while supporting environmental awareness and clean-up activities.

7.4.1 Strategies

- Continue to educate, communicate and participate in environmental preservation/conservation programmes and activities
- Support clean and green projects and activities through the engagement of JPS' employees in Company and national initiatives

7.4.2 Initiatives and Programmes

The key initiatives and programmes include:

- Support clean and green projects and activities
- Reforestation (this includes tree and mangrove planting)
- International coastal clean-up (through various beach clean-up activities)
- Facilitate/support energy saving and conservation initiatives
- Three Rs (reduce, reuse and recycling) activities

Security of Our Assets

JPS faces an increasingly complex set of risks that can emanate from all facets of the business. The threat of internal and external sabotage, break-ins, social upheavals, industrial unrests, and other disruptive events that may arise from the activity of being a business operator have become a part of the Company's natural existence.

Based on the nature of the business and our experiences over the years, it is very important to view JPS' security initiatives and programmes through several lenses. This includes basic levels of visibility via a 24-hour security monitoring centre, risk-based hardening and vulnerability management assessments and the effectiveness of the Company's asset protection measures against defined threat tactics. Based on the information generated from these assessments, the Company will implement techniques and procedures to achieve a security-centric operation.

7.5 Objective: Improve Security of Our People

To improve organizational security while improving and maintaining employee productivity and morale, the Company needs to first protect the most valuable asset - its people.

7.5.1 Strategy

- Conduct vulnerability assessment of each location each year to ensure that the gaps in physical security are reduced and employees are safe at work
- Continue to provide employees with safety education and awareness sessions with a view of achieving workplace security and sensitizing staff of current security trends.

7.5.2 Initiatives and Programmes

- Installation of electronic security solutions in visible areas
- Installation of security signs
- Establish a reporting medium where employees can easily report suspicious activities via written and electronic means or telephone
- Conduct regular security audits and security communications
- Security orientation for new employees and periodic refresher sessions for existing employees.

7.6 Objective: Improve Security of Our Equipment and Infrastructure

Over the past few years, the global cyber-crime landscape has changed dramatically, with criminals employing more sophisticated technology and acquiring greater knowledge of how to defeat cyber security measures.

JPS has no control over external risk factors and therefore, must approach emerging risks with diligence, and the understanding that it is unable to detect and intercept every cyber-attack, and prevent every disruption and intrusion. JPS is cognizant of the vulnerabilities of some of its unmanned critical infrastructure and the threats they face currently and in the foreseeable future. There is a need for greater protection of these facilities from unauthorized access, interference, sabotage and damage from various incidents, as have been experienced in the past.

7.6.1 Strategy

Both physical and cyber threats against critical infrastructure in Jamaica and in particular JPS are forecasted to increase over the next few years. JPS needs to remain vigilant in its efforts to forestall current and upcoming threats by making every effort to ensure that it possesses the capability to simultaneously monitor both physical and cyber threats, understand the interface between them and constantly innovate for maximum resilience.

JPS will utilize a combination of electronic access control, closed-circuit television (CCTV), perimeter intruder detection and panic alarm systems installed at the Company's locations across

the island to detect and prevent intrusions and reduce exposure to illegal access and interference.

7.6.2 Initiatives and Programmes

The key initiatives are:

- The upgrade and installation of new CCTV surveillance systems on critical infrastructure
- Installation of electronic security features and apparatus at all critical sites
- Establishment of a security monitoring centre for 24 hour visibility, command and control of assets. This will provide centralized monitoring of critical sites such as generation facilities, System Control Centre, substations, repeater sites and office buildings. The monitoring centre will operate 24 hours every day, and through the use of virtual and visual information can automatically analyse and correlate alerts from locations across the island. Alerts that come into the monitoring centre will be overlaid on a map-based interface to allow operators to quickly pinpoint and direct response personnel to the alert's exact location.
- Conduct planning and validation exercises through external testing or independent verification of internal results
- Safety Signage Programme: for the replacement, and the installation of safety signage at JPS' facilities across the island starting in 2019
- Conduct internal penetration tests of the Company's information technology environment once every quarter and take corrective actions where necessary
- This is a proactive and authorized attempt to evaluate the security of the Company's IT infrastructure by safely attempting to exploit system vulnerabilities, including operating systems, service and application flaws, improper configurations, and even risky end-user behaviour. Such assessments are also useful in validating the effectiveness of the defensive mechanisms, such as; anti-virus applications, as well as, end-users' adherence to security policies.

In response to the current and emerging information security threats facing JPS, a Security Program has been structured that provides mitigating controls and processes, and involves the acquisition and increase in capacity of solutions which include the following areas:

- Secured System and Network Access Authentication and Authorization - Implementation of an Identity and Access Management solution that addresses the need to ensure appropriate access to resources across increasingly heterogeneous technology environments
- Logging and Reporting - Increase in capacity of Log Management and Security Incident and Event Monitoring (SIEM) system and increased integration with enterprise systems to provide better log correlation to assist in IT security incident identification and response as well as technologies that will provide added visibility into Internet of Things (IoT) and SCADA network activity
- Malware and Vulnerability Management - The formation of a Patch and Vulnerability Management Group which comprises representatives from different stakeholder groups that will participate in a process to manage vulnerabilities and risks that impact JPS IT systems,

complemented by security baselining, routine vulnerability scanning and compliance reporting.

- Implementation of an Information Security Awareness Program to improve employees' ability to identify and report cyber security threats, and generally raise the level of IT security consciousness and operations.

Measuring Performance on Priority 1: Safety

Key Indicator	2018 Actual	2019	2020	2021	2022	2023
Recordable Injury/Illness	15	15	14	8	6	5
DART	11	14	11	8	8	8
Motor Vehicle Accident Preventable	4	8	7	5	5	5
Debilitating Injury	0	0	0	0	0	0
Liters Lost to the Environment	148	95	0	0	0	0

Table 17: Safety Key Performance Indicators 2019-2023

PRIORITY 2.

Customer Service

Improving our customer service & utilizing technology to best serve our customers

PRIORITY 2: CUSTOMER SERVICE

Today's energy customers are clamouring for more utility as they become increasingly aware of the plethora of options available in the market. This has sent utilities worldwide on a quest to meet evolving customer expectations. Technology enablement played a major role in transforming the way customers consume power, with direct implications for the utility business model, resulting in a new power reality for individuals, businesses and nations. What was once a bland exchange of kWhs for money has become a medium for self-expression, comfort, establishing political positions, showing concern for the preservation of the environment, opting for self-sufficiency (generation) and using power in precisely the way one chooses to.

Customers are now "fully connected" and want to be engaged on their own terms using a wide variety of channels. Changing customer behaviour has already prompted JPS to make changes to its service offerings, to provide more convenience to customers.

The most recent Customer Satisfaction survey results (2018) revealed that customers value reliable and good quality service, comfort and convenience, service options to suit their unique needs, safety and security, and value for money. Against this background JPS will seek to deliver customer value over the next five years, by focusing on three main service themes: customer empowerment, improving ease of doing business and quality of service.

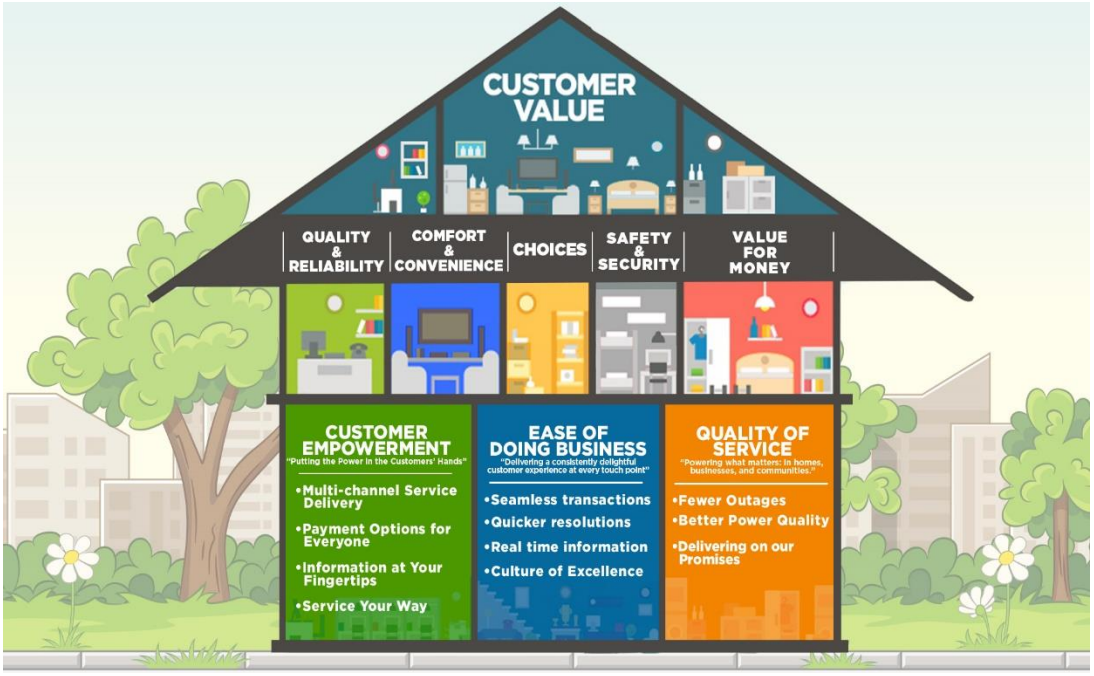


Figure 15: Delivering Customer Value

To improve ease of doing business, JPS aims to provide a consistently delightful customer experience at every touch point. The Company will pursue a strategy of having seamless transactions, quicker resolutions and real time information. Customer empowerment will be

enabled through multi-channel service delivery, expansion of distinct service options tailored to respond to specific customers' needs, increased comfort and improved safety and security in service delivery. The options will cross all channels of service delivery from temporary supply, prepaid service, commercial and residential consumption to a variety of energy solutions dependent on specific customer requirements like self-generation, localized energy storage, back-up battery service and EV charging stations. The intention is also to reduce supply disruptions, so customers experience fewer and shorter outages while being enabled to consume power the way they prefer.

JPS aims to use the opportunities provided by the changing marketplace to move the Customer Satisfaction Index (CSI) from its current 60% (2018) to 70% by 2024, which is more in line with the average CSI rating of US utilities, based on the results of the Electric Utility Customer Benchmark Study by J.D. Power & Associates, a global leader in customer satisfaction scoring and benchmarks.[35] According to J.D. Power & Associates, US utilities have been seeing year-over-year increases in customer satisfaction due to improved power quality and reliability; improved price satisfaction, as customers provide their utility with higher ratings for ease of understanding pricing, total monthly cost and fairness of pricing; and a higher percentage of customers getting critical information during power outages.

Like the customer in the J. D. Power Benchmark Study, JPS' customers have identified power quality and reliability, pricing, and proactive communication on power outages among the areas of the Company's service delivery that matter most to them. In addition, JPS' customers have indicated some dissatisfaction with the Utility's responsiveness and the time it takes to resolve queries.

The next five years will therefore see the implementation of initiatives that address these areas and ensure we are delivering on our promises.

Guaranteed and Overall Standards and Annual Targets

This Section will examine the three areas of the business impacting customer service delivery which focuses on the technical initiatives to address power quality and reliability (Generation, Transmission and Distribution efficiency), and the customer service delivery which is usually the point of contact with the customer. In respect of the latter the focus will be on customer solutions and options, customer education regarding pricing and billing, proactive communication about billing and power outages, processes and initiatives to improve the Company's responsiveness and timely resolution of customer queries.

The main objectives over the next five years, discussed in detail below, are to: improve service delivery; improve customer empowerment to reduce cost to customer (customer pays specifically for the service required); drive customer retention; improve perception of the brand

[35] https://www.jdpower.com/business/industry/utilities

and improve system reliability. The Company's success in these areas will be measured by its performance against the Guaranteed and Overall Standards, Reliability (Q-Factor) targets as well as CSI and Brand Perception scores.

Customer Service Delivery

8.1 Objective: Improve the Ease of Doing Business

The Company aims over the next five years, to continue to improve its service delivery by being more targeted and deliberate in identifying and addressing the needs of customers. The primary objective is to deliver a superior experience with every customer interaction. The focus is on making it a pleasure for customers to do business with the Company, by anticipating customers' needs, eliminating pain points and maximizing customer value. JPS aims to move beyond mere transactional interactions with our customers, to the creation of mutually beneficial relationships that result in long-term brand loyalty and customer retention.

8.1.1 Strategy

DEPLOY TECHNOLOGY TO ELIMINATE CUSTOMER PAIN POINTS AND ENHANCE CUSTOMER VALUE: The Company will implement initiatives to improve overall efficiency, while enhancing the customer experience. This will contribute to the achievement of a compliance level of 97% for the Guaranteed and 95% for the Overall Service Standards established by the Office of Utilities Regulation (OUR) by 2023.

8.1.2 Initiatives and Programmes

1. **MAXIMIZING THE BENEFITS OF SMART METER TECHNOLOGY**: With the deployment of smart meter technology, JPS has significantly reduced the number of estimated bills delivered to customers, while seamlessly expediting reconnections after service interruptions. This will also reduce the amount of breaches of the minimum service standards established by the OUR. Further steps will be taken to ensure that the benefits of the smart meter technology are fully realized. This will include: the integration of meter reading, bill payments and fault reporting systems, and more effective quality monitoring in the billing process. The Company has deployed a strategy to have full coverage of smart meters across its customer base by the end of 2023. Customers will benefit from fewer estimates, quicker reconnection, improved analysis and diagnosis of issues, along with real-time information regarding their energy consumption.

2. **BILLING AUTOMATION**: The results of the 2017 Ovum Global Payments Insights Survey indicates that 78% of billing organizations are focused on improving customer experience in payments and are investing in the technology needed to enhance this experience. Given its commitment to improving the bill payment process and to expanding bill payment options to

customers, over the next five years JPS will focus on bill production and delivery automation, the integration of meter data and billing systems, and the implementation of a debt management solution. The reconciliation of debt collections is still manually completed and applications that provide real-time debt information are unavailable. The approach is outlined below:

- **Bill delivery automation**: Improved billing communication using electronic channels resulting in greater compliance and lower cost per customer and improved collections cycle for JPS. For example, customers have been requesting direct access to an online portal from which they can access their bills with minimal contact with JPS
- **Billing systems integration**: Increased accuracy and efficiency in billing will result in an improved billing experience through the automation of processes, resulting in the efficient production and delivery of billing information to customers. Data for some meters is still uploaded manually because of a lack of integration of the reading database and the billing application. With the automation of the billing of all net-billing meters, which has now seen the automated upload of readings to the billing system, a revised bill structure and efficient delivery to customers.
- **Improved bill payment capabilities**: The expansion of bill payment channels will result in an improved customer experience by enabling customers with a wider range of convenient payment options.
- **Implementation of a full-scale debt management application** which will house customer debt information and allow for the production of real-time data; Real-time, accurate debt management/monitoring will result in increased customer compliance thus improving their credit rating.

3. **CUSTOMER NOTIFICATION FOR ALL OUTAGES**: Customers' dissatisfaction with power supply interruptions is magnified by the limited availability of real time information on outages. The Company will continue to expand the communication channels now used for outage notification, to include the JPS Mobile App, Emails, Text Messages, Social Media and other platforms. The Company is taking steps to introduce a technology solution which will facilitate automated Outage Notification to customers for all outages: planned and unplanned. This includes the GIS mapping of customers to feeders (power distribution lines), so that when an outage takes place on a particular line the affected customers are automatically alerted via the preferred medium selected by each customer. This will include updates, as needed, regarding restoration times. To support this effort, JPS is intensifying efforts to collect customer contact information through routine customer interactions as well as targeted campaigns. The expectation is that these initiatives combined, will allow the Company to significantly improve customer experience and reduce customers' dissatisfaction with information on outages.

8.2 Objective: Customer Empowerment 'Putting the Power in our Customers' Hands

8.2.1 Strategy

PROVIDE MULTI-CHANNEL SERVICE AND MORE SELF-SERVICE OPTIONS: Customers have become more demanding of utility companies, expecting the same level of innovation and customer focus that they receive from other companies with which they do business. Research company Gartner, predicts that self-service help will be the first choice of customers in the near future.[36] Companies should therefore ensure that customers are able to find answers to their questions using an assortment of self-service options, starting with their websites. See statistics in Figure 16 below.

Figure 16: Importance of a Company's Website

By providing more self-service options for customers, JPS has an opportunity to improve the customer's experience, and at the same time reduce the costs of serving customers. Self-service options will be provided primarily through online and digital platforms. The Company therefore needs to ensure that it provides a positive mobile experience to avoid frustrating customers seeking to use the self-help options offered. The fall-out from negative mobile customer experiences can be far-reaching, as indicated below:[37]

Figure 17: Implications of a Negative Mobile Experience

[36] http://www.gartner.com/imagesrv/summits/docs/na/customer-360/C360_2011_brochure_FINAL.pdf
[37] WOW Local Marketing http://wowlocalmarketing.co.uk/

8.2.2 Initiatives and Programmes

1. **JPS MOBILE APP**: The Company is currently developing an updated version of the MyJPS Mobile App for deployment in 2019. This will literally place the power in the hands of customers, who will be able to get real time updates on their accounts, energy consumption on their premises, power outages, and other JPS-related information. The Mobile App will also facilitate bill payments as well as customer reports. This initiative is expected to contribute to a reduction in the level of customer dissatisfaction with the length of transaction times, as well as the wait time for information from the Company.

2. **ONLINE CUSTOMER SERVICE**: JPS now provides customers with 24-hour service on several social media platforms, and via its website between 8:00am and 5:00pm. Customers are actively utilizing the multiple service platforms and contact points offered by the Company, with a marked increase in customers choosing online options.

   In addition to handling over 1.8 million contacts via its Call Centre in 2018, JPS resolved more than 24,000 customer cases via Facebook and Twitter, while more than 29,400 customer engagements were handled via web chat.

   In an effort to meet the growing demand for service on its online platforms, JPS will introduce more self-service options so customers can make reports and get responses without interacting with an agent, according to their preferences. Starting in 2020, the Company will begin utilizing Artificial Intelligence (AI) in the form of Chatbots to address basic customer queries online. This is expected to significantly improve customer satisfaction by reducing the time customers need to wait for responses to their queries. Currently, about 50% of JPS customers are dissatisfied with wait times when they contact JPS via the Customer Care Centre or Customer Service Offices. By offering more options for online self-service, JPS expects to improve the level of satisfaction by at least 50% by 2023.

   JPS will also enter into strategic partnerships to implement bill information kiosks in several non-JPS locations across the island by 2024. These will facilitate hassle-free access to billing information while enabling the emailing of bills to facilitate other business transactions.

3. **PAY YOUR WAY**: JPS will offer customers a range of bill payment options, which they can select, depending on their needs or consumption patterns. These will include payment options such as **Prepaid Service** and **Budget Billing**,

   - **PREPAID SERVICE**: JPS will expand prepaid service as a viable option for all customer groups, with the expectation that a minimum of 0.5% of the customer base will convert to prepaid service each year, between 2020 and 2023. To achieve this, the Company will increase the marketing of prepaid Pay-As-You-Go (PAYG) as an excellent cash flow and energy management tool for customers. With prepaid, customers have the option of

deciding exactly how much they want to spend on electricity. Prepaid service will also help to improve JPS' collections and cash flow, as the Company will move to convert chronically delinquent customers to prepaid service.

- **BUDGET BILLING**: Allows a customer to pay the same amount every month, with their account being reconciled at the end of a period that is mutually agreed between JPS and the customer

- **PAY ON BILL**: This option will be offered to customers who secure services from JPS, outside of the standard electricity service package. It will be available for persons purchasing items from the JPS eStore or securing services such as energy audits from the Company's Energy Solutions arm.

4. **SUITE OF SERVICE OPTIONS**: Customers have different needs, and their needs will change over time. Based on customer feedback, JPS is in the process of developing a robust suite of service options which customers will be able to choose or opt out of, based on their unique needs at any point in their relationship with the Company. Customers will be able to seamlessly access services such as:

    - Energy Audits
    - Energy Management Training
    - Supply and Installation of Commercial LED Lights and Retrofits
    - Power Factor Assessment & Correction
    - Load Assessment Services
    - Vegetation Management

5. **CUSTOMER EDUCATION**: The availability of information when customers need it, and where they want it, is a critical part of customer empowerment. The Company will therefore expand its customer education programme to ensure that information is available on all platforms, in a format that is accessible and useable by diverse customer groups. Given the growth in digital media, JPS will expand its recently introduced online "Customer Support" video series to include all platforms (YouTube, Website, Facebook, etc.), covering all areas of the business.

    A sustained, proactive customer education programme will reduce the need for customers to make contact with a JPS agent or visit a JPS office for information that they can access at their convenience, via the channel of their choice. This is expected to contribute to a 25% reduction in Call Centre contacts between 2019 and 2023.

8.3 Objective: Customer Retention

8.3.1 Strategy

CUSTOMER SEGMENTATION AND PARTNERSHIPS: JPS has experienced stagnant or negligible growth in energy sales in recent years due to improved energy efficiency and customers leaving

the grid. Like most energy companies globally, JPS is faced with the increasing reality of customer defection, as consumers seek more affordable options and more choices to suit their lifestyles. Preservation of the environment is top-of-mind among some consumers, making them prime candidates for renewable solutions, whether they are offered by JPS or by other companies. It is no longer a case of 'one size fits all', whether in terms of products and services, or communication methods. It is therefore imperative that JPS gets to know its customers and develop partnerships with key customer groups.

A Customer Relationship Management strategy is an absolute necessity for any business serious about improving their customer's experience. Market Researcher, Toma Kulbyte, notes that, "To deliver an excellent customer experience, companies must know their customers better than ever before. This means creating complete customer profiles that help the company to understand and measure customers' behaviours at every touch point across multiple channels. Once you know your customers well enough, you can use that knowledge to personalize every interaction. Customers have more power and choice than ever before. Companies are therefore responsible for understanding and acknowledging their needs. If you make sure their interaction with your company is smooth, pleasant and continuously improving, you will drive brand loyalty."

8.3.2 Initiatives and Programmes

A. **CUSTOMER EXPERIENCE PLATFORM:** The Platform will be deployed in 2020 and expanded incrementally over the subsequent 3 years. This will enable JPS to deliver more efficient customer service, and be able to capture details on its customers' preferences, lifestyles, etc. Customer accounts will be updated at every interaction point, to ensure that the Company always has the most current information on its customers. JPS can then use this data to develop products and services specifically for different customer segments. Most importantly, the platform will enable better case management and significantly reduce the time taken to resolve customer issues. It is expected that this will contribute to a more positive customer experience and, ultimately, customer loyalty and retention.

B. **CUSTOMER LOYALTY PROGRAMME**: The JPS Loyalty programme will provide opportunities for JPS customers to benefit from discounts and special service packages from other partners. Building on the foundation established by the **myJPS Rewards** programme, JPS intends to expand the number and range of merchant partners, as well as to make the rewards more attractive to customers. The intention is to implement a marketing campaign to encourage more customers to sign up for Ebills to benefit from the myJPS Rewards programme. This will convert to a better experience and lower cost to customers, as the Company moves to automate the billing processes and reduce bill delivery costs.

C. **TARGETED COMMUNICATION**: With greater knowledge of its customers, the Company will be better able to develop and send personalized communication. Customers will also be able

to update their personal profiles via a digital portal on the JPS website, which captures details on customers' needs to enable the tailoring of education and engagement strategies to meet these needs. This will improve the customer experience for special needs customers. Beginning in 2020, the company will develop Customer Education material with the capacity to facilitate assistive or adaptive technology, allowing access to visually impaired customers. The Company will also include sign language in its Customer Education Videos.

D. **PARTNERSHIPS WITH CUSTOMER INTEREST GROUPS**: In 2018, JPS established a framework for ongoing dialogue with Consumer Advocacy groups through quarterly meetings, which were used to capture feedback as well as share information on the Company's plans and programmes. Starting in 2019, this initiative will be expanded to include groups that represent commercial customers. Through partnerships with these groups, the Company will be better able to plan for the needs of their members, while getting buy-in for its programmes and initiatives.

BRAND AND REPUTATION

Historically, the JPS Brand has suffered from negative perceptions due to reliability issues and the belief that the Company was indifferent toward customer's needs, and had as its main pursuit the acquisition of profits at all cost. Through a deliberate effort to humanize the brand, showcase its philanthropic and community-related endeavours, some of this perception was changed, and a more favourable outlook generated in the period from 2014 onward. This was supported by an aggressive approach to enhance customer service. However, more needs to be done.

8.4 Objective: Positive Perception of the JPS Brand

8.4.1 Strategy

POSITION THE JPS BRAND AS A VALUABLE PARTNER: JPS will continue its strategy to reposition itself as a valuable partner for residential customers, businesses, communities, and Jamaica as a whole. The Company has adopted the tagline ***Powering What Matters,*** as part of the strategy to demonstrate the value the Company brings to the different areas of customers' lives.

While highlighting operational initiatives to improve service delivery and reduce the cost of electricity, JPS will be more deliberate in aligning itself with issues and causes that matter to our stakeholders, and which make a difference in the lives of individuals.

JPS' role as a partner in national development is often overlooked or understated. In this regard, the Company will ensure the fulsome dissemination of information on its projects and initiatives that contribute to national growth.

To achieve success, starting in 2019, JPS will develop and implement a 360-degree Marketing Communications programme that provides information on all areas of the business, while showcasing the people behind the operations.

8.4.2 Initiatives and Programmes

The 360-degree Market Communication programme includes key initiatives as highlighted below:

A. **Corporate advertising**, to position JPS as investing, working and improving, *Powering What Matters* to our customers and stakeholders, and meaningfully contributing to the realization of Jamaica's Vision 2030
B. **Direct, targeted customer communication**, to include monthly ENewsletters and key stakeholder engagement initiatives
C. **Consistent media presence**, to include:
    - Quarterly Media Briefings or Special Forums
    - Weekly scheduled interview programme, "JPS Cares" on radio stations covering a range of critical demographics
    - Weekly dissemination of News Releases/ Video News Releases/ Captioned Photos to highlight developments and philanthropy
    - Utilization of opportunities in print media, Talk Shows, Morning TV and other programming, to position JPS team members as "Energy Experts"

QUALITY OF SERVICE - SYSTEM RELIABILITY

Each time JPS' customers turn on a light, plug in a phone, approach a traffic signal, or log onto a computer, they trust that the power system will be working to enable the services they expect. The improved level of reliability provided by the national grid takes timely planning and investment and effective system operations and coordination. System operators rely on generating power plants to provide the capacity to meet energy demand and the transmission and distribution network to supply power to homes and businesses.

For a utility, system reliability is the ability of a power system to provide adequate, stable, reliable power to a given distribution of customers. It is the ability of the connected grid to supply the voltage customers need, the power customers need, and also include whatever backup systems the utility has for when the grid goes down. The focus on reliability means keeping the lights on, delivering electricity in the quantity and with the quality demanded by users, thereby leading to improved customer service and satisfaction.

JPS has made significant strides over the past five years to improve its reliability performance. Maintaining and improving JPS' plants reliability are key elements for driving customer service

delivery and achieving end-to-end efficiency. A key consideration for reliability performance is to provide the system operator with the most reliable supply of electricity to serve its customers. The Company has taken significant steps through prudent maintenance management, fleet utilization and optimization to promote asset reliability improvements. These improvements in reliability have also served as a catalyst for Heat Rate improvements achieved over the period. JPS' plant availability (EAF) has improved from 78.6% in 2014 to 89% in 2018. The performance in 2018 represents the best availability factor in over 10 years. The EFOR of JPS power generation facilities trended downward showing an improvement in EFOR of over 50%. The improvement in EAF and EFOR has improved SAIDI and SAIFI performances.

The Company also continues to focus its attention on improving the reliability and stability of the transmission and distribution grid. This includes the routine replacement of defective structures and equipment, transmission expansion, voltage standardization and the upgrade of the network including the leveraging of various smart grid technologies. This has resulted in an improved and more resilient grid and a reduction in the frequency and duration of outages as outlined in the SAIDI and SAIFI performance which has resulted in customers experiencing fewer and shorter outages over the five-year period.

The main objectives for the next five years, discussed in detail below, are to improve generation and transmission and distribution reliability. The Company's success in these areas will be measured by its performance against the regulatory targets for SAIDI and SAIFI and well as the EAF and EFOR scores.

8.5 Objective: Improve Generation Reliability

8.5.1 Strategy

MAJOR MAINTENANCE AND OVERHAUL: JPS will continue to perform major maintenance and overhaul of base load units over the next five years to maintain a reliable and efficient operation[38] and deploy maintenance strategy to improve plant reliability taking into consideration the plants scheduled to retire by 2023.

8.5.2 Initiatives and Programmes

Generation Reliability Projects

Bogue Generation Combine Cycle Plant Major Overhaul

- GT12 Major Overhaul with Controls Upgrade
- GT13 HGPI and Controls Upgrade

[38] See Maintenance Schedule in Priority 3: End-to-End Efficiency)

- ST14 Major Overhaul with Controls Upgrade

Bogue Generation Peaking Plant (Aero's Units) Major Overhaul

- GT 3 Hot Gas Path Inspection (HGPI)
- GT 6 GG Major Overhaul
- GT 7 GG Major Overhaul
- GT 9 GG Major and Generator Rotor Out Overhaul
- GT11 Hot Section and Combustion Refurbishment

Rockfort Power Plant Overhaul

- Rockfort Unit 1 and 2

Hydro Plant - Renewables Hydro Plants Turbine and Generator Overhaul

- Upper White River Hydro Power Plant (UWR-HPP)
- Lower White River Hydro Power Plant (LWR-HPP)
- Rio Bueno A Hydro Power Plant (RBA-HPP)

POWER SYSTEM IMPROVEMENT: JPS is scheduled to retire 292 MW of aged Steam Generation capacity at Old Harbour Power Plants and Hunts Bay Power Plant. The commercial operation of the 194 MW SJPC LNG Plant in 2019, 94 MW from the NFE/JAMALCO LNG Plant in 2020, the 37 MW Solar in 2019, 24.5 MW energy storage plant at Hunts Bay in 2019 and the possible replacement of 171.5 MW of existing aging capacity under JPS' ROFR clause by 2023 will result in improved system reliability. These projects will transform the overall reliability of the National grid. The removal of 292 MW over the period 2019 to 2020, will see the system operating reliability at approximately 86% EAF over the five year period. The natural outcome from these investments will result in improved service delivery to the customers.

JPS will implement all the generation capital projects[39] utilizing best in class technologies and employ process improvement initiatives, prudent maintenance management, cost reduction strategies and strict adherence to regulatory requirements. The implementation of these initiatives will lead to greater operational efficiency, reliability improvements and better quality of service to customers.

[39] For additional information see Financial Plan Chapter

8.6 Objective: Improve Transmission and Distribution Reliability

The Company will embark on three integrated strategies that will support the achievement of T&D reliability improvements which will seek to address known grid deficiencies, target SAIDI drivers and feeder configuration and connectivity.

8.6.1 Strategy - One

ADDRESS KNOWN GRID DEFICIENCIES: JPS will implement major improvements across the Distribution network in the form of conditioned based maintenance, substantial re-configuration of feeders and considerable enhancement in the connectivity of the feeders in large service areas to increase power quality and minimize the number of customers that will be negatively affected in a given power outage. This will result in statutory voltage quality boost and improve the overall reliability to JPS' customers.

8.6.2 Initiatives and Programmes

1. **TRANSMISSION AND DISTRIBUTION LINE IMPROVEMENT**: The aim will be to improve structural integrity, grid deficiencies and improve overall reliability of transmission lines. The replacement of defective poles and hardware as well as the rehabilitation of wood and steel poles seek to address and improve the integrity of the transmission line system.

   The scope of the programme encompasses the following initiatives over the five year period 2019-2023.

   - Structural Integrity Hardware Replacement – 54,242 pieces of defective equipment on the distribution system and 1,540 insulators on the transmission system
   - Structural Integrity Pole Rehabilitation - A total of 2,281 Transmission and 36,805 distribution poles will be rehabilitated or replaced
   - Steel Pole and Steel Tower Rehabilitation - A total of 43 Transmission structures will be targeted
   - Fault Circuit Indicator Installation – 270 Fault Circuit indicators will be installed on Transmission lines and 213 on Distribution lines. See Section on Grid Modernization for additional information

2. **SUBSTATION IMPROVEMENTS**: JPS will apply life extension measures to include rehabilitation works on power transformers, tapchangers and support structures as well as the replacement of aged and problematic equipment such as power transformers, circuitbreakers to improve the overall health of a substation.

   Substation activities over the five years (2019-2023):

   - Replace and/or process the oil in 12 transformers and correct major oil leaks on 10 transformers to extend its useful life by approximately 10 years
   - Installation and commissioning of the fire suppression system at 15 substations
   - Structural Integrity works to replace deteriorating wooden structures in 10 substations

- Replacement of 24 of the 138 kV and 69 kV circuit breakers at various substations. These breakers are over 20 years old and are unable to be serviced as the manufacturer has stopped making replacements parts for these breakers
- Equipment Replacement - This project will seek to replace nine potential transformers, five 138 kV switches, five 69 kV switches, three battery chargers and three battery banks at various substations
- Replacement of 15 reclosers and main breaker at various substations
- Some key substations have been identified as in need of general repairs. The improvements to be undertaken within the five years are: gravelling, control box replacement, fence repairs and replacements, relay building and roof repairs and replacement. The project will seek to do surface preparation, application of cold galvanizing compound and fabricate steel structures including steel columns, bus support and gantries that are deteriorated.
- Procurement of seven essential electrical testing equipment.
- Installation of 15 ground pits and grounding improvements at various substations. In an attempt to reduce the resistance of the substations to below 1Ω ohm or within specifications.

8.6.3 Strategy - Two

TARGET SAIDI DRIVERS: Equipment failure was the leading cause of forced outages with substation, transmission lines and distribution lines accounting for 72%, 53% and 35% of all faults respectively. Other issues affecting the T&D system are the structural state of steel poles and towers, vegetation control, lightning and insufficient detailed patrol. Having identified the SAIDI and fault drivers for the transmission system, pursuing the initiatives below in a sustained way over the next five years will significantly reduce interruptions, improve reliability and operational efficiency.

8.6.4 Initiatives and Programmes

1. **EQUIPMENT REPLACEMENT**: The equipment failure management initiative seeks to reduce equipment failure rate by employing a number of strategies set out as follows:

   Remain compliant with periodic inspections and condition assessment of substation assets as per schedule. These include electrical testing of substation assets as well as physical/chemical testing of oil filled power transformers. The necessary corrective actions are done accordingly from any defect findings.

   Remain complaint with periodic transmission line patrols. The necessary corrective actions are done accordingly from any defect findings.

2. **INTEGRATED VEGETATION MANAGEMENT**: The T&D network traverses across 95% of the island of Jamaica which is layered with tropical vegetation. Perennially, vegetation-caused

outages have been the major issue affecting the Company's reliability performance. It has accounted for approximately 26% of SAIDI and SAIFI annually.

Integrated Vegetation Management solutions are expected to reduce JPS SAIDI by approximately 2% annually over the next five years. This improvement is based on a reduction in the number and magnitude of vegetation related interruptions.

The Table below outlines the Company's exposure the vegetation.

System	Total Circuit Length	Effective Bushing Circuit Length	Vegetation Exposure
138kV Transmission Line	382	153	40% of total lines
69kV Transmission Line	826	496	60% of total lines
Distribution Primary	11,334	8,501	75% of total lines
Substations	50	50	All substations requiring bushing solutions, especially five with fast growing vegetation at Hydro Station
Total	**12,542**	**9,150**	

Table 18: JPS Facility and Vegetation Exposure

3. **LIGHTNING MITIGATION**: This initiative seeks to reduce the number of forced and transient outages and equipment failure caused by lightning by improving the lightning protection system for transmission lines.

   A combination of shield wire and lightning arrester supported by grounding through special ground pit with backfill will be utilized. A total of 400 Lightning Arrestors on the Transmission System will be installed along with grounding improvement.

   JPS will continue to adhere to technical specifications for pole-mounted transformers with retro-fitted lightning arrestors by ensuring minimal lead lengths.

4. **CONDITION AND RELIABILITY CENTRED MAINTENANCE**: Condition-based predictive maintenance (CBPM) is related to the conditions of equipment. Reliability-centred maintenance (RCM) entails careful study of equipment and failures. The RCM process utilizes historical records to determine the priority of assets to maintain.

   Another priority of JPS is the safety of its employees and customers. Hence JPS has embarked on a program of prioritizing the maintenance of load-bearing poles (poles that carry

transformers or switches or that experience constant angular forces) considering the risk of damage to life and property if such a pole were to fail.

Based on the improvement requirements identified from the performance review of the transmission system for the past five years and the asset health index, the worst performing assets and those with poor health indices were targeted for improvement. This strategy supports significant reduction in known grid deficiencies over the five-year period and supports the organization's goals to meet customer satisfaction and reliability targets.

8.6.5 Strategy - Three

FEEDER RECONFIGURATION AND CONNECTIVITY: This strategy seeks to improve customer satisfaction thorough improvement in reliability performance by limiting the number of customers affected by a single fault. This strategy will result in:

- Reduce outage areas to less than 800 customers for sustained outages
- Improve feeder connectivity

8.6.6 Initiative and Programme

1. **VOLTAGE STANDARDIZATION PROGRAMME (VSP)**: This programme is geared towards normalising all distribution feeders to 24 kV. Therefore feeders which were previously powered at 12 kV and 13.8 kV are now being upgraded to 24 kV (See Table 19). This will assist the Company in achieving its objective of becoming compliant with service area criteria as required by the distribution grid code and permitting greater load transfer capabilities from the voltage compatibility achieved.
    - This involves the upgrading of feeders which are rated at 12 kV & 13.8 kV to 24 kV;
    - A total of 21 feeders requires upgrading, however, 12 feeders of these feeders will be upgraded in this five year period (2019-2023).

Substations/ Feeders	No. of Feeders	VSP Upgrade	Completion Date
Oracabessa	2	From 12 kV to 24 kV	2019
Upper White River	2	From 12 kV to 24 kV	2020
Blackstonedge	1	From 12 kV to 24 kV	2021
Highgate	2	From 12 kV to 24 kV	2021
Michelton Halt	2	From 12 kV to 24 kV	2022
Rhodens Pen	3	From 12 kV to 24 kV	2023

Table 19: VSP Upgrade 2019 - 2023

This provides tremendous flexibility for load transferability to neighbouring feeders. It also improves inventory management as only one set of equipment can now be procured, but most importantly, the added benefit is in the area of technical loss reduction. Increasing the voltage to 24 kV from 12 kV and 13.8 kV will result in considerable reduction in line current. The reduction in current in the primary distribution network means a decrease in technical power losses[40].

2. **TRANSFERABILITY OF DISTRIBUTION FEEDERS**: The transferability of the distribution feeders is a function of the number of parallel points to neighbouring feeders, as well as feeder/transformer capacity within the substation and service area to accommodate additional loads. The aim is to ensure that sufficient capacity is within a particular substation to pick up additional loads and if not possible, then within the service area. To accomplish this, during the 2019-2023 planning horizon, the following transformers are designated for replacement or augmentation in the respective substations to facilitate improved transferability of the distribution feeders. (See Table 20).

- There are 64 Transformers (51 Distribution and 13 Inter-buss) in the existing fleet
- Eight transformers are being targeting in this five year time frame, based on abnormalities.

Substation	Planned Replacement and Expansion	Completion Date
Hope	Replace 10 MVA T2 with New 25/33 MVA Transformer	2019
Cane River	Replacement and upgrade 6-10/12MVA	2019
Tredegar	Install New Additional 25/33 MVA	2020
Rose Hall	Replace 15 MVA with New 25/33 MVA	2020
Parnassus	Replace 15 MVA T3 with New 25/33 MVA	2021
Duhaney	Install New Additional 25/33 MVA	2022
Spur Tree	Install New Additional 25/33 MVA in New Spur Tree S/S	2022
Porus	Upgrade to 15/16.5 MVA	2023

Table 20: Distribution Transformer Replacement and Expansion Plans

Grid Security and Stability

8.7 Objective: Strengthen Grid Security and Stability

JPS is the grid operator with the responsibility of ensuring harmonious expansion and reinforcement of the transmission infrastructure to improve grid security and reliability. Transmission expansion is normally supported by load demand and generation expansion. In Jamaica, the load demand is relatively flat hence, the transmission expansion is mainly geared towards network reinforcement and new generation expansion.

[40] See Chapter 10- End-to-Efficiency:System Losses

8.7.1 Strategy

TRANSMISSION AND DISTRIBUTION EXPANSION AND UPGRADE: The strategy for Grid Security and Stability is centred on JPS' Transmission and Distribution Expansion and Upgrade and related initiatives to meet the growing needs of customers.

Transmission Expansion and Upgrade

A key determination of the JPS' transmission expansion is the placement of additional generation. This will become clear when the IRP is finalized. Hence, subject to the outcome of the IRP, JPS' committed investment over the next five years will focus on limited transmission grid reinforcements to support voltage violation where they currently exist on the grid. Additionally, an energy storage system is being implemented to reduce variability associated with renewable energy generation thereby improving power quality. Refer to the Capital expenditure plan (Medium Term Capital Plan Section 13) for details on transmission investment over the period.

8.7.2 Initiatives and Programmes

1. NEW TRANSMISSION LINE

Bellevue to Roaring River 69 kV line

Significant stress is found in the system along the 69 kV corridor between Duncans and Bellevue Substation affecting several substations and transmission lines and electricity supply to customers. The line connecting Bellevue and Upper White River is congested 100% of the hours in the year and the line connecting Rio Bueno and Cardiff Hall is congested 80% of the hours in the year. These two lines are the only lines supplying this corridor. Forced outages on these lines create serious voltage violations which are corrected by load curtailment resulting in high customer dissatisfaction, poor reliability, and poor power quality and revenue loss to the company from unserved energy. The proposed construction of a new 69 kV line from Bellevue to Roaring River will reduce the congestion in the area considerably.

Old Harbour to Hunts Bay 138 kV Line

The relatively large load centres in the corporate area do not have adequate connectivity to the generation centres outside of the corporate area. The current transmission configuration leads to a bottleneck situation at the Duhaney substation seeing that all power has to be imported into the corporate area via this highly critical substation. Also, the security of the grid is currently compromised under N-1 and or N-2 contingent conditions. Such contingent conditions have actually been realized in recent years, leading to complete shutdown of the national grid.

With the retirement of the Hunts Bay B6 steam unit scheduled for 2020 (68.5 MW Capacity), JPS Rockfort Units (40 MW Capacity) and the JPPC scheduled for 2023 (61.3 MW Capacity), the current situation will worsen and as such there will be a desperate need for additional transmission lines to be in place to import power into the corporate area or new generation to be added into the corporate area. The long lead time to add baseload generation and the period between when B6 is retired in 2020 and new generation can be added in 2023 exposes the grid to grave stability risks. The proposed construction of the Old Harbour – Hunts Bay 138 kV line as a primary solution, will alleviate the congestion through Duhaney, improve corporate area system voltage, reduce system technical losses and provide a redundant path for power flow and improve grid security in the medium to long term.

2. INTER-BUS TRANSFORMER REPLACEMENT AND UPGRADES

Interbus transformers are critical elements of the power system in Jamaica. They are used as interfaces between the 138 kV transmission lines, which transport bulk power from the main generation plants, and the 69 kV transmission lines that supply power to the medium voltage substations. Timely replacement and upgrade of the interbus transformers are essential for grid security, reliability and the efficient management and operation of the power grid. Table 21 shows the existing interbus transformers that will be replaced/upgraded during the next five years.

Substation	Description	Completion Date
Old Harbour	60/80 MVA transformer 138/69 kV	2021
Bogue	80/100 MVA transformer 138/69 kV	2022
Tredegar	60/80 MVA transformer 138/69 kV T1	2023
Tredegar	60/80 MVA transformer 138/69 kV T2	2023

Table 21: Inter-bus Transformers Replacement and Upgrades for 2019 - 2023

Distribution Expansion and Upgrade

Expansion of the distribution network involves the construction of new substations which will facilitate new distribution transformers and new feeders to reinforce the distribution grid. The construction of new substations is critical for JPS to expand the distribution network to meet the growing needs of its customers as it pertains to reliability, demand and power quality.

8.8 Objective: Improve Grid Management

Proper grid management is essential for a stable and economical supply of electricity to the country. The real time balancing of electricity demand depends on plans and studies done on the availability and operation of Generation, Transmission and Distribution within established technical and regulatory constraints and conditions. If power supply and power demand are not

kept in equilibrium, this can result in blackouts and other systemic failures impacting service delivery.

Electricity demand is different throughout the day and throughout the year. Demand is supplied via a network of power lines by a combination of output from several power plants. The combination of power generators and lines used to deliver power may vary throughout the day and throughout the year based on input costs and planned and unplanned outages among other factors.

Variations in power demand and available supply are challenging to manage especially given that it occurs in real time, and is further complicated by higher penetrations of Variable Renewable Energy (VRE). Therefore, as the national power grid continues to evolve, the people, processes and technologies employed to manage it must be capable. Grid management is expected to improve given the strategies and key initiatives outlined below.

8.8.1 Strategy

To keep up to date with the continuous changes on the national grid, JPS will:

- Maintain and take steps to improve the operation of the power system in a safe, reliable and economical manner
- Improve stakeholder situational awareness
- Improve the management of VRE (Frequency Regulation and Renewable Smoothing)

This strategy will be approached by ensuring adequate coverage and competence of the essential personnel that have critical roles in this endeavour, in conjunction with the implementation of updated recommended processes tools and technologies necessary for the proper management of Jamaica's national grid. This strategy contemplates utilizing state of the art technology, in keeping with international best practices and equipping the users with the requisite skills and sufficient support to make optimal use of the tools provided. The level of support considered includes facilitation and cooperation with other key stakeholders.

8.8.2 Initiatives and Programmes

1. **MAINTAIN AND IMPROVE POWER SYSTEM OPERATIONS AND STAKEHOLDER AWARENESS**

   Outlined below are key initiatives that are intended to address this aspect of the strategy:-

   - **SCADA SYSTEM UPGRADE by 2022**:

     This project is to upgrade the present SCADA/EMS/ADMS System to OSI's latest version of the software that will bring improvements in the hardware platform, user interface, visualization platform and SCADA/EMS/ADMS applications. This will see a full replacement of the software and a partial or full replacement of the hardware and network infrastructure. This includes video wall controller, video wall upgrade, smart

mobile applications (OSI Voyager), etc. The ultimate failure and unavailability of the video wall system will result in a serious reduction in the situational awareness of the System Controllers and possible inabilities to respond in a timely manner, if at all, to manage grid contingencies.

The upgrade will include a module to simulate the actual distribution network (distribution state estimation). The current basis for measurement and estimation is primarily insufficient.

The project includes the following done at both the Main Control Centre (SCC) and Backup Site (EBS):

- A replacement of the current hardware (servers, clients, monitors and network infrastructure)
- Upgrade of the windows operating systems (server and client)
- Upgrade of the SCADA, EMS and ADMS Applications, Monarch Baseline Software, DBMS, HISTORIAN
- Replacement of Video wall controller as well as the full video wall hardware replacement thereafter, as these assets will reach their end of life and currently are experiencing intermittent failures.

- **OSI OMS UPGRADE**

This initiative will see the upgrade of the current ABB/Ventyx OMS to an integrated DMS/OMS (ADMS) solution on the OSI Monarch platform. This will also mean that the SCADA, EMS, DMS and OMS systems will also be on one common platform that will allow for a seamless integration between each and the same operational model for both the OMS and DMS. The project will span between 2020 and 2021. Fault location and load flow from the DMS can also be utilized in the OMS to improve situational awareness, analysis and the decision-making process during outage management.

Direct benefits of this initiative include:

- Lower total cost of ownership
- OMS/AMI integration to: Improve outage prediction and hence improve the ability to improve customer outage restoration
- Handle nested outages and provide quicker updates to customer on outages affecting them
- As an enabler the OMS working with AMI will allow achievement of a 10% reduction on the baseline in SAIDI over the next six years

- **OSI DERMS APPLICATION**:

  This project will add the DERMS application to the existing OSI Monarch System thereby creating a complete ADMS package. This application supports the integration of new generation (DGs) and micro grid operation.

  The DERMS application will enable the System Controllers to manage the power quality and reliability operations of distributed generators on the distribution network. It will also monitor and manage micro grids that might be established in the event of the creation of multiple islands on the distribution network under fault conditions or otherwise. The project is expected to have a duration of three years and will include the modules:

  - Voltage/VAR Control (VVC) Application
  - WEB Users
  - AMI Interface (MultiSpeak)
  - Damage Assessment & Mobile App
  - DER Monitoring and Control

  This initiative is expected to have the following benefits:

  - Ability to leverage the benefits of an integrated solution to manage the high influx of DERs (Solar, Wind, DGs) on the distribution network
  - Facilitate the establishment of micro grids
  - Reduction in distribution grid disruptions
  - Facilitate Wheeling Operations
  - Facilitate future Electric Vehicle (with charging stations) integration on the grid

2. MANAGEMENT OF VRE (FREQUENCY REGULATION AND RENEWABLE SMOOTHING)

- **IMPLEMENTATION OF RENEWABLE FORECASTING SOFTWARE**

  Two of JPS' third party suppliers have already been engaged for a trial of their renewable forecasting software to estimate the projected output from the VRE facilities on the grid. These technologies provides the following benefits:

  - Improved management and mitigation of massive power ramps by VRE on the grid
  - Better planning, preparation and response related to intermittent availability of VRE

- **REVISION OF SPINNING RESERVE POLICY**

  The present spinning reserve policy has become obsolete with the penetration of high levels of VRE on the system. Studies and simulations are being done to evaluate how best

to modify the existing policy to account for changes on the grid including increasing inclusion of intermittent generation. The revised spinning reserve policy will:

- Facilitate more robust and secure system operation
- Reduce the occurrences of under frequency operation, especially for VRE intermittency
- Accommodate inclusion of ESS as an integral part of frequency management
- Align grid operation with international best practices

GRID MODERNIZATION

Ultimately, efforts to modernize the national grid will directly or indirectly translate to enhanced customer experience. Grid modernization is focused on projects and programs that supports continued reliability improvement, while also improving resiliency, interoperability and operational efficiencies.

8.9 Objective: To Modernize the National Grid

JPS had started its transition from a traditional grid to a more modern, intelligent self-healing grid through the installation of smart devices that help to avoid or eliminate sustained outages that are due to transient faults. It also enables improved outage response by reducing patrol time, minimize the number of customers affected for main-line faults and allowing for remote transferability of power supply to restore supply to customers promptly.

8.9.1 Strategy

DEVELOPMENT OF A SMARTER GRID: JPS will advance the modernization of the grid through the employment of technology to automate processes and implementing projects aimed at the reinforcement and rehabilitation of the network to enhance its security and resilience.

8.9.2 Initiatives and Programmes

- **DISTRIBUTION AUTOMATION**: These devices limit faulted sections of a distribution feeder and allow for faster response and restoration of affected circuits at the primary and secondary distribution level as well as further optimize the functionality of the recently acquired Advanced Distribution Management System (ADMS). Over the next five years a total of 125 smart switches will be installed at feeder-to-feeder connection points and at strategic locations to segment feeders into a minimum of three sections.

- **FAULT CIRCUIT INDICATORS APPLICATION**: Fault Circuit Indictors (FCI) will be strategically placed on transmission lines to reduce restoration times. The combination of FCI and relay data will allow the Company to more accurately identify faulted zones, making it easier to identify the exact locations of faults so that corrections are done in a timely manner. 270

FCIs will be installed over the period, on the transmission lines and 213 FCI on the distribution lines.

- **TRIP SAVER AND RECLOSING CUT-OUTS**: When a fault occurs on the network, this smart grid solution eliminates momentary outages for customers on the main feeder by only blinking the affected laterals. This approach saves money for the Utility and its customers while improving reliability for all. A total of 1,290 Trip Savers will be placed on the distribution network.

- **SMART STREETLIGHT**: In 2019 the Company will continue the change out of high pressure sodium (HPS) lamps with smart light-emitting diode (LED) lamps. JPS will conclude the change-out of street lights island-wide by the end of 2021. A total 68, 000 of the total 110,000 remain to be installed; 25,000 in 2019, 25,000 in 2020 and 18,000 in 2021.

- **DISTRIBUTION FAULT MONITORING AND RECORDING**: The scope of this project for the next five years is to install and configure PQ Meters at all substations that would allow for measurement of power quality on all distribution feeders. The PQ Meters uses the PQ View software to conduct post fault analysis. With the devices real time monitoring capability, the data will be incorporated into its ADMS to further assist grid monitoring and analysis.

8.10 Objective: Compliance with Transmission and Distribution Design Criteria

8.10.1 Strategy

MAINTENANCE AND OPERATION OF AN EFFICIENT, CO-ORDINATED AND ECONOMICAL TRANSMISSION AND DISTRIBUTION SYSTEM: JPS will ensure compliance with the Transmission and Distribution Design criteria as outlined in the 2016 Electricity Grid Codes. All projects and processes beyond 2019 will be fully grid code compliant and the existing network will be transitioned to ensure full compliance.

Outlined below are the key initiatives that the Company will be undertaking to ensure grid code compliance.

8.10.2 Initiatives and Programmes

DESIGN CRITERIA 1: PROTECTION DESIGN CRITERIA

The gradual replacement of the generation fleet with a mix of renewables such as wind and PV Solar in addition to other low inertia generating units will significantly affect the stability of the grid and its ability to recover from disturbances such as transmission line and substation faults. It means the protection system has to act faster with a higher level of availability.

Failure of the protection system to act with speed and selectivity for disturbances will result in tripping of these low inertia machines leading to widespread outages and even system blackouts.

To minimize the likelihood of these widespread outages, it is necessary to upgrade the protection infrastructure to achieve better reliability and to meet more stringent requirements for fault detection, increased speed of operation and better fault discrimination.

The key initiatives and benefits are outlined as follows:

- **EXPANDING EQUIPMENT PROTECTION SCHEMES REDUNDANCY**

  Mitigate the effects of an "N-1" protection outage by procuring and installing additional distance relays and implementing redundant tele-protection schemes.

- **FAULT DETECTION AND ISOLATION ON CRITICAL LINES**

  Implement current differential protection on fourteen 138 kV lines and three 69 kV lines

- **TRANSMISSION SYSTEM SECURITY**

  Install transformer HV breakers at Queens Drive, Rose Hall, Greenwood, Oracabessa, Maggotty, Savanna-la-mar, Hope, Cane River and Greenwich Road substations, among others.

- **REPLACEMENT OF AGED INFRASTRUCTURE**

  Replace aged infrastructure such as control cables and panels as part of the modernization program to reduce failures due to "end of life"and hidden failures associated with control circuits.

DESIGN CRITERIA 2: DISTRIBUTION SYSTEM DESIGN AND GRID MODERNIZATION

The initiatives mentioned in Section 9.9.2: Grid Modernization will support the achievement of Design Criteria 2. The initiatives are therefore listed below and the details can be found in the aforementioned section.

- Distribution Automation
- Fault Circuit Indicators
- Trip Saver & Reclosing Cut-Outs
- Voltage Var Optimization
- Smart Streetlight
- Distribution Fault Monitoring & Recording

8.10.3 Measuring our Performance on Priority 2: Customer Service

	Key Performance Indicator	Base Year 2018	2019	2020	2021	2022	2023
1	EGS Compliance	91%	93%	94%	95%	96%	97%
2	EOS Compliance	74%	85%	90%	92%	95%	95%
3	CSAT Index (Survey)	60%	60%	64%	66%	68%	70%
4	Customer Perception: Ease of Doing Business (Survey)	64%	66%	67%	68%	69%	70%
5	Brand Perception: Ratio of Positive to Negative Media References	3.5:1	3.5:1	3.5:1	3.5:1	3.5:1	3.5:1
6	Brand Perception: JPS Viewed as a Good Corporate Citizen (Survey)	49%	52%	54%	56%	58%	60%
7	Customer Engagement via Digital Interactions	10%	15%	20%	30%	40%	50%
8	Outage Duration: SAIDI[41]	1,973.37[42]	1,872.41	1,745.26	1,659.84	1,594.91	1,516.13
9	Outage Frequency: SAIFI[43]	15.50	14.70	13.71	13.04	12.53	11.91
10	CAIDI	127.31	127.37	127.34	127.30	127.33	127.35
11	EAF%	89%	89%	84%	86%	84%	86%
12	EFOR%	5%	7%	9%	8%	8%	8%

Table 22: Customer Service KPI 2019-2023

[41] System Average Interruption Duration Index, the sum of all interruption durations divided by number of customers served.
[42] 3-Year average (2016-18) used for the baseline. For details see Rate Application Chpt. 7: Quality of Service - Table 7-9 Calculation of Baseline
[43] System Average Interruption Frequency Index, the total number of customer interruptions divided by number of customers served.

PRIORITY 3.

End-to-End Efficiency

Improving our overall efficiency in order to deliver the greatest value to our customers.

PRIORITY 3: END-TO-END EFFICIENCY

In its pursuit of end-to-end efficiency, JPS will streamline its processes to eliminate waste and reduce operating costs, which will help lower electricity tariffs to customers. End-to-End Efficiency is intended to target an overall delivery of key results across the business.

Through this effort, JPS intends to improve operational efficiencies across the business by re-examining work-flows, eliminating ineffective or redundant steps in processes, and improving synergies in operations. The Company will access lower prices and improved technologies as the market makes them available; utilize smart technologies to reduce systems losses; and improve plant performance and to effectively reduce operating costs. This will enable the Company to deliver quality service to its customers in a cost-effective manner and realize the benefits of its capital investments.

This improvement will be defined and measured in the context of an efficiency target or Productivity Improvement Factor to be achieved by JPS.

The main areas of focus for end-to-end efficiency will be on improving Heat Rate performance and plant reliability, reducing system losses and lowering operating costs.

9.1 Objective: Improve Heat Rate Performance

JPS' thermal Heat Rate performance has improved over the five-year period (2014 – 2018) from 11,457 kJ/kWh to 11,214 kJ/kWh as at December 31, 2018. This is the lowest heat rate performance by the JPS thermal fleet in the Company's history. The improved performances are primarily attributed to deliberate actions taken by the Company to ensure that the reliability and efficiency of its generating fleet were optimized by effecting major maintenance activities on key base load assets over the period.

9.1.1 Strategy

EFFICIENT PLANT PERFORMANCE: JPS will continue to invest in new technologies operating at the lowest production costs. These units will then be positioned relatively high in the merit order thereby ensuring a higher propensity for them to run given the economic dispatch methodology being used by the System Operator. This will result in the Company further lowering its record Heat Rate performance in 2018 to 9,337 kJ/kWh by 2023.

JPS will maintain generating plants in accordance with OEM recommendations and perform major maintenance and overhaul of base load units over the next five years to maintain reliable and efficient operations.

9.1.2 Initiatives and Programmes

- **RETIREMENT AND REPLACEMENT OF INEFFICIENT GENERATION PLANTS**: Retire 292 MW of inefficient and unreliable aged steam units from the JPS fleet by 2020 and replace with more efficient generating plants (Phase 1).

  Retire and replace 171.5 MW of older inefficient capacity with new, efficient and reliable generating units to the grid by 2023 (Phase 2). This is subject to the Minister's Schedule and ROFR mandate.

- **MAJOR OVERHAUL OF BASE LOAD UNITS**: Maintenance of the generating plants is an essential component of keeping the plants operating efficiently over their useful life. To improve plant efficiency major overhauls of key base load units over the next five years will be conducted. This includes Bogue GT 12 & GT 13 (major overhaul and control upgrade), Hunts Bay Unit B6 (Annual Overhaul), Old Harbour Unit 4 (Annual Overhaul) and ST14 (Major Overhaul).

- **MERIT ORDER COMPLIANCE**: Manage utilization of fast-starting peaking units (Gas Turbines) in accordance with their merit order to reduce their heat rate impact.

Heat Rate Future Outlook

The replacement of 292 MW of retired steam capacity by 2020 will result in improved reliability, and efficiency of the JPS fleet over the period 2019 to 2023. The JPS fleet thermal efficiency is projected to improve by 7%, with the corresponding heat rate moving from 11,214 kJ/kWh in 2018 to 9,337 kJ/kWh in 2023. The proposed retirement of the intermediate and peaking gas turbines during the rate review period could see an additional improvement of 1 - 2% efficiency. The corresponding fuel savings will be calculated when the economic model is developed for the 171.5 MW of capacity.

Table 23 below illustrates the expected Heat Rate performance based on the types of thermal plants that will remain in the JPS fleet after 2020.

Key Performance Indicators	2018	2019	2020	2021	2022	2023
JPS Heat rate (kJ/kWh)	11,214	11,269	10,290	9,319	9,603	9,324
Thermal Efficiency %	32	32	35	39	37	39
Enablers- EAF	89%	89%	84%	86%	84%	86%
Enablers- EFOR	5%	7%	9%	8%	8%	8%

Table 23: Projected Heat Rate Performance

Considerations

- The projected Heat Rate performances are predicated on achieving the indicated EAF and EFOR results.

Maintenance Schedules

In support of the objectives and strategies outlined above, the following maintenance activities will be undertaken to maintain plant reliability.

JPS GENERATION DIVISION PLANNED OUTAGE SCHEDULE 2019 - 2024

POWER STATIONS	Rated Capacity (MW)	Outage Days	REASON	2019				2020				2021				2022				2023				2024			
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
OHPS Unit #4	68.5	*10.0*	OHPS Unit #4 Annual Overhaul					RETIREMENT																			
RF2 - Rockfort	20	*35.0*	RF2 - Rockfort - Biennial Overhaul																								
RF1 - Rockfort	20	*5.0*	RF1 - Rockfort -Biennial Overhaul																								
HRSG12 Bogue	18	*3.0*	HRSG12 - Bogue Statutory																								
GT12 - Bogue	38	*35.0*	Major Overhaul and Control Upgrade																								
GT12 - Bogue	38	*3.0*	GT12 - Bogue - Hot Gas Path Inspection																								
GT13 - Bogue	38	*35.0*	Major Overhaul and Control Upgrade																								
HRSG13 Bogue	18	*3.0*	HRSG13 - Bogue Statutory																								
GT13 - Bogue	38	*3.0*	GT13 - Bogue - Hot Gas Path Inspection																								
ST14 - Bogue	38	*10.0*	Mini-overhaul																								
GT9 - Bogue	20	*5.0*	GT9 - Bogue - Hot section Inspection																								
GT7 - Bogue	14	*5.0*	GT7 - Bogue - Hot section Inspection																								
GT 11 - Bogue	20	*5.0*	GT 11 - Bogue - Hot Section Inspection																								
GT 6 - Bogue	14	*5.0*	GT 6 - Bogue - Hot Section Inspection																								
HBPS B6	68.5	*10.0*	HBPS B6 Annual Overhaul									RETIREMENT															
OHPS Unit #3	65	*10.0*	OHPS #3 Unit Annual Overhaul													RETIREMENT											
RF2 - Rockfort	20	*5.0*	RF2 - Rockfort - 6 months inspection																								
RF1 - Rockfort	20	*5.0*	RF1 - Rockfort - 6 months Inspection																								
GT3- Bogue	21.5	*35.0*	GT3- Bogue Major Overhaul																								
GT7 - Bogue	14	*10.0*	GT7 - Bogue - Major Overhaul																								
OHPS Unit #2	60	*10.0*	OHPS #2 Unit Annual Overhaul					RETIREMENT																			
GT3- Bogue	21.5	*3.0*	GT3- Combustion Inspection (Boroscope)																								
GT10 -Hunts Bay	32.5	*3.0*	GT10 - Combustion Inspection (Boroscope)																								
GT5 - Hunts Bay	21.5	*3.0*	GT5 - Combustion Inspection (Boroscope)																								
ST14 - Bogue	38	*35.0*	ST14 - Major Overhaul																								
GT 6 - Bogue	14	*5.0*	Major Overhaul																								
GT9 - Bogue	20	*5.0*	Major Overhaul																								

Table 24: Maintenance Schedule 2019 – 2024

9.2 Objective: Reduce System Losses

The reduction of system losses remains a key priority of JPS, and represents a significant opportunity for the Company to improve efficiency, quality of service and lower the cost of electricity to customers. The Company has made significant investments in the past to contain and reduce the level of exposure to losses. Several strategies and initiatives have been deployed with varying degrees of success. JPS has developed considerable insight through experience as to how to successfully deploy loss reduction projects. It will continue to refine its strategy to ensure that the greatest return is generated from each dollar spent on loss reduction.

JPS has developed a 10 year system losses reduction plan which is intended to outline a sustainable path towards system losses reduction over time. The emphasis of the strategy will be centred on measurements, process evaluation and improvements, analytics driven actions, technical and non-technical initiatives, continued research and development and engagement of key stakeholders. These are outlined below:

9.2.1 Strategy

9.2.1.1 Measurement

To confidently track and monitor the Utility's loss reduction strategy, there is a need to improve the measurement modalities to enhance the accuracy of reporting in analytical value. Several areas of the existing measurement capabilities have been targeted for improvement including timeliness, granularity and accuracy. The plan to improve the measurement capabilities will allow the utility to:

- Accurately determine how much energy is lost, reducing and eliminating, in many cases, the reliance on estimates and "rules of thumb"
- Observe system losses in a more granular manner, dissecting and drilling down into system losses by different sections of the network for example parish, feeder, feeder segment, transformer circuit and individual accounts
- Obtain a near real-time view of the dynamics of the system losses experience and how it changes with time

The comprehensive overhaul of the measurement system integrates the metrics and key performance indicators (KPIs) that track the performance of internal and external processes. This wholesome approach to measurement is the foundation on which all loss mitigation activities will be built.

The main enablement for achieving the desired level of measurement is Smart Meter technology. These electronic meters and the associated networking infrastructure allow two-way communication between the meters and the utility. The utility can remotely monitor and operate the meters. A more detailed look at the Smart Meter technology and its rollout is presented in section on 9.2.3 Smart Meter Programme.

9.2.1.2 Energy Balance and Connectivity Mapping

The energy balance is a foundational technique that transforms metering data into losses calculations. The losses information that the energy balance provides is vital to the loss reduction plan and is featured heavily in the sections below. By measuring the energy at all points entering and exiting any section of the network, the losses on that section can be calculated. This calculation requires that all the points of entry and exit for the desired section be known. This has traditionally been accomplished through mapping exercises to establish how different points of the network are connected.

There are several challenges with conducting physical mapping exercises to maintain a good model of the different points of the network and their interconnections. These exercises involve field teams visiting locations and capturing data about the network. This is slow, costly and the data is prone to obsolescence based on the frequency with which the network changes. The Company plans to scale back the physical mappings and support the connectivity model with several other methods, including:

- **Mapping Process Optimization** - New policies and procedures will be implemented to capture connectivity information when technicians interact with premises and other metering points on the network. These interactions include maintenance, service orders and emergency response activities. The relevant IT systems will be augmented to support the capture, transmission, validation and storage of this information in the GIS where it will be integrated into the network connectivity model. The model will be improved over time with each interaction with the network.
- **Remote Smart Meter Connectivity (Pilot)** - Variations in voltage, outage timing, and events tend to correlate more strongly amongst meters that are a part of the same circuit. Remote connectivity mapping leverages this by comparing data from transformer and customer smart meters. The potential benefits of this includes improved accuracy, more rapid results, and lower requirement for human involvement. This initiative will be piloted in 2019 in the Portmore municipality and expanded into other parishes between 2020 and 2023 consistent with the smart meter rollout schedule in Table 33.

9.2.1.3 Technical Loss Measurement

Technical losses are natural losses occurring mainly due to the power dissipation in the electrical system such as transformers, transmission and distribution lines, and other equipment. These losses can be computed and controlled but not eliminated. As at December 2018 the technical losses computed on JPS network is 7.94% and is broken down as follows:

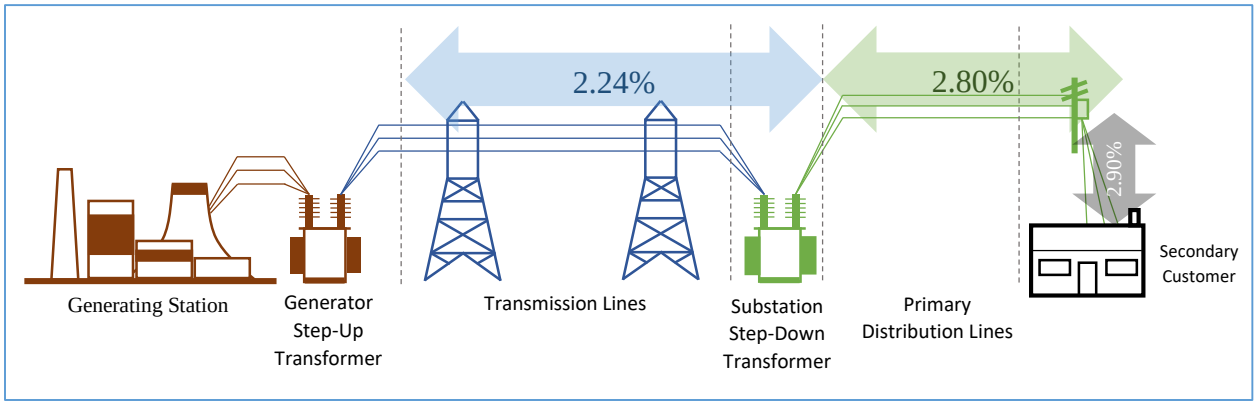


Figure 18: Technical Loss Disaggregation as at December 2018

Component	Energy Loss (%)	Methodology
Transmission Network	2.24%	Measured Energy Loss
Primary Distribution Lines and Pole & Pad-mounted Transformers	2.80%	Computer Simulation
Secondary Distribution Lines	2.90%	Estimation based on analytical model
Total	**7.94%**	

Table 25: Breakdown of Technical Losses in 2018

The losses on the transmission side are directly measured while the other sections of the network are modelled. Both the modelling and measurements are supported by the metering on generating plants and substation feeders. This metering was implemented in the 1990's to early 2000's and as at the end of 2018 there are 27 net generation, 112 feeder and 11 frontier meters, which cover five power stations and 42 substations. JPS has 79 sub-feeder meters installed, which measure the energy exchanged between subsections of feeders. Figure 19 shows where metering points are installed on the network. Meter points are identified by red circles - 1: Net Generation; 2: Revenue; 3: Feeders; 4: Sub-feeder/frontier and 5: Circuit

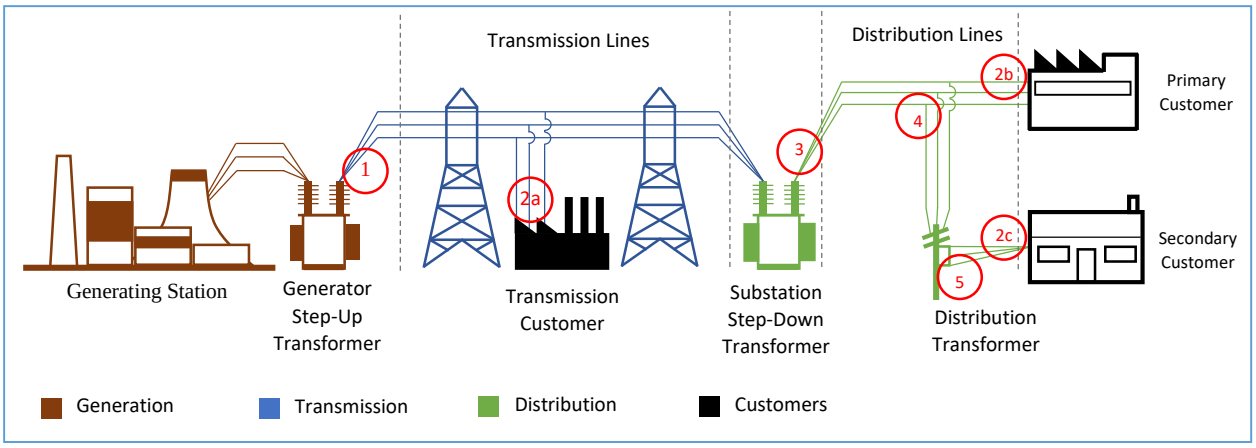


Figure 19: Meter Points

The table below summarizes the Smart Metering plans for the next five years

Network	Metering Point	Metering Description	Quantity	Existing Saturation Level %	Planned Saturation Level %
Transmission	1	Net Generations	18	100	100
	2a	HV Customers	4	100	100
Distribution	3	Feeder	112	100	100
	2b	MV Customers	152	100	100
	4	Sub-Feeder	40	30	100
Secondary	5	Transformer	39,904	5	100
	2c	LV Customer	610,000	10	100

Table 26: Summary of Smart Meter Coverage

Transmission Loss Measurement

The transmission technical energy loss takes into consideration the transmission lines, inter bus substation transformers and distribution substation transformers. In Figure 19, this is the difference in net energy entering point (1) and exiting at points (2a) or (3). This was measured as 2.24% at the end of December 2018. All generating plants, feeders and transmission customers are currently metered as at December 2018 and the transmission losses on the network are completely measured.

Primary Distribution Loss Measurement

The primary distribution lines, also called feeders, start at the low voltage side of the substation transformers (3) and ends either at a primary distribution customer or at a distribution transformer. The energy loss on this section of the network includes the losses on the medium voltage (24 kV, 13.8 kV, 12 kV and 6.9 kV) single and three phase lines as well as the distribution pole and pad-mounted transformers for all feeders island wide. This lost energy is the difference

between the net energy entering point (3) and leaving via points (2b) or (5). These feeders can be sub-divided using sub-feeder or frontier metering (4), however, the placement of these devices is driven by multiple considerations including network management and loss measurement.

All feeders are metered at the substation transformer and all primary distribution customers are metered, however, the distribution transformers metering coverage is just over 15% as at December 2018.

A model was created using a sample of 34 feeders to determine the level of primary line and distribution transformer losses in 2018. The electrical, loading and other parameters of the distribution lines and transformers where imported into DigSILENT PowerFactory and the resulting model was calibrated using available field data. The results of this exercise was used to estimate the overall system primary distribution and distribution transformer losses in 2018.

Several initiatives are planned that will improve the ability of the Companyto measure primary distribution and distribution transformer losses over the next five years. These include:

- **Improved feeder and sub-feeder metering** - Two additional feeder meters are planned for installation in 2019 – 2020 at the Lyssons and Goodyear substations due to the splitting of feeders in 2016. Existing feeder and sub-feeder instrumentation will be transitioned from carrier based GPRS communication to a smart mesh network operated by the utility. The smart transformer and revenue meters also operate on this network and the topology has demonstrated significant reliability improvements. The consolidation of network technology reduces the cost and difficulty of implementation and support of the metering portfolio. Between 2019 and 2020, JPS will transition 154 feeder metering points to the Smart mesh network.

- **Transformer metering** — The Smart Grid initiative includes the metering of the low voltage side of distribution transformers. There are approximately 39,904 distribution transformers on the network and approximately 5,900 of them have metering installed as at December 2018. These meters support both the primary distribution and transformer circuit energy balances. The plan is to install meters on all distribution transformers. Any new transformer points added to the network will be metered.

  Out of the balance of 6,004 transformers, approximately 4,000 transformers are metered via the existing RAMI systems with the remainder expected to be metered under the RAMI Programme over the next five years.

- **Modelling and segmentation (pilot)** - In 2019, JPS will conduct a pilot of all four feeders in Portmore starting with Naggo Head 610. The connectivity of all assets connected to the

primary and secondary network of the feeders will be captured and stored in a connectivity model. Analytical packages will be used to integrate the connectivity model, energy measurements, simulations, as well as other information to estimate the primary distribution losses on the feeder. The results of this pilot will determine if and how this methodology is applied to the other feeders on the network.

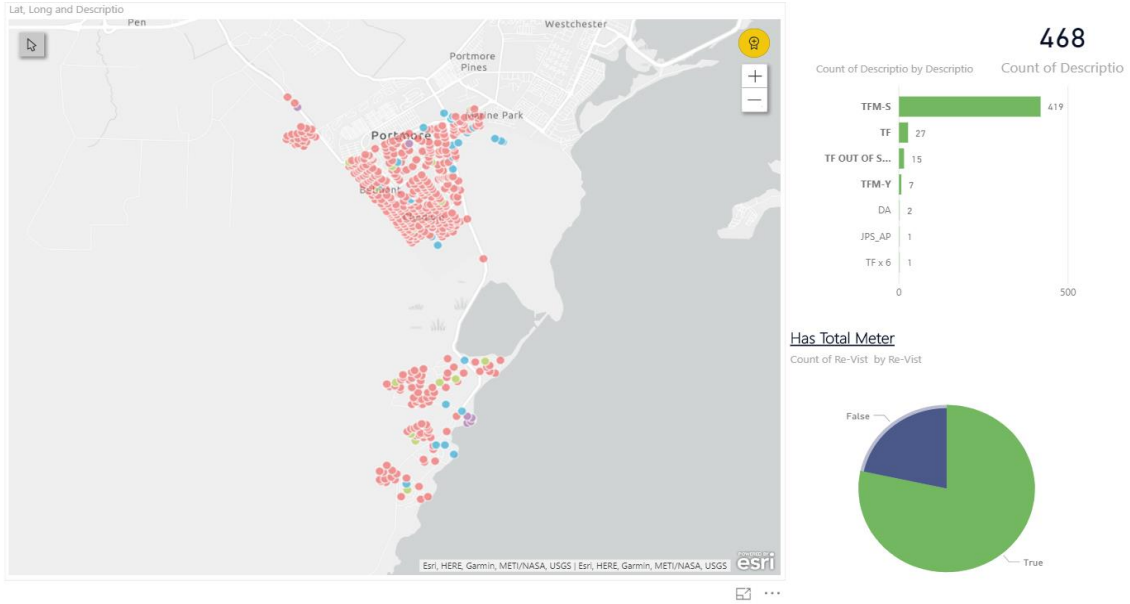


Figure 20: Assets on Naggo Head 610 in modelling software

- **Substation Service Measurement** — All the energy used for the operation of substations will be metered to improve the accuracy of technical loss calculations. This initiative started in 2018 and will continue in 2019. A total of 37 meters were installed and commissioned at 33 substations islandwide. The remaining nine substations below will be completed in Q3 2019.

a. Upper White River
b. Martha Brae
c. Bogue
d. Port Antonio
e. Annotto Bay
f. Highgate
g. Oracabessa
h. Michelton
i. Blackstonedge

Secondary Distribution Losses

The estimation of secondary losses is a challenging task as this section of the network is the most complex and dynamic. The losses here occur between points (5) and (2) in Figure 21. The amount of information and the level of accuracy required to model the technical losses here is cost prohibitive and as a result, there is an absence of up-to-date models for simulations. The loss here is estimated based on rule of thumb and standards governing conductor type, length per circuit, average loading per circuit and the number of secondary distribution circuits. With the advent of smart transformer and revenue metering, the total losses on the secondary network can be directly measured using an energy balance. A combination of sampling and modelling will be used to separate the technical and non-technical losses from this energy balance.

9.2.1.4 Non-Technical Loss Measurement

The primary technique for measuring non-technical loss is the energy balance performed at the transformer circuit level. This requires the measurement of the energy entering the circuit and being delivered to customers as shown in Figure 21. In 2015, JPS made a significant investment in its smart transformer meter program with remote reading capabilities, with approximately 5,900 transformer meters installed as at the end of 2018. The rollout of smart revenue meters began in 2016 and will continue until 2023. The plan is to meter all transformers and customers over the next five years.

The details on this initiative can be seen under the smart meter program Section 9.2.3

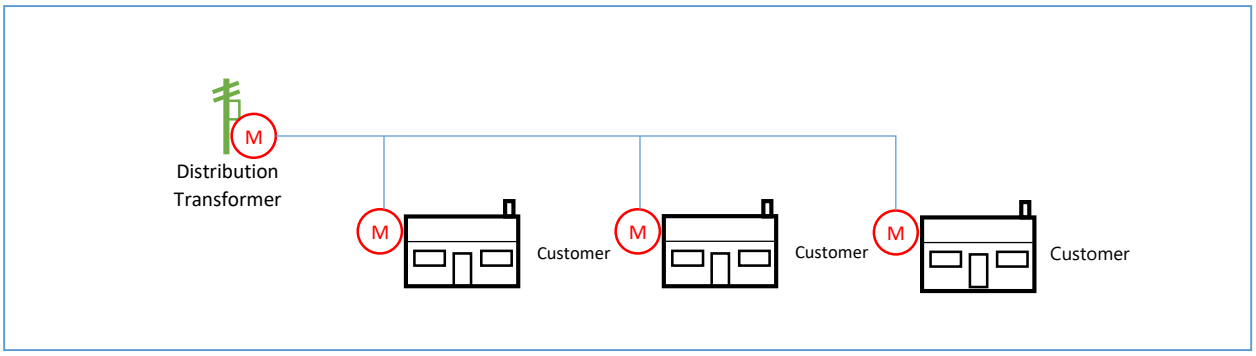


Figure 21: Transformer Circuit and Metering Points

As at the end of 2018, JPS has the capability to determine the distribution losses by feeders, parishes and at various transformer locations:

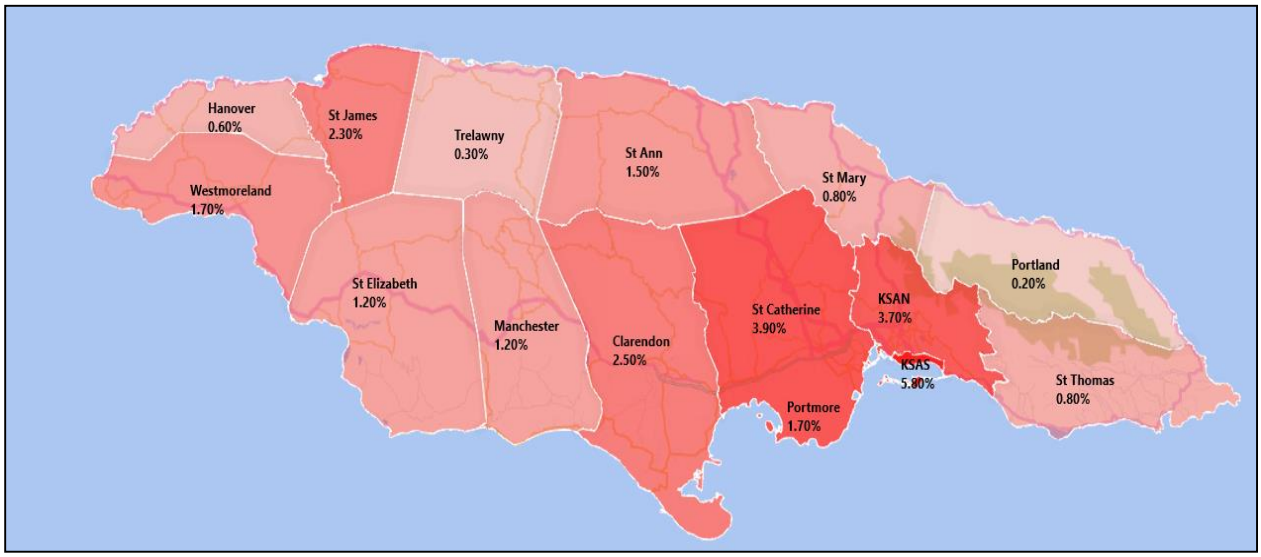


Figure 22: Map of Losses Distribution as at October 2018

Parish	Metering Point	Average Energy Loss Monthly (kWh)
KSAN	Hope 510	3,110,131.07
St. James	Queens Drive 710	2,733,561.47
St. Catherine	Tredegar 410	2,530,184.48
Westmoreland	Paradise 110	2,395,482.32
Portmore	Twickenham 210	2,392,564.71
Clarendon	May Pen 110	2,082,177.08
KSAS	Rockfort 410	2,079,391.45
St. Catherine	Michelton 110	1,977,555.59
Manchester	Kendal 210	1,919,893.13
St. Thomas	Good Year 210	1,846,015.48
KSAN	Constant Spring 410	1,816,009.71
St. Catherine	Rhodens Pen 210	1,726,518.13
KSAS	Wash Blvd 710	1,708,234.46
St. James	Bogue 210	1,708,200.64
Manchester	Spur Tree 210	1,696,732.39
Portmore	Naggo Head 610	1,664,935.62
St. Elizabeth	Maggotty 210	1,664,069.55
St. Catherine	Tredegar 210	1,642,272.12
KSAS	Wash Blvd 310	1,573,223.95
Westmoreland	Paradise 310	1,566,004.05

Table 27: Top 20 High Loss Feeders

The vision for the measurement and energy balance is a model that starts with losses at a high level and can be drilled and sliced down to any sub-section of the network as desired.

9.2.1.5 Analytics and Process Improvement

The Company collects large quantities of data on each of its customers. Information about how they use electricity, their payment history, age, gender and spatial location are examples. It also collects data on, its own operations, initiatives and projects. The volume of data that is generated and processed by the Company is expected to increase dramatically with the proliferation of advanced telemetric technologies. Embedded in this data are the patterns and relationship insights that can help the Company understand how electricity users and the utility interact and behave. These insights can be applied to control and reduce costs, improve operational performance and customer satisfaction, and generally improve the outcomes of loss reduction initiatives.

The Company has already begun working on a plan to implement an analytics platform to extract insights from data. This will be done by combining different sources of data and applying analytical techniques and tools to look for correlations and other meaningful patterns. The platform must be able to effectively manage the growing volume of raw data and transform it into actionable intelligence in a timely manner. The ability to rapidly build, test and deploy analytics is also a desirable requirement in responding to changes and taking advantage of opportunities in timescales that matter to the business. With this in mind, JPS has designed a platform using the three guiding principles of flexibility, timeliness and scalability. The figure below shows the high-level logical design of the analytics platform:

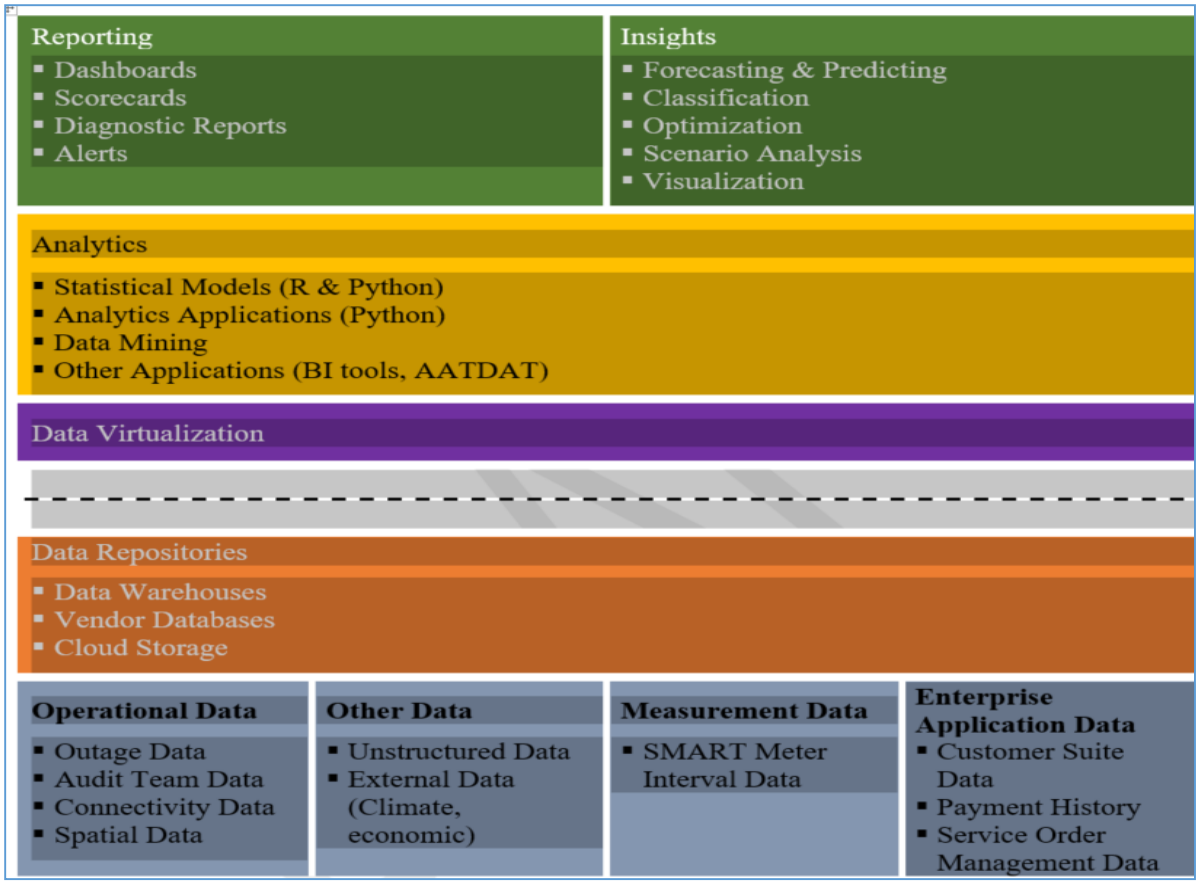


Figure 23: Architecture of Analytics Platform

The analytics layer of the figure above is where the data is explored and models and algorithms are built and run to produce the dashboards, visualizations and reports that will be integrated into the decision making process. Three important environments will be provided in the analytics layer:

- **The Exploration Environment**: Facilitates the application of analytical techniques to investigate patterns, trends, test hypothesis and build models to explain the data. The data is interrogated and a sense of the potential insights is gleaned.
- **An Application Development Environment**: Allows the design and testing of the applications that will package the analytical algorithms and models designed in the exploration environment.
- **The Production Environment**: This is where both first and third party applications that have been deployed to end users operate.

The layers below the dotted line represent the various sources of data and the places in which they are stored. The virtualization layer acts as an intermediary between these layers and the analytics by consolidating and hiding the underlying details of the different sources. This allows

the analytics to perform its function without regard for matters such as where the data is located, what interfaces are used for access, what format it is stored in etc. This provides flexibility for the utility in how it implements the collection and storage of data and improves the maintainability of the production analytics.

While analytics offer many potential benefits to the losses program, there are also benefits to customers in the form of improved service delivery. The outcomes below are samples of those planned for analytics:

Project	Benefit
Energy Balance	The dynamics of losses on different sections of the network will inform loss control initiatives.
Theft/Fraud Detection	There is better utilization of Company resources to control losses, and less disruption to legitimate customers.
Outage Detection	Improved response to outage events, which means less time spent without supply and opportunities for proactive communication with customers.
Customer Segmentation	Tailoring losses initiatives to different types of customers will allow for better losses outcomes. This also applies to the way the Company interacts with and delivers service to its customers.

Table 28: Analytics Outcomes in development

9.2.1.6 Complete System Energy Balance

The ability to measure energy at different segments of the network was a primary factor in the decision to implement advanced measurement technologies. Smart metering is expected to generate over 57 million data points per day for consumption alone once full coverage is achieved. The analytics platform will provide a visual representation showing where, when and how much loss is occurring on the electric grid.

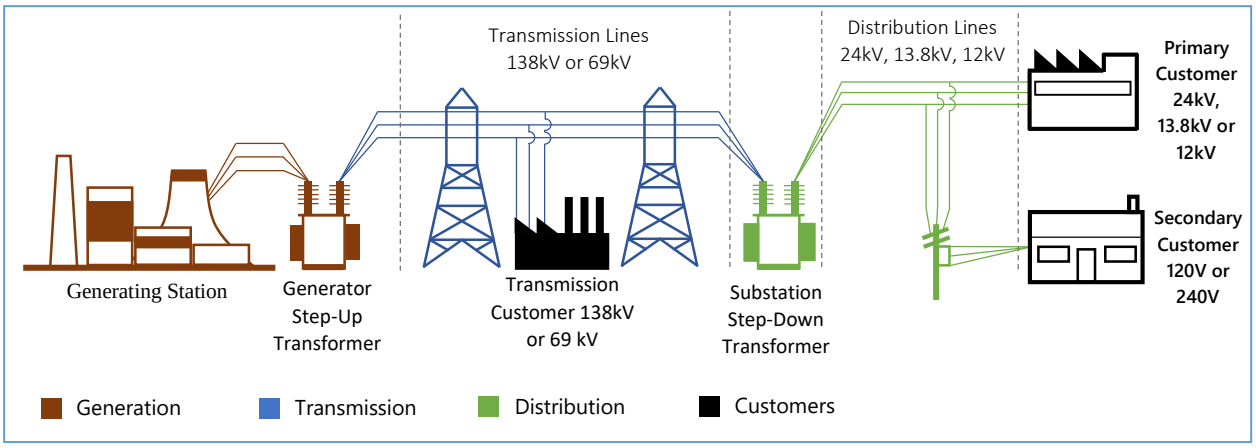
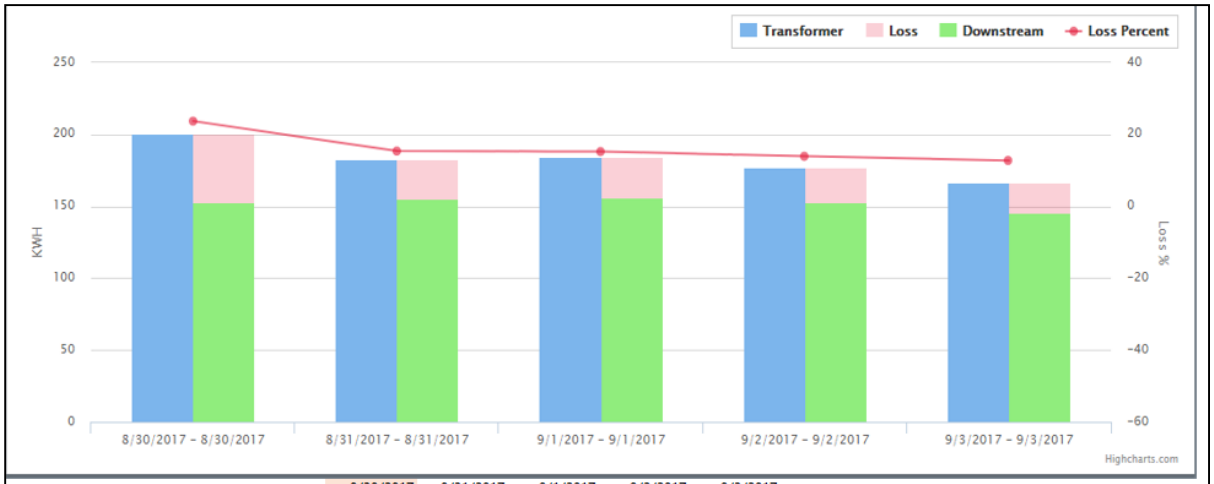


Figure 24: Sections of the Electrical Network that will be measured

The figure below shows the energy balance for a circuit in Montego Bay where the average losses recorded daily was 23.7%. A field team intervened and found a customer who was intermittently inverting the smart meter. The results of the audit were validated when the energy balance showed a loss of 15% and then 12% in the days following the correction of the irregularity. Analytics can correlate the changes in losses with the activities of initiatives to measure their impact. In this regard, the energy balance is the foundation for many of the other more advanced analytics.



	8/30/2017	8/31/2017	9/1/2017	9/2/2017	9/3/2017
Transformer Meter Delivered	201	183	184	178	167
Revenue Meters Delivered	153	155	156	153	145
Loss	48	28	28	25	21
Loss %	23.7%	15.3%	15.2%	13.9%	12.8%

Figure 25: Sample Energy Balance from AATDAT

The ultimate goal of the system energy balance is to integrate energy balances as reflected in this example and at different sections of the network in a seamless way.

Third-Party Advanced Automated Meter Software (AATDAT and MDMS)

The advanced automated theft detection and analytical tool (AATDAT) combines meter interval and event data, spatial and connectivity information about the meters on the network using advanced algorithms to determine the likelihood of loss for individual services. The advanced analytics are packaged into use cases, which capture patterns that are indicative of certain types of loss. New use cases can be created and existing ones can be modified based on feedback from the field teams to improve the effectiveness in identifying irregularities. Examples of the use cases are:

- The Energy Balance use case compares the energy delivered downstream by a transformer with the aggregate energy delivered to each service supplied by the transformer. This is run on every SMART circuit[44] on the grid.
- The Pattern Theft use case looks for interruptions in the power to the meter and compares this with the associated transformer. Discrepancies are indicative of the meter being removed.
- The Disconnected Unreachable use case flags meters that have ceased to communicate after being remotely disconnected. This is indicative of a meter being removed to install a direct connection after the customer has been disconnected.
- The Drop on Event use case looks for changes in the consumption pattern of a meter after some event like the meter losing power.
- The Channel Reverse use case looks for energy registered on the received channel. This may be indicative of inverted meters.

It is anticipated that as these algorithms are refined based on the feedback from investigations the Company will experience an improved strike rate on audits.

A Meter Data Management System (MDMS) will be implemented by the end of 2019. This software will integrate data from a myriad of sources like the GIS, smart meters and customer suite to consolidate much of the interactions with meter data. The headline features of the MDMS include:

- Centralized storage and processing of smart meter reading and event data
- Automated service order generation based on meter events and tamper detection notifications across all AMI smart meters
- Validation, editing and automated estimation of meter readings and transformer loading analysis
- The system will provide meter load data to the Advanced Distribution Management System (ADMS).

[44] A SMART circuit has a SMART metered transformer together with fully SMART metered services

9.2.2 Technical Losses

Overview of Technical Losses

Technical losses on the network occur primarily due to resistive power, also called I^2R losses, during the process of transmitting and distributing power to the load centres. A percentage of the total power generated dissipates in the conductors of the lines and transformers mainly in the form of heat. These losses are unavoidable due to the material properties of the conductors but can be minimized using several different techniques. These techniques usually involve reducing the current necessary to transmit the desired power or optimizing the materials and layout of the network to reduce the impedance between power source and load. Other sources of technical losses include the hysteresis and inductive losses in the transformer.

Technical losses rise exponentially with load and during system peak loads they are at their maximum. Peaking generators may have to be run to help to supply the peak demand, which drastically increases the cost of production of electricity.

Technical Loss Reduction Initiatives

Technical loss reduction is usually capital intensive with increasingly diminishing returns that take longer to realize. Average technical losses is in the range of 6% to 10% on most utility grids, but they increase exponentially as power lines become heavily loaded. Avoiding a small amount of electricity demand in the highest peak hours can reduce line losses by as much as 20%. At such levels of losses, disproportionately more generation resources must operate to deliver the same amount of electricity to end-users.

Initiatives	Five Year Technical Loss Reduction Action Plan
Voltage Standardization	12 feeders will be upgraded to 24 kV. This reduces the current needed to supply a certain amount of power.
Distributed Generation (Hill Run)	Distribution generation plant to be installed in Hill Run, St Catherine.
Transmission Line Upgrade	Bellevue – Roaring River 69 kV transmission line to be installed to improve reliability and reduces technical losses.
Power Factor Correction	Maintain PF of 0.95 or above for all feeders
Phase Balancing	The software of all feeder revenue metres will be upgraded to measure phase imbalances. Phase balancing will be executed where phase imbalance is greater than 10%.

Table 29: Summary of Technical Loss Reduction Initiatives

Voltage Standardization Programme (VSP)

One of the most effective techniques for reducing resistive losses involves increasing the voltage level of the network, which reduces the current demands for a particular power level. Since resistive losses are proportional to the square of the current, a two-fold increase in voltage reduces line losses by four times with all other factors being constant. There are limits to this technique, as special measures are required to manage safety and losses like corona discharge, which begin to dominate at higher voltages.

The VSP is geared towards normalizing all distribution feeders to 24 kV. Feeders that were previously powered at 12 kV and 13.8 kV are now being upgraded to 24 kV. This provides tremendous flexibility for load transfers to neighbouring feeders and the added benefit of technical loss reduction. Customers will enjoy increased reliability provided by the flexibility in operating the network.

The planned increase in the voltages on the feeders will result in the reduction of resistive losses by a factor of 3 to 4. JPS plans to upgrade twelve of the existing 12 kV and 13.8 kV substations to 24 kV, over the next five years. The table below lists the stations along the estimated annual energy loss reduction expected following the upgrade.

Feeder	Average Annual Energy Reduction (MWh)[45]	Year
Oracabessa 110	34.44	2019
Oracabessa 210	640.07	2019
Upper White River 110	102.5	2020
Upper White River 210	30.12	2020
Blackstonedge 110	47.66	2021
Highgate 110	530.73	2021
Highgate 210	57.26	2021
Michelton Halt 110	1,381.36	2022
Michelton Halt 210	732.24	2022
Rhodens Pen 210	463.09	2023
Rhodens Pen 310	499.35	2023
Rhodens Pen 410	575.94	2023
Total	5,094.76	

Table 30: VSP Schedule

Distributed Generation

[45] Based on DigSILENT simulations

Distributed generation refers to the concept of generating electricity in a decentralized manner. Electricity is generated closer to where it will be used. A benefit of this is that electrical energy has to travel over shorter distances to reach loads and incurs less technical losses as a result. As a part of JPS strategic objective to provide more reliable and efficient generating facilities on the distribution grid, JPS plans to install a 5 x 2.5 MVA natural gas fired plant in Hill Run, St. Catherine with co-generation facilities to supply a neighbouring customer. This plant is part of a 14 MW Right of First Refusal Initiative of JPS to replace a portion of the existing generation fleet with distributed generation. The distributed generation plant will be primarily interconnected to the New Twickenham 410 feeder which operates at 24 kV.

The aim of the project is to defer capital investment, provide grid support to the New Twickenham 410 feeder as well as provide steam production for a neighbouring customer. It is the intention of the plant to operate in two (2) modes namely Grid Parallel Mode and Islanding Mode (micro-grid configuration). In both modes the plant will inject real and reactive power to supply the loads on the JPS New Twickenham 410 feeder. The deferral of capital investment will be realized when the plant is operating in grid parallel mode, as the New Twickenham substation transformer is not required to be replaced if the load grows. In the case of a loss of supply from the existing New Twickenham substation, the generators will switch into Islanding Mode and supply as much of the loads on the feeder as possible, thus improving the reliability of the New Twickenham Feeder.

Transmission Line Upgrade

Transmission lines are necessary to transport bulk power to major load centres as well as improving stability and reliability to the power grid. Over the last decade, there has been significant growth in the commercial sector in the North-Western Coast of Jamaica. Undoubtedly, this growth has considerable economic impact for Jamaica and by extension, JPS is benefitting from growth in larger rate 40 and 50 customers. However, the aforementioned growth has created substantial challenges for the power grid, to maintain a reliable power supply to its customers.

There is a chronic low voltage condition below the nominal operating range from Cardiff Hall, Roaring River through Ocho Rios to the Hydro Units generally affecting all the substations in the Parish of St. Ann, whenever the Bellevue - Lower White River 69 kV transmission line trips offline or is experiencing a maintenance outage. Similar conditions occur each time a 69 kV transmission line connecting Bellevue or Duncans Substations trips offline or is experiencing a maintenance outage. This situation affects over 50,000 customers, including large hotels and hospitals, costing JPS millions of dollars in both loss of revenue and damage claims. The System Controller will have to manually shed customer loads at Cardiff Hall, Roaring River, Upper White River and Ocho Rios S/S to alleviate the problem and requires the generators to provide additional voltage support. This is due to the very long radial 69kV line created from the N-1 condition.

Furthermore, the possibility exists for a partial blackout of the power grid, if a either the Bellevue –Lower White River or the Duncan's Rio Bueno transmission line is out of service for planned maintenance and either of these transmission lines trips offline. The system cannot sustain an N-1-1 condition. The transmission lines are not sufficient to transport the bulk power and at the same time maintaining reliability of the power grid.

The construction of the new 69kV Transmission Line between the Bellevue and Roaring River substations will lead to significant improvements in Bus Voltages when either the Bellevue - Lower White River or the Duncan's Rio Bueno 69 kV transmission line trips offline. Besides the improvements to grid reliability and safety, this initiative improves the operating voltage of sections of the grid during adverse conditions. The increased voltage has a technical loss benefit.

Power Factor Correction

JPS will continue to install/repair capacitor banks along feeders with the aim of maintaining all feeders at a Power Factor level 0.95 or higher. The capacitors, which will be placed where they are most needed following an assessment done monthly.

Based on the status of the capacitor network the following will be pursued:

- Conduct a thorough assessment of the status of all capacitor banks in the system
- Identify the load centres especially those contributing to poor power factor on the system
- Develop and utilize the placement and installation of capacitors
- Pursue the continuous measurement and automation of the switched capacitor banks
- Organize work plans for power factor correction on selected feeders based on performance
- Monitor the performance of feeders in relation to power factor
- Centralize the coordination of capacitor placement, installation and maintenance

All feeders will be monitored monthly through the use of the Monthly Distribution Network Report and remedial actions coordinated to reduce the incidence of poor power factor on feeders. Following the correction of the first set of feeders' new discoveries will be targeted

Phase Balancing

The Company transmits and distributes electricity using a three-phase system. Customers that only need a single phase simply receive supply from one of the three phases. If the loading and phase of all three lines are not equal and at exactly 120° of phase difference then the power loss is greater than for a perfectly balanced system. The unbalanced network is a consequence of an unequal load distribution on each phase. In addition, it can be a consequence of an unbalanced supply from the source, as well as asymmetrical electrical parameters of the components. The unbalanced load produces additional losses in transformer windings and core. Furthermore, an

unbalanced power system causes current to flow in the neutral conductor, resulting in increased losses on the network.

The software for feeder meters is being upgraded to measure the level of imbalance on each feeder. The objective is to balance the phase so that the maximum deviation of the average phase current is less than 10%. Phase balancing is an ongoing O&M activity that requires focus. The situation requires constant monitoring and adjustment as loads on the network change. Phase balancing activities will be managed centrally and coordinated with the parish operations on the specified feeders to effect correction, as will Power Factor Correction.

9.2.3 Non-Technical Losses

Overview of Non-Technical Losses

Non-technical system losses ("non-technical losses" or "NTL") are caused by actions external to the power system and they consist primarily of electricity theft and fraud. This type of loss correlates very strongly with socioeconomic conditions, and literature suggests that the same factors that cause deteriorating socioeconomic conditions also affect system losses. These factors include the cost of energy, dysfunctional law enforcement, political corruption and a culture desensitized to certain crimes. As is typical for countries with similar socio-economic backgrounds, non-technical loss is a significant feature of the energy sector in Jamaica at 18.33% of Net Generation in 2018. An estimated 90% of this is due to theft or fraud. An estimated 23% of the households in Jamaica enjoy a supply of electricity but have no contract with the utility (illegal abstraction).

Oftentimes the abstraction involves bypassing or tampering with the meter or operating illegal connections. However, there are other less severe forms of non-technical loss like defects in metering infrastructure or meter reading errors. All non-technical loss can be eliminated in theory, however, there is a point where the cost to do so begins to outweigh the benefits. The cost to generate, transmit and distribute this "lost" energy is jointly borne by paying customers and the Company. The direct cost of non-technical losses is estimated at US$177M in 2018. This does not include any of the secondary cost-effects of theft, like the impact on service delivery.

The factors that influence persons to commit theft or fraud include the rising cost of energy; the accessibility of paraphernalia and expertise to support theft or fraud; the social acceptance and encouragement of abstraction; the low probability of being caught and punished; and the low cost of punishment [46]. For many users, the proliferation of these factors has made abstraction of electricity a more attractive option compared with legitimate supply. Non-technical system losses

[46] World Bank Group Energy Sector Strategy – "Reducing Technical and Non-Technical Losses in the Power Sector, July 2009; KEMA Study on Technical Non-technical Losses in The JPS Power System and on Regulatory Treatment of System Losses, 2013; USAID Workshop on best practices for loss reduction, July 2015

has been a major challenge for the Company, which has limited control over many of the socio-economic factors mentioned.

The Company has undertaken a myriad of initiatives in the past to help control losses with small but encouraging results. Many of these initiatives focused on containing the symptoms, but sustainable loss reduction requires that the causes be addressed. This also requires sustained and coordinated mobilization of key stakeholders like the Government to address some of the underlying factors. Increased focus is being placed on engaging and coordinating with the Government and other stakeholders, like the private sector, to create a more holistic loss reduction strategy. This strategy applies the well-established economic principle of comparative advantage in determining the roles of each stakeholder. With each stakeholder addressing challenges for which it has a comparative advantage, the national cost of reducing electricity theft can be minimized.

Notwithstanding the harsh economic and operating environment, JPS has managed to achieve system loss reduction for three consecutive years (2016-2018). Over those three years, system losses has reduced by 0.73 percentage points. Although relatively small, this is a fundamental shift from the upward trend of system losses experienced in prior years.

Much of this success is the early result from laying the foundation for the loss reduction strategy over the past five years, and applying the lessons learned from previous experiences. The greater emphasis on measurement, automation and analytics is already yielding benefits in how efficiently the Company's resources are being deployed and several key performance indicators have already responded.

JPS will be relying heavily on improving its measurement capability as the foundation for the loss reduction strategy over the next five years. The rationale for this focus is the need for objective, accurate and timely data regarding the state of system losses as a basis for executing reduction initiatives. This data serves as the input to the analytics machinery, which will inform when, where and how the loss reduction initiatives are deployed. The measurement will capture how the system responds to the initiatives, closing the loop, enabling the Company to respond dynamically to new and unique challenges.

Non-technical Loss Reduction Initiatives

Smart Meter Programme

The Smart Meter programme is a part of a greater business strategy that is critical to delivering value to customers across numerous areas of the business. The installation of smart meters in combination with analytics will improve the Company's ability to identify energy losses at all levels of the network, right down to the individual customer. It will also provide greater efficiency and flexibility for billing operations and improve service delivery to customers. Customers will immediately benefit from fewer estimated bills, fewer adjustments due to incorrect readings and

more timely reconnections. Several other value-add benefits are being explored over the long term like access to load profile data to help customers manage how they consume electricity. In essence, the Smart Meter programme provides significant benefits to many areas of the business including system loss reduction.

As described in previous sections, the most critical benefit of the Smart meter programme to loss reduction is accuracy in measurement. Systematic loss reduction requires, firstly, identifying where losses occur on the network and disaggregating those losses using other technology enablement to hold perpetrators accountable. Adding geospatial and demographic dimensions to losses measurement will facilitate more appropriate and targeted initiatives. This also helps in prioritizing and determining the prudent levels of investment for each target area.

The Smart Meter deployment strategy over the next five years involves a comprehensive tiered metering solution for different points on the network as follows:

- Smart Meter Residential
- Smart Meter Residential (Pre-paid/Antitheft)
- Smart Transformer Meter
- Smart Check Meter
- Smart Frontier and Substation Meter
- AMI Meter Rehabilitation

The implementation schedule was designed around completing parishes on a feeder-by-feeder basis so that the full benefits of a complete implementation can be enjoyed. The methodology for prioritizing areas of the network generally considers the level of losses, the presence of large commercial and industrial customers and the demographics of non-customers. Both the method for ordering the rollout and the schedule itself are discussed in the section below. Where feasible, the existing AMI system will be rehabilitated and integrated into the system of measurement.

With the increased coverage of smart meters, particularly of customers and transformers, several benefits discussed throughout this document can be realized. The premier benefit is the energy balance, which can be computed for both technical and non-technical losses with a resolution of 15 minutes at all levels of the network. This information improves the effectiveness of the loss reduction strategy by supporting the analytics platform, which can pinpoint irregularities amongst customers. This will guide the audits and investigations. It is described in more details below.

Check Meter Programme

The Smart Check Meter project is specifically designed for large commercial customers. This programme will see the implementation of secondary meters for each of the large customers to continuously measure and verify energy delivered to such customers, by the end of 2019. Where

technically and economically feasible, all large commercial customers will be a one to one mapping between revenue and check meter. This allows the direct measurement of non-technical loss for each customer. Any unacceptable deviation in this loss will trigger a real time alert, which will enable the rapid response by the field teams to potential loss events.

This customer group contributes more revenue than any other category and is particularly sensitive to loss events because of the disproportionately high level of consumption. Dedicated monitoring and analysis is required to reduce non-technical losses as close to nil as possible.

Residential Anti-Theft Smart Meter with Prepaid

There are geographical areas where regular ANSI type smart meters in combination with meter investigations will be insufficient to reduce electricity theft. This is because meter investigations and corrections are difficult to perform in these areas due to violent and unsafe conditions. Approximately 13% of the utility's revenue is lost in these areas. Anti-theft Smart Meters restrict unauthorized access to the metering infrastructure to make theft much more difficult. These meters still have all of the measurement benefits of regular Smart Meters and are a part of the complete island wide rollout. The meters also have a prepaid solution to help customers manage their consumption.

The plan for these areas combines the anti-theft technical solution with social intervention activities that engage the communities and encourage customer on-boarding, customer retention and positive changes in attitudes towards bill payment.

The selection and prioritization criteria for these geographical areas include the presence of high losses and the degree to which regular auditing and correction operations can be performed. The project involves 61 communities over the next five years and 100 by the 10^{th} year. The areas closely align with the 100 at risk communities identified by the Planning Institute of Jamaica (PIOJ). Approximately 20,801 meters have been targeted for installation in the first five years. The data collected from each installation will help validate and support the area selection for the subsequent year.

The activities of the Strike Force Operations (Strike Force) and the Community Renewal team (CRT) will be coordinated with the deployment of these meters. Strike force will be used to sterilize the areas prior to or during installation and provide security, while the CRT will cultivate community relations, educate on good energy usage and ensure a smooth transition once the installation is complete. Strike Force will also be engaged from time-to-time to maintain customer compliance and prevent deterioration or regression in losses. The activities of Strike Force are covered in the section below.

The budgeted costs and schedule for meter installation is summarized below.

Year	2019	2020	2021	2022	2023	Total
Qty	5,826	3,750	5,000	3,725	2,500	20,801
Budget (US$ '000)	$4,200	$3,074	$4,874	$3,055	$2,055	$17,258

Table 31: Budget Summary of Residential Anti-Theft Smart Meter Programme

Some salient points and activities of the plan are:

- The targeting of 61 communities in the first five years and 100 by the 10th year aligns with the at-risk communities identified by the PIOJ.
- Approximately 20,801 Anti-theft meters will be installed in the first five years.
- Measurement data collected by mid-year will help to validate and support project selection for the subsequent year.
- Strike force will continue to maintain their presence within the communities to reduce incidence of theft and promote regularization.
- Stakeholder and community engagement will sensitize the community to the project and its objectives as well as facilitate customer on-boarding activities.
- Pole line infrastructure construction followed by anti-theft smart meter installation and ongoing community engagement.
- Sustained community engagement in Parish Operations
- Preparation of project completion certificates and documents, project operationalized to parish office

Planned Capital Expenditure for the Smart Metering Programme

The planned capital expenditure for the smart metering programme, for 2019 to 2023 is outlined in the Table below.

Project Name	Five Year Capital Budget (US$'000)					
	2019	2020	2021	2022	2023	Total
Smart Meter Programme	21,700	17,970	20,142	17,273	8,193	**85,278**
Rami Projects	4,200	3,074	4,874	3,055	2,055	**17,258**
Check Meters	1,200	0	0	0	0	**1,200**
Metering Infrastructure Replacements	9	204	204	204	204	**825**
Analytical Software Procurement and Development	0	307	0	0	0	**307**

Total	**29,128**	**23,575**	**27,241**	**22,554**	**12,475**	**104,868**

Table 32 outlines the capital expenditure for the full suite of the AMI deployment for the next five years.

Project Name	Five Year Capital Budget (US$'000)					
	2019	**2020**	**2021**	**2022**	**2023**	**Total**
Smart Meter Programme	21,700	17,970	20,142	17,273	8,193	**85,278**
Rami Projects	4,200	3,074	4,874	3,055	2,055	**17,258**
Check Meters	1,200	0	0	0	0	**1,200**
Metering Infrastructure Replacements	9	204	204	204	204	**825**
Analytical Software Procurement and Development	0	307	0	0	0	**307**
Total	**29,128**	**23,575**	**27,241**	**22,554**	**12,475**	**104,868**

Table 32: Planned budget for Smart Meter Programme

Smart Meter Deployment Schedule

The rollout is executed on an administrative parish basis ensuring that a parish is completely saturated with Smart meters before moving onto other areas. This approach delivers the maximum value since meter reading and many other activities that depend on metering are coordinated at the parish level. Completely transitioning to Smart Metering avoids multiple technologies and the associated processes, policies and logistical challenges. The planned locations for 2019 – 2023 are shown below.

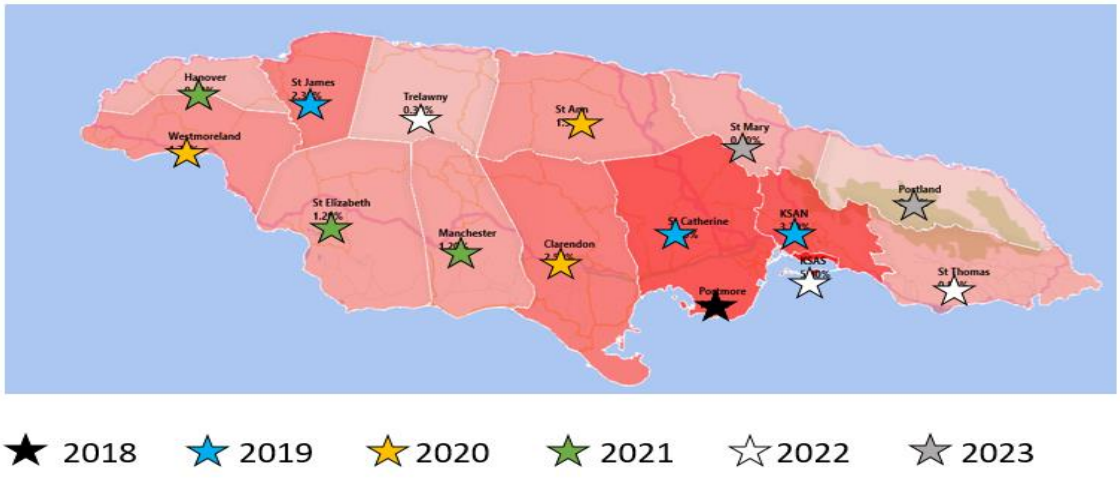


Figure 26: Smart Meter Rollout Schedule

The schedule for the parishes was prioritized based on the level of losses, the penetration of commercial and industrial customers, the demographics of the customers and the meter density for network coverage. Note that the darker colours in the figure represents higher losses areas.

The schedules delineated in Table 33 assume that the project begins once the Project Management Plan is formally approved by the project's sponsors and key stakeholders, and is completed once a formal project closure and acceptance by said stakeholders.

Project Description	2019	2020	2021	2022	2023
Smart Meter Residential	Jan-Oct	Jan-Oct	Jan-Oct	Jan-Oct	Jan-Oct
Smart Meter Residential (Prepaid/Antitheft)	Jan-Nov	Jan-Oct	Jan-Oct	Jan-Sep	Jan-Sep
Smart Transformer Meter	Jan-Aug	Jan-Aug	Jan-Aug	Jan-Aug	Jan-Aug
Smart Check Meter	Jan-Nov				
Smart Frontier and S/S Meter	Jan-Aug				
Smart Meter Rehabilitation	Jan-Nov	Jan-Oct	Jan-Oct	Jan-Sep	Jan-Sep

Table 33: Five Year Programme Roll out Schedule

Loss Reduction Benefits of Smart Meter Programme

The primary objective of the smart meter and check meter programme is to provide accurate and real time loss measurement to aid in the efforts of loss reduction. This is a critical and fundamental first step in tackling losses. It is important to understand that the installation of the smart meters themselves will not reduce losses. The integration of the telemetry they provide with other efforts will increase the capacity of the utility to reduce losses. The primary initiatives being implemented are audits and investigations (described in section below).

	2019	2020	2021	2022	2023
Smart Meter	0.14%	0.23%	0.32%	0.38%	0.43%
Smart Meter (Anti-theft)	0.10%	0.10%	0.10%	0.08%	0.07%
Check Meter	0.10%	0.05%	-	-	-
Total Reduction	0.34%	0.38%	0.42%	0.46%	0.50%

Table 34: Loss Reduction Projected Benefits

Audits and Investigations

Audits and investigations are important tools for validating and correcting cases of losses. The primary goal of an audit is to determine whether there is a loss, the amount of energy lost if any and to correct any irregularity that caused or can cause a loss. Audits also provide valuable information about the nature of any irregularity, the premise and its occupants. This information

is invaluable in supporting the analytics, which can use this information to predict future occurrences of losses. Audits will increasingly rely on the outputs of the measurement and analytics elements, as these areas become more developed.

Several aspects of the audit process itself have been targeted for improvement:

- **Aligning procedures with the new technology**
  The new metering technology being used by the utility demands a change in how technicians conduct audits. The way technicians interface with, measure and detect losses is different with Smart meters. New policies are being designed to align the procedures surrounding audits with the new metering paradigm.

- **Data Collection**
  To increase the effectiveness of the analytics, certain data will be collected during audits. Data such as the transformer connectivity of the meter, the presence of alternative energy sources, the types of appliances present and information about the size of the premise can be used to validate assumptions and improve how loss detection is modelled.
- **Flexible audit hours**
  Audits will be conducted at the time of day and of the week most likely to yield a result. Analytics is important as it will help inform the teams of the best time to perform an audit. Many residential customers have similar working hours to the Company and this has interfered with detecting irregularities. Additionally, the public is aware of the Company's operating hours and persons tend to abstract electricity outside of this period.

- **More aggressive follow-up**

  Several forms of media will be employed to help with follow-up including automated text messages, emails and phone calls. The follow-up process will be more strictly monitored to ensure that the utility does its best to promote compliance amongst its customers and a system to prioritize follow-up will be designed. There will also be lower tolerance with non-compliant and repeat offenders, with increased integration with the police force.

- **Operational Analytics**
  Operational metrics of the audit teams will be monitored and analysed to identify opportunities for improvement. The goal is to optimize the operational performance of the teams by providing tools and to help motivate teams by rewarding efficiency and performance.

- **Large Account Priority**
  The priority placed on the large accounts will continue with all Rates 40, 50, 70 and medium 20 customers being audited at least once annually. All Rates 50, 70, and some Rate 40 customers will have check meters installed and benefit from rapid response

investigations. This means that once there is any meaningful variance between the revenue and check meters, dedicated large-account audit teams will respond.

Below is a breakdown of the number of audits expected to be conducted over the next five years.

Description	2019	2020	2021	2022	2023
R10 Audits	74,298	74,298	78,013	81,914	86,009
Small R20 Audit	11,005	11,005	11,555	12,133	12,740
Medium R20 Audits	8,632	8,632	8,632	8632	8632
Rate 40 Audits	1,722	1,722	1,722	1,722	1,722
Rate 50 Audits	126	126	126	126	126
Rate 70 Audits	23	23	23	23	23
Total	95,806	95,806	100,071	104,550	109,252

Table 35: Proposed Number of Audit to be Conducted

The table above is projected based on the following expectations by 2020:

- The number of field teams will increase from 30 to 40
- The strike rate will improve from 14% to at least 25%
- The number of Customer Relations Representatives (CRRs) providing back office support will increase from 6 to 10
- The proportion of audits driven be Smart meter analytics will increase

9.2.4 Community Renewal Programme (CRP)

It is estimated that about 53% of non-technical losses is attributed to illegal users. Based on the 2011 census data it was determined that there are approximately 180,000 illegal users. The CRP has taken on a different approach for the delivery of sustainable energy services to volatile and vulnerable communities. This approach requires increased presence, coordination and harmonization to create the mind-set needed to boost cultural change towards becoming regularized and paying customers.

The main objectives of the programme are to:

- Improve customer relationships by operating within their comfort zone
- Reduce losses by building stronger communities through social intervention
- Increase JPS' customer base through regularization initiatives

JPS' CRP targets high-loss communities in the parishes of Kingston, St. Andrew, St. Catherine, Clarendon and St. James based on the results of losses assessment conducted. JPS will target communities in the top 100 most vulnerable communities as determined by the Planning Institute of Jamaica (PIOJ).

Results have shown that billed energy has improved significantly in most communities due in part to the innovative use of prepaid metering to help customers manage their consumption and retain legitimate supply.

9.2.4.1 The CRP Experience

- Great benefits have been derived from joint social intervention activities such as community engagement meetings, door to door walk throughs, energy management sessions and, sponsorship of community activities (sports, fairs, audits, back to school activities and senior citizens treats).
- Strike Force Operations have been conducted along with stakeholder engagement to promote sustainability.
- The use of prepaid metering has been promoted to assist in energy management and affordability.
- There has been an increase in bill payment and purchase of prepaid credit after one to two years of joint interventions. Infrastructure construction was completed 2016 to 2017 for most projects.

9.2.4.2 Strategies

The following are the strategies that will be undertaken:

- Implement pole line infrastructure using the anti-theft solution
- Implement community engagement and social intervention activities with internal and external partnerships to improve bill payment culture and energy management
- Forge partnerships to provide assistance to consumers
- Promote a special rate for community renewal

9.2.4.3 Initiatives

- **Stakeholder Engagement**: Engagement of Community Leaders for discussion of project implementation including government representatives, MPs, Councillors, Community Development Commission (CDC) and external partners (completed within the (Qtr. 1).
- **Pole Line Construction and Customer Connections**:
  - Implement Hexing solution to facilitate Prepaid metering
  - Transfer of existing customers to new infrastructure
  - Connection of new customers
  - Removal of existing secondary and illegal connections
- **Audits and Investigations:** Improve energy management practices and address customer service concerns.
- **Community Engagements**: These include community meetings, walk throughs, and sponsorship events. Utilizing community facilitators- that is engaging members of communities for facilitation between customer and JPS

- **Customer/ Resident Survey- Pre and Post Survey on the Status of the Community:** The survey will seek to capture impact of the interventions and change in the bill payment culture
- **Community Renewal Rate Campaign:** Promote through a Call to Action with JSIF and other agencies, in 30 Integrated Community Development Project (ICDP) communities and Partnership with PATH
- **Energy Management**
    - Light Bulb Swap – All customers will get two to four LED bulbs replacement on connection/ transfer to the new AMI infrastructure.
    - Race to Save Energy Management Competition between members of communities
- **House Wiring:** through partnership with external agencies e.g. JSIF in shared project areas
    - Sustainability to promote customer retention
    - Community Engagement - Parish Operation will sustain intervention programmes, by way of continuance of community meetings.
    - Strike Force Operations - Based on ongoing assessment of communities and active operations on a monthly basis to deter illegal abstractions (Within one month after transfer of customer to Hexing Infrastructure)
    - Stakeholder Engagement
    - Engaging potential partners to assist with sustainable social intervention initiatives implemented.
- **Customer Onboarding:** Complete the connections which began in Red Pond, Granville, Rose Town and Canaan Heights.
    - Preliminary work for four new project areas — specifically data gathering and total meter installation
    - Programme sensitization for the new areas
    - Construction for four project areas
    - GOJ assisted house wiring for project area
    - Customer onboarding will continue in existing areas.
    - Completion of connections and transfers customers

JPS partners with OUR and GOJ to address non-technical losses

JPS will partner with the Office of Utilities Regulation and the Government to implement sustainable losses initiatives to reduce non-technical losses outside of JPS' control.

The non-technical loss reduction Stakeholder Working Group ("the Working Group") was established to assist the GOJ address the unsustainably high level of non-technical system losses by identifying, developing and supporting the implementation and monitoring of effective

mechanisms and initiatives to reduce electricity theft. In this regard, the Working Group is charged with examining, technical, economic, social, enforcement and legal issues that may be contributing to electricity theft and provide recommendations on practical policy interventions and programmes to reduce losses. In so doing, the Working Group will give expression to the GOJ's commitment to its role and responsibility of aiding the fight against non-technical losses as agreed and expressed in the Electricity Licence, 2016.

The Key Stakeholders

The stakeholder working group includes leadership members from the following key institutions.

- Jamaica Social Investment Fund (JSIF)
- Jamaica Public Service Company Limited (JPS)
- Office of Utilities Regulation (OUR)

Such an initiative, however, must be informed by robust data analyses and the results suitably designed into pilots as a precursor to a national wide programme. The Community Renewal Programme will focus on the projects agreed by the partnership.

Description of Communities Selected for Pilot Projects

The communities for pilot intervention were identified by the Working Group as suitable candidates for non-technical loss reduction initiatives and customer regularization based on the following agreed selection criteria between JPS, JSIF and the OUR representatives, and are in keeping with the mandate of the Working Group.

Selection Criteria

The selection criteria considered included the following requirements;

- High energy loss - specifically high non-technical loss (energy theft) - Over 50% losses
- Red Zones
    - High crime rate
    - JPS having difficulty in reading meters and collecting for bills
- Police presence in the community (preferable through ZOSO)
- Community Leaders coordination and willingness to accommodate intervention
- Existing Partnerships working in the community e.g. JSIF, Citizens Security and Justice Programme (CSJP), Social Development Commission (SDC), Planning Institute of Jamaica (PIOJ)
- Readiness index for intervention (PIOJ)

In addition to the above-mentioned criteria the following considerations were also taken into account:

- Easy or minimal addition of pole line infrastructure
- Access to basic amenities such as light, water, sewage
- The regularization must be sustainable and make business sense to the utility.

There are three project areas being proposed for consideration that should see JPS on-boarding at least 400 customers per community during 2019 and 2020. Over the remaining five years, projects will be chosen in partnership with the Government based on the selection criteria.

Project Handover

- Project Handover to Parish Operations within one year of commencement for example, 2019 projects hand over in 2020, and 2020 projects in 2021
- Strike Force Operations
    - Based on assessment of illegal activities continuing in completed community
    - Community Renewal will do the first request and the Parishes will follow up thereafter
- Community Engagement
- Parish Operation to continue with community engagements and community meetings at least quarterly or as needed.

Key Planning assumptions

- 30% of the targeted illegal users engaged are converted to legal customers.
- House wiring assistance will be made available through external partners or allowance through the system benefit fund.
- 50% of customers will pay bills consistently within the year.
- Social intervention programmes and community engagement should result in positive behaviour change and how the JPS Brand is perceived in vulnerable communities.
- Deliverables outlined in agreements with supporting partners will be upheld.
- The prepaid billing option is a catalyst for transitioning consumers to customers.

9.2.5 Strike Force Operations

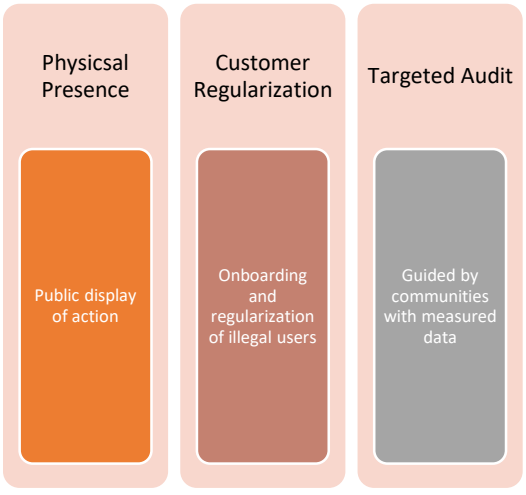
The Strike Force is the name given to the special task force of technicians and support staff that facilitate the Company's operations in difficult communities often referred to as red zones. These red zones are characterized by high levels of non-technical loss, high numbers of illegal users, restricted operations by the Company, high unemployment, and high levels of violent crimes.

Over 50% of non-technical loss is attributed to the estimated 180,000[47] persons illegally abstracting electricity. The most frequent medium for this abstraction is an illegal connection made between the secondary distribution lines and the premise commonly referred to as a "throw-up."

The loss reduction strategy for red zones involves addressing several of the underlying issues in a holistic way as experience has shown that a piecemeal approach to these high-loss areas return sub-optimal results. The strategy involves:

- Designing products that can help to address the unique circumstances of potential customers
- Facilitating social intervention and other activities aimed at empowering and reforming the communities
- Restricting the opportunity for abstracting electricity
- Increasing law enforcement engagement

The Strike Force coordinates and collaborates with law enforcement to support all these goals by removing illegal connections, facilitating the prosecution of persons abstracting electricity, on-boarding customers where the opportunity presents itself, and maintaining a presence in select red zones. The Strike Force also provides support, in the form of security and audit capacity, to other units of the business that need to operate in areas where there is a heightened risk of physical harm, damage to property and threats to life. The operational strategy for 2019 – 2023 is centred on three themes: targeted operations, customer regularization and maintaining a physical presence.



Targeted Audits and Physical Presence

The audits conducted by the Strike Force will make increasing use of measurement and analytics as these elements become more developed. The team will prioritize high loss feeders, using measurement and analytics to help pinpoint the ideal areas to operate. The ability to see how losses respond to Strike Force activity will also play a role in managing the operational aspect of the teams.

The Strike Force has also adopted the approach of repeated operations in certain communities. Maintaining a physical presence is expected to improve the outcomes of Strike Force and other initiatives.

[47] The 2011 National Census recorded over 800,000 households with access to electricity. The number of illegal users was estimated by comparing this to the number of active premises.

Customer Regularization

The Strike Force team in conjunction with the CRT has already begun actively on-boarding customers and these efforts will increase. The team offers energy conservation and counselling to customers post-conversion. Additionally, the plan is to have the teams actively promote products that are targeted at former users.

Key Initiatives	2019	2020	2021	2022	2023
Customer Conversion	500	500	500	500	500
Throw up Removal	200,000	200,000	200,000	200,000	200,000
#Arrests	300	300	300	300	300

Table 36: Strike Force Operations Targets

9.2.5.1 Regulatory and Legislative Support

Considerable research has been devoted to examining the issue of non-technical loss, especially in developing countries where the losses tend to be higher. Research has shown that many of the factors that affect system losses in developing countries like Jamaica are social, political and economic in nature. Strong partnership and coordination between the Government and the utility is a common feature in countries that have successfully reduced non-technical system losses (NTL) over the long-term[48]. Successful plans often involve increased monitoring capabilities by the utility and extensive reform of Government institutions. The Electricity License, 2016 (the Licence) recognizes that there are elements of NTL that are impossible to address without the active partnership of the Government.

In 2015 the GOJ and JPS entered into negotiations for amendments to the operating Licence. A major concern behind the negotiations was the effect of the ongoing high penalties from system losses on JPS' financial performance and the singular responsibility placed on JPS to address this primarily socio-economic problem. The breakout of non-technical losses into JNTL (NTL considered within JPS' control) and GNTL (NTL not fully within JPS' control) acknowledged for the first time within the legal and regulatory framework a shared responsibility for addressing non-technical losses between JPS and the GOJ.

It is important to note however that the GOJ's assistance is also required in addressing non-technical losses which had been considered to be within JPS' control by the OUR in the previous filings. As previously mentioned, the initiatives pursued by JPS would have had a sustainable impact on system losses reduction, only subject to strong engagement of all the stakeholders, the most significant being the GOJ.

Office of Utility Regulation

[48] Antmann, P. (2009, July). Reducing Technical and Non-Technical Losses in the Power Sector. Retrieved from World Bank, Washington DC: https://openknowledge.worldbank.org/handle/10986/20786

The OUR is a critical stakeholder, as the Regulator determines the losses target while ensuring that rates are fair to JPS' customers. JPS requests that the OUR play a key role in reviewing and shaping the Company's loss reduction plans, approving its loss-reduction activities and providing positive incentives for loss reduction. Regular engagement of the OUR is desired to ensure alignment of targets that are achievable. This should be maintained through the Losses Interface Committee (LIC).

Community Leadership

To reduce losses in a sustainable way, culture change is required. This can be accomplished through the leadership and support of elected community and constituency leaders. Losses projects will be executed in phases and at each phase community leaders and MPs will be engaged to ensure buy-in on the project. Community Leaders and MPs have already been engaged in the Community Renewal projects and the losses special projects. This level of engagement will continue throughout the proposed plan.

Government of Jamaica Support

To enable effective and sustainable non-technical losses reduction, clear roles must be identified for the GOJ and initiatives with targets established to which the GOJ commits. This is challenging process, and must take account of the complexities and speed of decision-making by the state. It is especially difficult to achieve commitment when it requires new allocation of resources. Nevertheless, some progress has been made over the last five years as JPS has intensified its consultations with the GOJ The Electricity Act, 2015 significantly increased the criminal fines for those convicted of electricity theft. The Licence also explicitly acknowledges a role for the GOJ with an impact on performance assessment.

In 2018, a Terms of Reference (TOR) was developed for the GOJ's role in the loss reduction plan. The discussion around each support role is provided below.

Policy & Legislative Deterrence

International experience has shown that jurisdictions that exhibit an entrenched culture of electricity theft most often begin the slow process of change with strong policies and laws to curb the practice. Radical legislation with exemplary sanctions signals a government's break with tolerance of a practice that is often viewed as a cultural norm. The Electricity Act, 2015 increased maximum fines to J$5M for illegal abstraction and amended the language of related legislation.

JPS has had consultations with the National Council on Justice (NCJ), a cross-functional body chaired by the Minister of Justice that spans the state's judicial and enforcement arms. Representations include the ministries of Justice, national security, the offices of the Chief Justice, Court of Appeal, Parish Courts, Commissioner of Police, Director of Public Prosecution, among other bodies. Those consultations identified other possible areas of strengthening of legislation that JPS can pursue.

Change of legislation can be a long and difficult process. However, the Electricity Act, 2015 provides for a review cycle of five years and will therefore become due for review by the Parliament in the summer of 2020. JPS will take this opportunity to seek a complete schedule of strong sanctions, language amendment and supporting regulations to further strengthen the deterrence effect of the legislative framework against power theft. For the period 2019-2020 the Company will consult with the portfolio ministry, the NCJ and other stakeholders including the OUR to build consensus and increase the probability of success.

State Enforcement of the Law

This is the area on which JPS is entirely dependent on ongoing state intervention to enforce the law. It is a weak link in the losses fight that requires strong political will if it is to act as an effective deterrent. Global experience has shown that consistent enforcement of the law is the most effective deterrent against an ingrained culture of crime. Fighting power theft competes with other crimes for allocation of resources and is not assigned a high priority despite being the most commonly occurring crime. JPS has limited success in this area of fighting losses. JPS has very limited ability to influence heightened performance of this state function.

The Company has nevertheless identified some areas to target. One is the lack of technical knowledge of methods of stealing electricity as an obstacle preventing the police from independently identifying and prosecuting offenders of the law without reference to JPS. The Company is therefore in consultation with the police leadership on developing a syllabus of training for selected teams of officers across the island.

JPS will also be pursuing recommendations at the NCJ for the Company to train a large pool of investigators that can be assigned the powers of district constables (DCs) to work alongside a smaller team of police officers trained as electricity theft specialists. These teams will form regional squads to prosecute electricity theft without overly stretching the resources of the police to address other crimes.

Over the 2019 to 2020 period the Company will also sensitize the police to the higher penalties available for prosecution under the Electricity Act, 2015.

Enable Legitimate Grid Access

The third role identified for the GOJ is a programme to encourage and facilitate legitimate access to the grid. Jamaica has a high level of informal settlements and housing. Safety regulations require that, as a pre-requisite for electricity service premises must receive a government certificate of inspection for conformity of the electrical installation with prescribed standards. It is illegal for JPS to supply electricity to premises without evidence of certification, which therefore poses a barrier to entry for legitimate electricity services.

In the modern world, access to electricity is viewed increasingly as a basic human right symbolized in the United Nations Sustainable Development Goal (SDG) #7 calling for universal access to affordable electricity. Jamaica has ratified the UN's SDGs.

Repeated survey findings have shown that the inability to fund safe electrical installations is a leading contributor to electricity theft, with the highest incidence in informal settlements. The near full coverage of the island by the electricity distribution grid means that it is within reach and accessible to most communities islandwide. Government data suggests that over 180,000 households[49] could have illegitimate electricity supplies based on JPS' customer base. The relatively high cost of house wiring would be the inhibiting factor for many of these potential JPS customers.

Only the Government can sustainably fund the improvement in the housing stock, including the internal electrical installation, of low-income families. JPS, along with the Jamaica Social Investment Fund (JSIF) has attempted modest programmes in the past that wired a few thousand homes over the past five years. To have any meaningful impact on losses, however, the scale of any house-wiring programme must be amplified dramatically.

JPS is proposing that the GOJ targets the wiring of 5,000-10,000 homes per year for the upcoming regulatory period.

This programme is best implemented as an element of a wider social intervention programme that addresses other issues in marginal communities, such as access to other utilities like water, security, and social and infrastructural improvement. The GOJ's Zones of Special Operations (ZOSO) programme which includes a social intervention dimension, provides a platform for a structured and targeted expansion of regularization activities in these communities such as network reconfiguration by JPS and customer premise wiring by the GOJ for low income and vulnerable households.

9.3 Lowering Operating Cost

JPS' operating and maintenance (O&M) expenditure for the period will support the Company's strategic focus of delivering greater value to customers . In pursuit of end-to-end efficiency, JPS will lower its operating costs through the following strategies:

a) Investment in technology to derive efficiency gains
b) Business Process Optimization
c) Cost Reduction and Containment

[49] The 2011 National Census recorded over 800,000 households with access to electricity which far exceeds the number of active accounts on the company's customer database.

9.3.1 Impact of Capital Investment on O&M

For the period 2019-23, JPS will invest US$209.9M in efficiency Capital projects, of which, US$125.7M will contribute to lowering Non-Fuel Operating and Maintenance expenses. These Capex program to be undertaken by JPS will garner cumulative net savings in O&M totaling US$9.6M over the five-year period (2019 to 2023). The major programs that will positively impact the cumulative net O&M expenses are:

a) Smart Meter Deployment
b) Voltage Standardization
c) Field Area Network
d) Smart Street Lighting
e) Grid Modernization
f) Business Intelligence
g) Network Technologies and Spares

The table below shows the net cumulative impact of the five-year capital program on O&M expense over the period by project and by cost category.

Project Name (Cumulative)	Operating Expenses by Nature	2019 LE	2020	2021	2022	2023
Smart Meter Deployment	Bill Delivery & Meter Reading	(247)	(1,093)	(2,707)	(4,850)	(7,376)
	Third Party Services	(3)	(223)	(602)	(1,130)	(1,769)
	Technology & Telecom	132	698	1,549	2,732	4,108
	Sub Total	**(118)**	**(618)**	**(1,760)**	**(3,248)**	**(5,038)**
VSP	Third Party Services	(200)	(401)	(601)	(801)	(1,002)
	Overtime	(75)	(151)	(226)	(301)	(377)
	Sub Total	**(276)**	**(551)**	**(827)**	**(1,103)**	**(1,378)**
Field Area Network	Technology & Telecom	-	(255)	(510)	(765)	(1,020)
	Sub Total	**-**	**(255)**	**(510)**	**(765)**	**(1,020)**
Smart StreetLight	Materials	(107)	(235)	(388)	(570)	(789)
	Third Party Services	(1)	(3)	(6)	(10)	(15)
	Technology & Telecom	10	19	29	38	48
	Sub Total	**(99)**	**(219)**	**(365)**	**(542)**	**(757)**
Grid Modernization	Materials	(107)	(232)	(357)	(509)	(774)
	Third Party Services	10	20	33	46	61
	Sub Total	**(96)**	**(210)**	**(321)**	**(459)**	**(708)**
Business Intelligence	Overtime	-	(410)	(738)	(1,000)	(1,210)
	Third Party Services	-	(159)	(287)	(389)	(471)
	Technology & Telecom	-	282	564	846	1,128
	Sub Total	**-**	**(287)**	**(461)**	**(543)**	**(553)**
Network Technology Spares and Emergencies	Materials	-	(50)	(100)	(150)	(200)
	Sub Total	**-**	**(50)**	**(100)**	**(150)**	**(200)**
	GRAND TOTAL	**(588)**	**(2,191)**	**(4,343)**	**(6,809)**	**(9,653)**

Table 37: Net Cumulative Impact of Capital Projects on O&M Expenses

<u>Smart Meter Deployment</u>

In addition to enhancing the Company's Loss detection capabilities, the implementation of the Smart Meter Deployment Project will yield significant cost reduction benefits. US$7.4M in net savings is projected for the O&M category of Bill Delivery and Meter Reading, as a consequence of the Company's thrust towards 100% deployment of smart meters. Since the inception of the project in 2016 (to November 2019) 260,000 smart meters were installed; by 2023 a further 470,000 smart meters will be installed to replace revenue and transformer meters. This will allow the Company to realize significant reduction in meter reading costs over the five (5) year period.

The Smart Meter Deployment project will result in savings in Guaranteed Standards (particularly GS7 breaches), penalties for estimated bills will now be substantially reduced, as the Company improve its compliance rate from 72.9 percent to 90.9 percent. In addition, smart meters enable remote disconnections and reconnections, thereby decreasing Disconnection and Reconnection contractor costs by US$110K or 14%.

Voltage Standardization

The Voltage Standardization Program (VSP) will be upgrading 12 feeders from 12 kV to 24 kV in the northern parishes, to improve reliability and power quality to the tourism industry. The attendant reliability enhancement under VSP is projected to also yield O&M savings of $1.37M from reductions in Emergency Service Response and Circuit Patrol costs over the five years.

Field Area Network

Net Savings of US$1.02M in telecommunications charges are expected as the Company expands its network capabilities and decrease dependency on third party suppliers. The Company is progressively implementing a Field Area Network to extend from JPS' Wide Area Network to end points. When fully deployed, the Network will integrate transformer meters, distribution automation switches and trip savers, smart technology access points, fault circuit indicators, thus eliminating the use of SIM cards and attendant data charges.

Components of the Field Area Network currently in use are:

- Meters manufactured by Itron; these use the Mesh technology, which avoid data charges and are deployed in "yellow" zones.
- Digital Mobile Radio network; this is a robust hurricane-resistant network designed to connect field personnel across the island. This also does not use data SIM cards and eludes data charges.

In addition, the Company has negotiated a switch from per kilobyte billing to flat rate billing of SIM cards used on our network, and continue to negotiate variations of these rates with our telecommunications providers to curtail costs.

Smart Street Light

The change out of high pressure sodium lamps with smart light-emitting diode (LED) lamps will yield savings of $811K as the replacement of fuse elements (a major cost driver) will no longer be required.

Grid Modernization

Under the Grid Modernization Program, the Company will spend $708K less in mechanical spares e.g. fuse elements by the end of the five (5) year period.

Business Intelligence

JPS will expand its business intelligence and analytical capabilities through a US$3.6M investment. The **Business Intelligence Programme** will enable JPS to become a truly digital business utilizing analytics and business intelligence.

The Company expects to realize savings of US$1.2M in overtime over next 5 years owing to the roll out of this programme. Additionally, business intelligence is expected to promote accuracy and significantly reduce estimates, thus contributing to the elliminaton of US$82K in EGS7 breaches over this period.

9.3.2 Business Process Optimization

JPS will optimize its business processes to maximize the value being delivered to its customers through cost effective approaches. JPS' approach for process optimization entails: the identification of all enterprise business processes, measurement of the processes and then the optimization of the processes. During the period 2019 to 2023, several processes will be identified, measured and optimized for maximum throughput. Some of these processes are, Procure to Pay (P2P), Meter to Cash (M2C), Field Force Management and Inventory Management. These process improvement initiatives will support reducing internal inefficiencies, maximizing cash flow potential and delivering maximum value to customers. Through this effort, JPS intends to improve operational efficiencies across the business by re-examining work-flows, eliminating ineffective or redundant steps in processes, and improving synergies in operations.

The Meter to Cash (M2C) Business Process initiative will enable the optimization of the Smart Meter optimization, while Field Force Management process reengineering will facilitate reduction in T&D maintenance costs from efficiency gains of automation including overtime reduction. Some of these benefits are incorporated in areas such as the Smart Meter Programme and other Cost Reduction and Containment initiatives.

9.3.3 Cost Reduction and Containment

In conjunction with executing, capital investment efficiency initiatives and business process optimization, JPS will pursue other cost reduction initiatives across the business. Initiatives for 2019-23 include:

- Optimize fleet operating and maintenance costs;
- Negotiate and access lower prices through effective supplier chain management
- Expand digitization of business transactions including electronic bill delivery
- Outsourcing and technology implementation

JPS' purchase in 2019 of a tractor head fitted with crane will mitigate the substantial third party costs of transporting poles and transformers over the ensuing five years. As a measure to ensure efficient deployment and cost control, the entire fleet has been fitted with GPS tracking. In 2017, JPS negotiated preferential rates (Petrojam ex-refinery plus 5%) for the fleet fuel requirements that will extend into the next regulatory period, continuing to realize advantageous operating costs equivalent to a 14% discount on fuel relative to retail prices.

Additionally, printing and courier contractor deliveries will be reduced by US$545K or 30% as electronic bill transmission proliferates, thereby reducing the cost associated with physical bill deliveries.

Transmission & Distribution Maintenance will decline from US$3.7M in 2019 to an annual average of US$3.1M thereafter, as the team reaps efficiency gains through an Integrated approach to Vegetation Management. JPS will also increase crew availability and productivity, using an optimal mix of in-house and contractor crews to balance Overtime versus 3rd party expenses.

Congruent with the Company's strategic objective of cost reduction, payroll costs show a decline from the 2019 Latest Estimate of US$72.76M to US$66.2M in 2023. This $6.6M reduction is primarily attributable to the fall in headcount from 1,506 in 2019 to 1,468 in 2023 as a result of the decommissioning of the Old Harbour and Hunts Bay plants between 2020 and 2021.

Similarly, arising from the aforementioned plant retirement, insurance premiums will decline by US$1.4M or 27 percent over the period. Further, as the SJPC 194MW plant heralds the new generating fleet, premium rates are expected to be favourably priced, with the prospect of minimal maintenance costs and absence of repair/replacement costs for these units over the first decade of operation.

Measuring our Performance on Priority 3: End-to-End Efficiency

	Key Indicator	2018 Actual	2019	2020	2021	2022	2023
1	JPS Heat Rate (kJ/kWh)[50]	11,214	11,350	10,246	9,327	9,613	9,337
2	System Losses (% reduction)	0.19%	0.34%	0.40%	0.45%	0.50%	0.61%

Table 38: End to End Efficiency KPI 2019-2023

[50] Heat Rate Projections are based on calendar year

PRIORITY 4.

Growth

Maximize value to customers and other stakeholders by successfully pursuing sustainable business growth in the evolving energy market.

PRIORITY 4: GROWTH

Defining a New Path for JPS- 360 Provider

JPS aims to maximize value to customers and other stakeholders by successfully pursuing sustainable business growth in the evolving energy market. Whilst the economy is expected to grow naturally, JPS has to remain vigilant and will seek to innovate, create and capture significant value from new and existing customers, given the increase in options for energy supply.

The forecast is impacted by planned defection by large customers, loss of new load primarily in the hotel sector where distributed generation is a feature of construction design, increase in ownership of energy efficient appliances and energy saving equipment as well as customer renewable energy solutions and the LED smart streetlights project which will see the replacement of all remaining HPS lamps (>approximately 70,000) over the period. Growth via traditional means, energy sales, is primarily driven by expected growth in business activities and the housing stock, which is expected to lead to higher levels of generation of electricity. JPS will also continue to grow in non-traditional ways (regulated and non-regulated) such as implementing new utility scale renewable projects, power wheeling services, operations and maintenance services, customized behind-the-meter solutions, electric vehicle penetration, smart energy retail services, energy management and data services and adjacent business lines

The following outlines some of the opportunities that will be pursued by JPS over the medium term:

10.1 Utility Scale Renewables

JPS is in support of the national goal of a modern, efficient, diversified and environmentally sustainable energy sector. To this end, the Company is seeking to take advantage of the opportunity to grow its generation capacity using renewable energy as its generation source. Currently, the total capacity of utility scale renewable at the end of 2018 was 151MW. The Company is evaluating opportunities to undertake utility scale renvewables projects (e.g. solar and wind energy), which would contribute significantly to achieving the GOJ's energy objectives, of adoption of renewable energy in the nation's energy mix of 20% by 2030.

Given relevant regulatory and ministerial approvals, JPS will identify potential sites using energy resource databases, conduct feasibility studies and assessments, and develop strategic partnerships to execute initiatives.

10.2 Behind-the Meter Energy Services and Solutions

Rapidly declining costs of Distributed Energy Resources (DERs) has presented consumers with more options for them to take greater charge and control of their "power" needs. As a result, today's energy customers are "plugging" into the energy business in a new way. Customers are moving towards a reduction (load defection) or elimination (grid defection) of their regular power

from the centralized grid by installing rooftop solar panels, building self-generation plants or purchasing storage units.

JPS is seeking to respond to the changing needs of its customers by providing customized solutions. JPS intends to explore the incorporation of unique, customizable services and solutions into the regulated business e.g. roof-top Solar PV lease, smart home services, and individual and bundled services. JPS is also seeking to recommend for approval a block of MW from retired assets to be used for customer sited grid-connected distributed generation to be owned and operated by JPS with associated O&M Services.

10.3 Electrification- Electric Vehicle Penetration (EVs)

Globally, the energy sector is experiencing a large increase in electrification in the transportation industry. Electric vehicles are a more efficient and cleaner form of transportation, and have a lower life cycle cost than internal combustion engine (ICE) vehicles. Global trends, such as the need to protect the environment, have led several countries to implement policies to proliferate the use of electric vehicles.

JPS currently owns an electric vehicle and a charging facility. The Company has undertaken several feasibility studies, and is positioning itself to take advantage of the emerging EV market. In the long term, significant EV usage in Jamaica brings value to all stakeholders. Some of the key benefits of EV include reduced dependency on oil, lower greenhouse gases from vehicle emissions, the ability to make more use of intermittent forms of renewable energy and lower life cycle costs for owning and operating a vehicle. Other benefits include potential revenue through vehicle to grid (V2G) technology, possibly lower overall energy rates due to the premium charged on vehicle charging, increased kWh sales, and the opportunity for additional revenue streams.

JPS will support the creation of an enabling environment to facilitate the deployment of EV through active stakeholder engagement, lobbying of the Government, and strategic public and private partnerships.

Some of the key initiatives include:

- Supporting the development of a national roadmap for electric vehicle deployment
- Supporting the development of the EV infrastructure
- Installation of 12 charging stations as an initial step towards the build out of a public electric vehicle charging network , 20 charging stations to be rolled out over the five year period.
- Supporting engagement regarding introduction of Electric Buses into the Government's Rural School Bus programme
- Supporting the creation of partnerships for EV financing for fleets and large transportation vehicles

10.4 Energy Management and Data Services

There is an increasing participation of governments in energy efficiency programmes where energy use has an obvious impact on the cost of operations. Energy efficiency is one of the GOJ's Top 10 priorities with a goal to reduce the public sector's energy use through the implementation of an Energy Management & Efficiency Programme (EMEP).

Corporate energy strategies are also becoming a main feature of corporate business plans as customers are actively seeking to optimize their energy use due to rising energy costs reported to consume profit margins at 20% or more.

While increased energy efficiency will result in a reduction in overall kWh sales, JPS is seeking to aggressively support the Government's energy programme and that of corporate Jamaica. Energy efficiency presents other opportunities in the energy market to create non-traditional revenue streams. To support efficiency goals, JPS is seeking to establish an energy management and data services hub to grow its presence and participation in this component of the energy space.

10.5 Smart Energy Retail Services

Over the last six years, the JPS eStore has focused on empowering residential customers to manage their energy usage more efficiently through the use of low-cost energy efficient equipment and devices, as well as bulk sale of energy retrofitting supplies for businesses.

Over the next five years JPS will reposition the eStore to increase the value delivered to both residential and commercial customers in keeping with shifting preferences and needs. Through a suite of products that marries energy and technology, the eStore will smarten homes and businesses; empowering and enhancing the quality of life of customers and supporting the achievement of business objectives. This will be enabled through strategic partnerships and with the intention to establish a regional footprint.

10.6 New Business Growth

To avoid revenue erosion and to grow business, global utilities have begun to diversify revenue streams in a creative way. Many have begun to leverage physical assets and infrastructure, and existing customer databases and relationships for new business opportunities. These include telecommunications/wireless connections, landscaping and tree-trimming, pay-to-use mobile apps, energy efficient technologies developed in partnership with third party vendors; and acquisitions and joint ventures to add improved capabilities and expand geographical footprint.

JPS intends to explore the likelihood for new business lines by leveraging existing assets within its core regulated operations.

10.7 Energy Sales Growth

Energy sales is projected to grow by an average of 1% per annum over the rate review period while customer numbers are projected to grow by an average 1.4% per annum over the five year period, driven primarily by growth in industry, household and reductions in illegal connections.

The consumption per customer is expected to fall as more customers employ energy efficiency measures or install energy production systems.

Over the five year period JPS will invest US$42.4M to deliver on its growth priority. The following are the key initiatives, which JPS will pursue:

- Implementation of Customer Growth projects - These are primary and secondary line extensions and transformer upgrades, which will meet the residential and business customers' need for power. JPS has a mandate to provide access to customers who have a demand for its services. This is facilitated through the extension of the distribution network or upgrading the existing infrastructure.
- Implement the Distribution Transformer Programme to expand capacity to serve new customers
- Installing new feeders and upgrading feeders
- Building charging stations for electric vehicle roll out

In addition, JPS will be pursuing the following initiatives to grow its energy sales:

- **Customer Engagement**: Engaging large at-risk customers to better understand their needs and develop best fit solutions
- **Project Execution**: Execute on loss reduction projects, which will result in adding more customers to the grid and being able to bill for their consumption
- **Product Value**: Demonstration of product value and the value proposition for remaining on the grid
- **Project Planning**: Improve project planning to prevent delays of critical material
- **Strengthen Relationships**: JPS will also strengthen relationships with major developers and Parish Councils, and continue to position itself as the preferred provider of power and energy services.

Measuring Performance on Priority 3: Growth

Key Indicator	2018 Actual	2019	2020	2021	2022	2023
Billed Energy Sales (GWh)	3,212	3,215	3,246	3,284	3,322	3,361
Billed Sales Growth (%)	0.08%	0.12%	0.97%	1.16%	1.15%	1.16%
Billed Customer	658,052	668,404	680,868	694,457	705,897	717,322
Customer Growth (%)	2.30%	1.57%	1.86%	2.00%	1.65%	1.62%

Table 39: Growth KPI 2019-2023

PRIORITY 5.

Stakeholder Relationships

Connecting with persons in a way that facilitates the winning of hearts and minds, and the creation of a collaborative environment that fosters mutually beneficial partnerships.

PRIORITY 5: STAKEHOLDER RELATIONSHIPS

Stakeholder engagement is a critical part of the Company's Business Strategy, which goes beyond transactional relations with customers, business partners, policy makers and other influencers. Stakeholder engagement is about connecting with persons in a way that facilitates the winning of hearts and minds, and the creation of a collaborative environment that fosters mutually beneficial partnerships. The Company's stakeholders are many and varied and, as a consequence, the Stakeholder Engagement Strategy must necessarily address the unique nature and needs of each segment.

11.1 Objective: Creating an Enabling Environment

JPS' Stakeholder Engagement Strategy is aimed at creating an enabling environment for the utility, through transparency, information-sharing, and overt facilitation of varying perspectives in decision-making. The engagement of key groups such as businesses, communities and government, is expected to result in greater trust of the organization and mutually beneficial strategic partnerships.

The primary objectives of a Stakeholder Engagement Strategy are therefore to:

- Educate, build awareness and understanding
- Generate more objective conversations around JPS and the energy sector
- Influence the policy making process
- Facilitate partnerships that advance JPS' commercial agenda
- Create Allies and Advocates
- Build brand affinity

STAKEHOLDER GROUPS

The main Stakeholder Groups, which the Company seeks to engage are:

- The Political Directorate
    - Government: Ministries, Members of Parliament, Bureaucrats
    - Parliamentary Opposition
    - Local Municipalities
- Policy Makers
- Regulators
- Shareholders
- Employees
- Customers: Key Accounts and Consumer Advocacy Groups
- Communities
- Sector Groups / Special Interest Groups
- Media

Each group is important to the organization because of their varying levels of influence: some are critical to the operational and commercial success of the Company, while others impact policies affecting the organization, and others can influence perception of the JPS brand.

11.1.1 Strategy

The key to the successful implementation of the JPS Stakeholder Engagement Plan, is the establishment of trustworthiness. To this end, JPS will seek to deliver on its commitments, be compliant with agreed terms and conditions, and be transparent and timely in its communication. While formal engagement of stakeholders is critical, the importance of informal engagement and the development of personal relationships cannot be overemphasized. Through the development of personal relationships, trust is engendered and long-term partnerships can be built.

11.1.2 Initiatives and Programmes

GENERAL CUSTOMER EDUCATION:

One of the primary objectives of JPS' Stakeholder Engagement Programme is to build awareness and understanding of the Company's operations, policies and procedures, as well as the general environmental factors that affect the energy sector. This information helps to improve the ease of doing business, and empowers customers in their decision-making. The Company aims to proactively provide customers with information via the initiatives listed below:

- **Brochures & Specialised Publications**: To be distributed via email, in offices and at events
- **Radio Programmes**:
  - Designated segments in popular discussion programmes
  - Radio Drama Programmes
- **"JPS Support" Video Series**: With customer preferences moving towards more video-based content, JPS will expand its messaging to include videos on all its online platforms.
- **Digital Screens**: indoor and outdoor screens are integral to the customer education efforts..
- **Print Media**: The print media continues to be an important medium.
- **Television Programmes**: Reality shows and discussion programmes that reinforce key messages.
- **Electronic Newsletter**: Distributed monthly to customers via email
- **Website**: The JPS website is being developed as a central repository of customer information.
- **Expos and Events**: These provide a platform for customer interaction and information sharing.
- **SMS Text Messaging**: The Company will utilise more direct messaging, as it continues efforts to get information to specific audience segments.
- **Conferences and Symposiums**: JPS-hosted conferences and symposiums focusing on specific topics, and targeting specific groups

KEY CUSTOMER ENGAGEMENT

Large Commercial & Industrial Customers are given priority attention by JPS, because of the unique needs of their businesses, and their overall contribution to the nation and the Company's revenue. The engagement initiatives for this target group include:

- **Key Account Programme**: Through which JPS assigns Account Executives to individual commercial and industrial customers.
- **Tier 2 Key Customer Management Programme**: Facilitates direct engagement of business customers, who fall just below the Key Account group. The relationship with these customers are managed by Parish Managers, who meet with them regularly to provide updates and get feedback on how the customers can be better served by JPS.
- **Top 50 Programme**: Which partners members of the Executive Leadership team with the largest business customers
- **Business Association Partnerships**: Through strategic partnerships with business associations such as the Jamaica Manufacturers & Exporters Association (JMEA), the Jamaica Hotel & Tourist Association (JHTA), and Chambers of Commerce, JPS has an opportunity to get partner with customers on initiatives that support economic development, business expansion and customer retention.

ENGAGEMENT OF SPECIAL INTEREST GROUPS

JPS will seek to engage special interest groups primarily to facilitate more objective conversations around JPS and the energy sector. These groups are an integral part of the Company's customer education and engagement strategy, and include: Professional Organisations, Non-Governmental Organisations, Sector Groups, and Consumer Advocacy Groups. The primary initiatives to be pursued in engaging these groups are:

- **Quarterly Engagement Meetings**: Through its Consumer Advocacy & Special Interest Group programme, JPS facilitates quarterly engagement meetings with consumer and special interest groups such as the Consumer Affairs Commission, National Consumers League to provide updates on the Company's operations and get feedback from the representatives of these groups.
- **Tours of JPS Facilities**: Scheduled tours of JPS' facilities provide an opportunity for special interest group representatives to get a better understanding of JPS' operations.
- **Educational Sessions**: These sessions allow for presentations and detailed discussions on specific areas of JPS' business or the energy industry in general.
- **Customer Outreach**: Through partnerships with the special interest groups, JPS has an opportunity to reach and build alignment with specific target audiences.

MEDIA ENGAGEMENT

The Media represents a critical stakeholder group, with a key role in the dissemination of information to various audience segments. Recognising the media's need to have accurate up-to-date content to engage their audiences, JPS provides information on its operations on an ongoing basis. Over the next five years, JPS Company will deepen its partnership with the media through:

- **Sponsorship of and participation in Media Events**: JPS is a long-time sponsor of the National Journalism Awards, and will continue to support excellence in the media via this platform. In addition, the Company will continue to consider the various requests for partnerships from the respective media houses.
- **Senior Executive Discussion Fora**: Media representatives require and appreciate information from subject matter experts and senior executives. JPS will continue facilitating access to key persons by journalists.
- **Quarterly Media Briefings**: Scheduled media briefings will be made a routine part of the Company's communication process, as they facilitate transparency and ease of access to information.
- **Monthly Engagement Sessions**: Opportunities will be provided monthly for the engagement of representatives from different media houses to host JPS, or be hosted by the Company as part of ongoing information sharing.
- **Media Appreciation Event**: One informal event each year, to allow for greater interaction between JPS personnel and the media.

COMMUNITY ENGAGEMENT

JPS recognises the importance of staying connected to the communities that it serves. As part of its strategy to engage communities, JPS works through its Community Renewal and Foundation arms to implement a range of initiatives to support community development, while building brand affinity and supporting customer retention. These initiatives include:

- **Community Meetings**:
  - "Save a Seat for Us" campaign to partner with community groups and organizations
  - Ongoing community engagement by local parish teams
- **Environment & Energy Management Programmes**: Through partnerships with environmental groups and communities, JPS will lead energy efficiency and conservation initiatives, while supporting environmental awareness and clean-up activities.
- **Health & Wellness Expos**: Recognising the need for access to basic services in some of the communities in which it operates, JPS hosts expos in inner-city communities to assist persons who could not otherwise afford some services.

- **Career Fairs**: In an effort to address the issue of unemployment and inadequate preparation for employment, JPS hosts Career Fairs to provide communities with information on available opportunities.
- **Partnerships with Schools**: Through the JPS Foundation, the Company has established partnerships with schools at the primary and secondary levels. These partnerships allow for the sharing of industry information, while allowing students access to resources that can advance their education.

Measuring Performance on Priority 5: Stakeholder Relationships

Metric	2018	2019	2020	2021	2022	2023
Brand Perception: JPS as a Good Corporate Citizen	49%	52%	54%	56%	58%	60%
Ratio Positive to Negative Media Reference	3.5:1	3.5:1	3.5:1	3.5:1	3.5:1	3.5:1
CSAT Index	60%	60%	64%	66%	68%	70%
Employee Engagement Survey	NA	35	60	64	64	64

Table 40: Stakeholder Engagement KPI 2019-2023

People, Process & Technology

CAPABILITES ENABLING THE STRATEGIC PRIORITIES

12.1 Human Resources

This section of the plan sets out JPS' people management goals, objectives and targets over the next five years. The environment has become increasingly competitive, with continuous technological advancement and changing business dynamics.

Employees are key enablers of the organization as they help to shape, develop and contribute to the effectiveness of the organization. Organizational effectiveness is achieved through the identification of actions and plans that positions JPS in the best possible place to be able to address the multiple and complex challenges the organization faces and deliver on the goals and commitments of the Company. This includes managing risk and competition, taking advantage of opportunities, supporting JPS' commitment to national development, meeting service standards and continuously providing value for key stakeholders, while operating in an effective and efficient manner.

Trends in Human Resources over the next five years will be impacted mainly by an age-diverse workforce, enhancements in technology and changes in the approach to leadership. JPS is run by a workforce that spans four generations; Baby Boomers who operated in the government-owned era, Generation X who led the transition to private ownership, Millennials or GenY who are leading the technology-transition charge and Gen Z who are new recruits into this melting pot of cultures, ideologies and expertise. All of this means that JPS will need to adjust its entire approach to the employee lifecycle; from recruitment to retention.

Technology not only impacts on the operations of the business, it directly impacts on how human resources and their data are managed. As companies become paperless and transactions become more social, JPS must stay on par with these changes so its employees are served efficiently and their expectations can be anticipated and met.

Finally, operations and business thinking has been evolving over the years from management to leadership, and over the next five years, people-centric servant-leadership will continue to manifest itself further in coaching, mentorship and engagement.

JPS recognizes the need to deliver increased value to customers and shareholders while enabling its employees to achieve their goals. Over the next five years, JPS will build a culture of high performance and accountability by engaging its employees and equipping them with the right skills, tools and conditions to succeed.

The following are the key objectives of the people strategy:

- Improve Employee Engagement
- Increase People and Organizational Effectiveness and Efficiency

- Training and Development

12.1.1 Objective: Improve Employee Engagement

Employee engagement is a critical driver of business success in today's competitive marketplace. High levels of engagement promote the retention of talent, fosters customer loyalty and improves organizational performance and stakeholder value. As such, JPS sees employee engagement as a critical success factor for the five year plan.

Employee engagement has taken many forms in JPS over the past five years, including but not limited to formal and informal reward and recognition programmes, health and wellness activities, volunteerism through the JPS Foundation and various types of employee meetings. While the Company will continue to engage its people in these ways, the focus of the engagement strategy will be directed primarily on strengthening leadership competencies, increasing direct and face-to-face interactions with employees, pursuing strategic recruitment and retention, for the JPS of the future.

12.1.1.1 Strategy

JPS will attract and retain the best employees, develop the skills and harness talents to support the business achieving its goals and increase communication with employees.

12.1.1.2 Initiatives and Programmes

The following are some of the initiatives and programmes over the five year period:

- **Employee Communication**
  Improving the frequency, level and methods of communication across the organization; sharing and reinforcing the Company's vision and commitment to national development, customer excellence and employees' well-being with a view to creating greater alignment of the goals of the organization and employee

- **Employee Meetings**
  Bi-annual company-wide "Town-Hall meetings" and regular "Captain's Table" sessions for employees and Senior Leadership to discuss the visions and plans of the organization, issues and opportunities in the industry and developing creative and innovative solutions together

- **Company-wide Incentive Programme**
  Implement a revised company-wide Performance Based Incentive Programme (PBIP) to support the drive towards a high-performance organization and provide adequate incentives for employees to be effective, efficient, productive, creative and innovative in their thinking and performance

- **Strategic Wellness Initiatives**
  Roll out an enhanced Health & Wellness Programme to create a healthier lifestyle and promote a greater work life balance for employees

- **Build the JPS Employer Brand**
  Provide opportunities for current and future employees to develop brand affinity by sharing their stories of success, develop brand advocacy through Corporate Social Responsibility and promote JPS as an Employer of Choice

- **Formal Coaching And Mentorship Programmes**
  Develop and expand Company-wide Coaching and Mentorship programmes for current and high-potential leaders, as well as provide opportunities for employees to broaden their experience and knowledge of the business as they operate in an increasingly cross-functional and interdependent work environment

- **Design Feedback Mechanisms**
  Implement a variety of forums for employees to be able to share ideas and give feedback on the direction of the Company and how they feel about their contributions and work environment. This will be done through regular Employee Pulse Surveys, Focus Groups, and Working Groups throughout the year, and acting on results from these surveys and sessions.

- **Employee Innovation**
  Conduct regular ideation sessions and facilitate the formation of cross-functional teams to encourage and incentivize employee innovation and creativity to solve real-life problems across the Company.

12.1.2 Objective: Increase People and Organizational Effectiveness and Efficiency

JPS will be focusing on implementing the supporting infrastructure to enable efficiency and effectiveness across the organization.

12.1.2.1 Strategy

This will be done through utilizing strategic man-power planning, improved cost control and strategic employee development. JPS will design its training programme in the context of the future needs of the organization based on movement and trends in the industry, skills gaps identified, and the goals the Company.

12.1.2.2 Initiatives and Programmes

JPS will pursue the following initiatives and programmes over the five year period to deliver on its strategy:

- **HR Management Systems Improvement**

  Implement a complete HR Management System for recruitment, competency and performance management, training and leadership development

  - Support effective recruitment of staff, and ensuring new staff goes through a tailored orientation process to enable them to quickly become effective in their new roles. This includes developing tailored recruitment strategies to identify and hire the best candidates especially for specialized roles.
  - Support effective staff retention through numerous approaches to career development, performance management, succession planning and promotion, job enrichment etc

- **Employee Information Management**

  Use technology to automate HR processes and digitize personnel files to reduce paper-based processes, improve data retrieval and reduce the cost of storage and records management overall

- **Company-wide Succession Planning**

  A formalized succession planning programme to ensure that key and critical roles across the organizations are being developed for retention and replacement.

- **Job Specific Training**

  Modify job specific training for the current and future JPS, enabling its people to be skilled and be able to effectively deliver value to its customers.

- **Leadership and Management Training**

  Companywide leadership development and change management programmes that will enhance leadership capabilities and improve on project execution. Enhancements will be made to high-performance leadership programmes such as iLead, new managers training and ongoing leadership development series. This will be facilitated through formal development, coaching and mentoring, enabling managers to drive a high-performance culture and demonstrate competence in dealing with every aspect of human resource management.

- **Competence Development**

  JPS will develop its leadership competencies at all levels, to ensure that staff understand their own leadership styles, and can adapt them to deal with different situations, in order to motivate and energize their teams. This includes preparing staff for leadership roles early in their careers, so that they have the necessary depth and breadth of experience to take on roles with greater responsibility.

Department	2018 Actual	2019	2020	2021	2022	2023
TOTAL	1,540	1,541	1,492	1,468	1,468	1,468

Table 41: Headcount estimate for 2019 – 2023

At the end of 2018, the headcount was 1,540 employees and it is expected to be approximately 1,463 employees by 2023. Currently there are 1,515 employees operating in 10 Senior Divisions, 27 Divisions and 154 Departments across the Island. The majority of employees are between the ages of 44-54 and over 200 employees will be retiring or close to retirement age within the next five to ten years.

12.2 Process

JPS will optimize its business processes to maximize the value being delivered to its customers through cost effective approaches. JPS' approach for process optimization entails: the identification of all enterprise business processes, measurement of the processes and then the optimization of the processes. During the period 2019 to 2023, several processes will be identified, measured and optimized for maximum throughput. Some of these processes are, Procure to Pay (P2P), Meter to Cash (M2C), Field Force Management and Inventory Management. These process improvement initiatives will support reducing internal inefficiencies, maximizing cash flow potential and delivering maximum value to customers.

Enterprise Process Identification

Enterprise business processes are those that tend to go across functional areas to deliver a value-added output to customers. The enterprise processes will be identified according to their high-level activities, categorized into related functional groups, mapped by their relevant input and output factors, assigned functional process owners and an enterprise owner and ascertained revenue yielding capabilities and costs. This method of process identification will allow JPS to replicate processes, sustain process changes and carryout complex analysis and improvements seamlessly.

Process Measurement

Business process measurement is the art of understanding the factors that affect the performance and overall nature of the process. These factors are used to develop process

performance measures or KPIs. The KPI categories include but are not limited to Labour Productivity, Process Capability, Process Yield and Process Efficiency.

- **Labour Productivity (LP)**: is a measure of how well the human resources are being managed to deliver the best value to customers at a minimum cost. Labour Productivity is calculated as $LP = \frac{Cost\ of\ Service}{Hours\ Worked}$.
    - To maximize the benefit of this measure, JPS must conduct internal and external benchmarking for comparison of results to see whether there may be scope for improvement in Labour Utilization.

- **Process Capability (C_p)**: is a statistical measure of a process' ability to produce output within specification limits. The specification limits are found by the customer by indicating their tolerance for the quality or value of the output of the process.

- **Process Efficiency**: is the ability of a process to accept input and produce an output with the least amount of effort. Labour Productivity, as seen in the above, is a type of process efficiency. However, for JPS, process efficiency refers to throughput yield; that is the amount of outputs with an absence of defects requiring rework.

Process Optimization

Having identified and measured enterprise business processes, JPS must also seek to optimize the performance of the process for improved value to the customer at the best cost. This can be achieved through using many known strategies in the BOM industry, such as: Lean, Six Sigma, Agile and BPMN. When a process is performing optimally, it gives the organization the best "value for money" that is possible for the best value to the customer. The enterprise processes below are a few of those that will be optimized within the next five years.

- **Procure to Pay (P2P)**

  This process entails the ordering of materials and services through to the payment thereof. When run efficiently, this enterprise process allows for clear planning and moving of the Company's money in a manner conducive to efficient business operation. However, when inefficiencies exist within this process, the Company loses trust with suppliers as well as visibility in the movement of funds.

  In optimizing this process, JPS will seek to:

    - Increase visibility in the movement of funds
    - Increase capacity for accurate cash flow forecasting
    - Reduce overdue payments to suppliers

- **Meter to Cash**

  The Meter to Cash process involves a number of activities from account management (set up and maintenance of customer accounts), meter reading, billing and the collections of customer payment. This review will enable JPS to identify areas of inefficiencies in the process and address them by re-engineering the process placing emphasis on changes required to optimize the setup, activation, reading and billing of smart meter accounts. This includes streamlined integration and optimization of the IT systems used in the process, including implementations, upgrades and enhancement of the relevant systems. This will result in a more efficient process, improved collections and lower transaction or process related costs. In optimizing this process, JPS will seek to:

  - Reduce the number of handoffs between process activities
  - Optimize the process cost
  - Reduce bad debt

- **Field Force Operations**

  JPS has a number of field operation teams working in various locations island-wide. The Company is acutely aware of the importance of field force management in delivering operational efficiency and customer service excellence and as such, will employ a more disciplined and streamlined approach over the next five years to achieve this result.

  Improving the Company's field force operations will help to reduce administration cost, improve planning efficiency and increase productivity. This means, the Company will be able to allocate tasks, optimize scheduling, dispatch and routing, and have more control over execution of tasks, resulting in a leaner and smarter JPS.

12.3 Technology

Technology Infrastructure

Technology is a driving force for innovation, optimization and process improvement. This has become more important in enabling and supporting the business to deliver value to its customers. Over the next five years, JPS will continue its drive to provide a modern IT Infrastructure platform, establish a robust and effective data recovery platform and drive operational efficiency through automation.

12.3.1 Objective: Improve Technology Infrastructure and Resilience

12.3.1.1 Strategy

Develop a resilient technology infrastructure framework through (a) the establishment of programmes and projects that simplify the environment for operation and costs efficiency, deliver productivity improvements, customer and corporate data loss prevention and process automation. (b) Review of overarching governance policies surrounding hardware modernization and standardization, infrastructure design, user self-services and automatic fault detection, and (c) a holistic management of infrastructure services.

12.3.1.2 Initiatives and Programmes

The following outlines the major programmes which seek to improve the technology infrastructure and resilience over the course of the next five years.

- Data Loss Prevention Programme – this includes automatic data recovery site failover, net backup storage capacity expansion and the establishment of hyper-convergent server architecture.
- Hardware Modernization Programme – this includes retirement and replacement of desktops, laptops and servers and migration to Window 10.
- Customer and User Experience Transformation Programme – this includes projects such as customer Self Service Portal, User Identity Management, ITSM Service Portfolio, automation of standard repetitive processes and the migration of IT as a service.
- Utilize Behaviour Analytics to inform solutions creation to improve staff productivity
- Data Centre Facilities Improvement Programme

12.3.2 Objective: Implement System Upgrades and Infrastructure Optimization

12.3.2.1 Strategy

The strategy is to identify critical infrastructure that will not be replaced, and make systematic improvements to its reliability and operational efficiency. The Company will also significantly decrease unplanned IT system outages and poor performance of applications that impact customer contact, service delivery and access to information.

12.3.2.2 Initiatives and Programmes

- Enterprise Application Support and Optimization Programme – This includes projects such CS 4.3 Database Optimization and Performance Adjustment and CS 4.3 Application Server Migration; Citrix Platform Upgrade and Performance Tuning, Oracle Financial Reporting and support the implementation of an Oracle supplier management module (iSupplier).
- Review and tuning of in-house built applications and interfaces
- Facilitate regulatory adjustments

IT Applications and Technology Optimization

JPS researches, designs, develops and implements innovative solutions that enable it to meet its goals and deliver value to its customers. The solutions utilized are a combination of commercial off the shelf applications, in-house application development and systems integration. Over the last six years, JPS has implemented new applications and upgraded existing systems to create a stable application backbone that places the customer at the centre of its digital transformation strategy. In the next five years, JPS will work to enable a digital customer experience by developing a scalable, open and secure network of solutions with a wide variety of channels for customer interactions. All customer contact points in the future customer interaction model will support data collation and availability from multiple platforms to ensure a rich customer experience. These will include billing information, outage information and information on operations in customers' respective areas. Customers will also be able to make reports and requests via these multiple platforms.

12.3.3 Objective: Implement Innovative Technologies

JPS will implement innovative technologies that enables a digital customer experience.

12.3.3.1 Strategy

Create a 360 degree view of customers across all enterprise systems and provide single interface for employees to respond and resolve customer requests. Similarly, empower the digital customer by enhancing customer self service capabilities via digital consumer devices and facilitating a deeper understanding and relationship with its customers through the use of advanced analytics.

12.3.3.2 Initiatives and Programmes

- **Programme - Asset Management** - Investments in the use of modern technologies to improve asset management practices and enable workforce mobility will reduce the expected increase in asset maintenance and replacement costs due to an ageing infrastructure and increased severe weather events over the next 10 years. These technologies will optimize the planning, scheduling and execution of work to improve overall system reliability and prioritize asset investment decisions based on empirical data. This includes projects such as:
    - Distribution Asset Management
    - Distribution Work Management
    - Transmission Network Asset Management Optimization
    - System Reliability Analytics
    - Asset Health and Predictive Maintenance analytics
- **Customer Experience Programme** - JPS will expand the use of digital customer service channels to deliver information, communication and self-service options to meet evolving

customer expectations while reducing the overall costs of communicating with customers. Core systems and processes for billing will also be upgraded over the next five years to support the introduction of new tariffs and maximize the rollout of smart meters to enable customers to better control their energy usage. Some of the other projects are:

- Upgrade/Replacement of Customer Suite application
- Expand features available via the customer mobile application to provide full service capabilities and expand into smart home technologies
- Upgrade the payment platform
- Customer Service analytics
- Meter Data Management Systems integration
- Smart Meter Device Management integration
- Smart Meter Programme – this will provide customers with the information necessary to manage their energy usage and control costs in a sustainable way. The AMI initiative requires an extensive IT support stream that includes data management, data storage, data analytics, data security and highly reliable telecommunications.

Smart Grid Operations - Telecommunications

As JPS continues to advance technologies for improvement in service delivery, reliability, losses, asset management and growth, telecommunication will be at the centre and become increasingly important. JPS will focus on continuously improving the core networks that support SCADA, Teleprotection and Corporate Services and AMI networks that support smart metering and intelligent grid operations. Building staff capacity internal to the team and across the wider JPS to support the new interfaces with pole line devices is critical for operational success, advancing the Company's ability to deliver quality service, promote excellence in customer service, improve operational efficiency and foster a culture that is conducive to organizational growth and development.

JPS will modernize the Core Networks for speed, capacity and security and implement a robust Field Area Network to support AMI and Smart Grid effectiveness.

12.3.4 Objective: Improve Core Network Availability

12.3.4.1 Strategies

Strengthen the core telecommunication network with a focus on both equipment and medium upgrades and implementation, and improve network availability.

12.3.4.2 Initiatives and Programmes

- Telecom back-up power
- Microwave network availability improvement

- Tower infrastructure facilities strengthening
- Fibre infrastructure builds
- Replace end of life telecommunication network devices

12.3.5 Objective: Increase Operational Technology Reliability

12.3.5.1 Strategy

Focus on nodes affecting reliability as well as the process and work force for maintaining them.

12.3.5.2 Initiatives and Programmes

- Phase 3 DMR Implementation and Radios for two-way communication
- Implement Field Area Network (FAN) to support the Smart Meter, RAMI rehabilitation, prepaid metering and smart streetlight programmes
- Improve maintenance programmes
- Technical Skills Training, Mentorship and Professional Certification

12.3.6 Objective: Telecommunications End to End Efficiency

12.3.6.1 Strategy

Improve capabilities, processes and culture

12.3.6.2 Initiatives and Programmes

- Upgrade the Network Operation Centre monitoring and operational capabilities
- Eliminate single points of failure within the SCADA and Teleprotection networks
- Documentation and Standardization of network tools, protocols, infrastructure and components

12.3.7 Objective: Improve Customer Service Office Networks

12.3.7.1 Strategy

Improve Office Communication Network and Mobility

12.3.7.2 Initiatives and Programmes

- Implement Network Redundancy for all Commercial Office locations
- Replace End of Life Private Branch Exchange (PBX) System with an IP based telephony network
- Mobile Phones Contract Renewal
- Implement a Unified Communication and Collaboration Network to improve customer interaction, service delivery and support through all platforms including social media. The network will also host all internal communications and data sharing.

Technology and Cyber Security

JPS is seeking to improve organization cyber security culture, processes and controls. This will include implementing and supporting robust processes, technological controls and creating a security-minded culture for all JPS employees. Initiatives and programs will be executed to improve the cybersecurity posture of JPS' infrastructure, which is designed to mitigate the risk associated with cyber incidents and breaches that may adversely affect the reputation and finances of JPS and its' customers.

12.3.8 Objective: Improve Application and Enterprise Mobile Data Security

12.3.8.1 Strategy

Comprehensive vulnerability management program and Leverage Mobile Device Management and Mobile Threat Defence Solution.

12.3.8.2 Initiatives and Programmes

- Application Vulnerability Security Management - Intended to identify and resolve weaknesses in applications, to reduce the likelihood of unauthorized access and destruction or alteration of customer data
- Mobile Threat Defence Solution – Provides protection for corporate mobile phones to reduce the likelihood of unauthorized access and destruction or alteration of customer data. The deployment of mobile threat defence solutions to enhance Mobile Security capabilities and reduce the enterprise vulnerability from attacks emanating from the Company assigned mobile devices.

12.3.9 Objective: Improve Internet of Things Security

12.3.9.1 Strategy

Implementation of security technologies that will provide added visibility into Internet of Things (IoT) and SCADA networks.

12.3.9.2 Initiatives and Programmes

- **Internet of Things Project** - A holistic approach to secure JPS' IoT devices to assist in creating an infrastructure of interconnected objects that is secure, interoperable, mobile and always at work gathering data, transmitting conditions and empowering users who analyse and leverage this information in real-time. The introduction of smart devices in the field has created the need for new solutions. These include advanced Log Management and SIEM, and an expansion of the firewall capabilities.
- **Implementation of Email Security Solution** - Having migrated from our previous e-mail platform to current email platform of Microsoft Office 365™ that is a cloud based service, JPS now requires a robust "Next-Generation" level of security for its cloud

based email solution. One that provides defense against malware, phishing and ransomware, secure email delivery, end user quarantine, and other security functionalities.

- **Implement IAM**- A comprehensive solution that combines and controls authentication and authorization for individual users across different systems to gain required and appropriate access.
- **Implement DLP solution** - To reduce the likelihood of unauthorized disclosure of access to and destruction or alteration of customer information.
- **Desktop and Server HIPS solution** - To provide antivirus and antimalware protection for desktop/laptop computers to reduce the likelihood of unauthorized access to and destruction or alteration of customer data.
- **Database Encryption programme** - To provide security to customer data by masking the data while resident in corporate systems; an additional layer of protection in the event of physical access database breach.
- **Cloud Security Programme** - To provide protection for customer data that is resident on systems hosted in the cloud and to reduce the likelihood of unauthorized access to and destruction or alteration of customer and corporate information. These protections include antivirus, anti-malware, firewalls, network segmentation and other security solutions.

Investing in a digital transformation strategy will improve the overall customer experience, making it easier for customers to conduct business with JPS, anywhere and anytime. With the expanded data that will be available to customers with the execution of the Initiatives and Programmes, they will be better able to manage their energy usage and promote energy conservation, in support of Jamaica Energy Policy (Vision 2030). These digital tools will place customers at the centre of the utility and put customers in better control of their energy needs. The level of service will increase through automation, not only from a customer service perspective but also in areas of system reliability, safety for customers and societal benefits of having a smart energy infrastructure.

The IT Infrastructure investment will result in a more resilient environment to handle the expected significant growth in data points and real-time management of customer information, consumption management, outage feedback and the availability of a wide range of information for the customers' utilization. Consequently, the Company will require a very robust infrastructure to handle these demands.

Data protection is a paramount need for both customers and JPS' business enterprise. Access Control processes with advanced auditing and alerting capabilities will allow the Company to move from being reactive to being proactive. Restricted access to SCADA and other critical systems will reduce cyber vulnerability in an age of increasing attacks on utility providers. Online

Financial Plan

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FINANCIAL PLAN

13. Medium Term Capital Plan

JPS is on a path to unleash Jamaica's growth and prosperity. The Company believes this can be achieved by securing the nation's energy future and providing an energy solution for every Jamaican. JPS intends to make the necessary investments over the next five years to deliver greater value to its customers and improve their service experience. JPS will make investments that are aligned to its strategic plan and are prioritized to deliver optimum value for its customers. The investment activities have been aligned to deliver on the Company's strategic priorities - exceptional customer service, end to end efficiency, growth and safety.

The table below outlines JPS' proposed annual investment by strategic priority. JPS will invest US$478.8M, spending an average of US$95.7M per annum. JPS will invest 46% of its five year budget to improve Customer Service, 44% to improve efficiency across the business and the remaining 10% invested to deliver on safety and growth related objectives.

Strategic Priorities	2019	2020	2021	2022	2023	Total	Percentage %
Customer Service	40,169	38,988	50,227	46,728	43,711	219,822	46%
Efficiency (End to End)	49,602	42,451	43,717	46,513	27,618	209,901	44%
Growth	10,308	9,440	7,643	8,635	6,361	42,386	9%
Safety	1,605	773	1,273	1,768	1,259	6,679	1%
Grand Total	101,683	91,652	102,859	103,644	78,949	478,788	100%

Table 42: Capital Investment by Strategic Priority 2019- 2023

Major Projects Overview

One of the key customer service projects is the construction of a **new Single Circuit Transmission Line from Old Harbour to Hunts Bay** in Kingston and the upgrade of the Duhaney to Hunts bay line sin Kingston. This will be done at a cost of US$37M. This investment in transmission expansion will support the provision of power in the load centre of Kingston as Thermal generation in the area is retired. This will also enable customers to benefit from a stable and, secure power grid that reduces technical losses.

JPS will complete the change out of streetlights across the island by the end of 2021. The programme will facilitate the replacement of 68,000 HPS lamps with **smart LED lamps** bringing the total to 110,000. This will result in the further reduction of the street lighting bill and energy

consumption by 50%, improve visibility, support the smart grid and allow for remote monitoring and control of all streetlights in Jamaica.

In advancing the programme to achieve end to end efficiency, JPS will, among others things, implement the following major projects.

- Complete the roll out of **Smart Meters** throughout the network. This project will enable the detection of losses while significantly reducing the operations and maintenance costs related to meter reading and billing.
- Conduct **overhauls of critical generating units** such as the Bogue combined cycle plant and the Rockfort Units, to ensure they deliver power more efficiently. This will keep maintenance costs from growing while ensuring units convert fuel at the most efficient rates.
- Complete the development of **Enterprise Asset Management**, which will facilitate greater efficiency as the proper management of assets become more structured and achievable.

The agenda for growth will see JPS commissioning two **distributed generation** projects during the period. This initiative comprises 14 MW of generation placed directly adjacent to large customer operating locations and will have the effects of boosting reliability, enhance efficiency of plant utilization providing waste heat to customers and reducing the incentive for grid defection. This is a key prong of the growth strategy as it encourages commercial and industrial customers to remain on the grid while their boosting production. JPS will also roll out **electric charging stations** as a fundamental catalyst for the development of the Jamaican electric vehicle industry. This investment will provide the means through which EV owners will have the ability to charge their vehicles throughout the island if needed. The potential for growth from electrification of transportation can be exponential for JPS and therefore has a price benefit for customers.

To boost safety JPS will complete the roll out of **digital mobile radios** to operations staff, upgrade its **safety signage infrastructure** throughout operating and service locations island wide, upgrade its emissions monitoring infrastructure at power plants and continue the installation of **security cameras** at critical locations. **Information Technology Security** is also critical as data storage needs grow. To this end cloud security, firewall infrastructure and BOYD security will be improved throughout the period to staff, customers and business partners.

Over the next five years, JPS will achieve compliance with the Regulated Thermal Heat Rate Target, achieve 23% improvements in reliability as measured by the SAIDI and SAIFI indices, reduce system losses by 2.30% points and improve productivity by an annual rate of 1.9% on controllable Opex.

To achieve these outcomes, the Company will make prudent investments in its Generation, Transmission and Distribution and General Plant. Some of these investments will generate transformative effects in how the utility operates.

JPS	US$'000						
	Forecast					Total	Average
	2019	2020	2021	2022	2023		
Generation							
Generation Routine	18,563	16,511	13,643	22,208	13,277	84,203	16,841
Generation Sub-Total	**18,563**	**16,511**	**13,643**	**22,208**	**13,277**	**84,203**	**16,841**
Transmission							
Transmission Expansion	154	2,170	9,900	16,789	14,862	43,875	8,775
Routine Asset Replacement	3,511	3,747	3,908	3,983	4,012	19,162	3,832
System Upgrade	12,972	4,315	6,279	1,667	2,667	27,900	5,580
Transmission Sub-Total	**16,637**	**10,233**	**20,087**	**22,439**	**21,541**	**90,937**	**18,187**
Distribution							
Distribution Expansion	6,800	6,000	5,000	7,000	6,000	30,800	6,160
Routine Asset Replacement	8,863	8,425	8,983	9,351	9,547	45,168	9,034
System Upgrade	17,526	19,151	17,876	11,341	10,692	76,587	15,317
Distribution Sub-Total	**33,189**	**33,576**	**31,859**	**27,692**	**26,239**	**152,555**	**30,511**
Losses	**27,099**	**21,554**	**25,219**	**20,533**	**10,452**	**104,857**	**20,971**
IT	**3,045**	**5,514**	**6,878**	**4,975**	**3,825**	**24,237**	**4,847**
Facilities and Other	**2,650**	**2,497**	**3,773**	**2,768**	**2,596**	**14,284**	**2,857**
Business Development	**500**	**592**	**400**	**-**	**-**	**1,492**	**298**
System Control	**-**	**1,176**	**1,000**	**3,029**	**1,018**	**6,223**	**1,245**
Rate Base Total	**101,683**	**91,652**	**102,859**	**103,644**	**78,949**	**478,788**	**95,758**

Table 43: Capital Investment by Category 2019-2023

13.1 Generation

JPS generating fleet has the capacity to deliver 640 MW of power on a daily basis. JPS will invest US$84.2M over the medium term mainly to overhaul and maintain its fleet that have reached their OEM recommended running hours. This investment will enable improved customer service and greater efficiency as they enable the Company to meet more stringent fuel efficiency standards for the grid and improve unit availability. Some key interventions include the investment of US$32M in maintenance initiatives on the Combined Cycle Plant at Bogue over the period with overhauls on GT12 and GT13 in 2019 and 2020 respectively, as well as both units in 2023; and a full overhaul of the highly efficient ST14 in 2022. This investment will keep the gas powered plant delivering 120 MW of power at a heat rate below 9,000 kJ/kWh.

The woodstave pipeline network along with the generator and controls units at five Hydro Plants will also be upgraded at a cost of US$8.5M. These systems are all outdated and their productive

capacity have reduced, resulting in forced outages. These planned upgrades will evidently result in improved efficiency of the hydro generation fleet.

13.2 Transmission and Distribution

JPS is the sole entity in Jamaica Licenced to Transmit and Distribute electricity and as such must ensure that the T&D grid is capable of reliably moving power from power plants to customers' premises, while ensuring safety and stability of power supply. JPS will invest US$243M over the next five years to address known grid deficiencies while enhancing the resiliency of the system resulting in improved reliability. JPS will replace and upgrade defective assets, expand the system to facilitate growth and improve compliance with grid codes while staying true to the service area concept. These investments will enable JPS to achieve its strategic objectives of customer service excellence and growth thus improving the customer experience while lowering energy bills.

The main T&D projectsto be completed over the period are:

The construction of a new 69kV transmission line from Bellevue to Roaring River in the northern side of the island. This will be built at a cost of US$6.8M. This will solve the chronic low voltage condition in and around the Ocho Rios area, providing the stability required to meet the power needs of the existing 50,000 customers in the area and allow for additions in light of the expected expansion in tourism in the area. This new transmission line will provide a new access point to eliminate the radial design in the service area and also put the grid closer to N-1 contingency compliance as required by the Grid codes.

JPS will **refresh its transformer network by investing US$16.5M replacing or adding 8 distribution transformers and four interbus transformers to the grid**. The transformers which will be added will facilitate the connection of new load across growing population centres. The programme will also aid the transferability of power within service areas and reduce the impact of maintenance outages on customers.

JPS will also make a significant US$17.6M investment to **continue its Voltage Standardization programme, standardizing 12 feeders across north and central Jamaica from 12kV to 24kV**. This will reduce technical losses thus improving efficiency while facilitating transferability of load to neighbouring substations. The customer service experience on these feeders will significantly improve with the added benefit of being able to transfer loads. Previous feeders that were upgraded have seen the duration of outages reduced by up to 70%. This will therefore be a major contributor to customer service improvement over the medium term.

The Company will invest US$13.1M to **continue the Grid Modernization Programme**. This will see approximately 1,500 smart devices rolled out across the distribution network including 1,250

trip savers, 180 fault circuit indicators, 110 DA switches and 23 pole mounted reclosers. These devices will address temporary faults, which account for 90% of all faults at the distribution level. These smart devices will play a major role in allowing JPS to achieve its objective of 23% reduction in the duration of outages hence enhancing the customer service experience.

The **routine replacement of defective poles and related equipment on the Transmission and Distribution network** will also benefit from increased investment over the medium term. Data from the outage management system has shown that one of the leading causes of outages is defective equipment such as poles, cross arms and insulators. JPS' patrol and asset management data has also revealed that close to 10% of the 280,000 poles on the network are currently defective at an 80% defect level. Given that this level of defect increases each year as equipment ages, the Company will invest US$40M over the next five years to replace or rehabilitate approximately 37,000 defective poles and 59,000 pieces of equipment on the distribution system and 2,700 transmission poles, 1,600 insulators and 166 transmission structures (steel poles and towers).

13.3 Loss Reduction

System losses is one of the greatest inefficiencies that currently exists within the operations of the Company, with 26.27% of the energy produced being lost to technical and non-technical drivers at the end of 2018. This inefficiency presents a cost that impacts the Company's profitability as well as electricity prices. To tackle the problem of system losses, JPS will invest US$104.8M over the next five years to deliver a 2.30% points improvement and set the platform for significant future reductions. The two major investment programmes being pursued are:

Complete the roll-out of **Smart Meters** within the five year period at a cost of US$85.2M. Smart Meters will optimize the remote detection and measurement of losses, enabling response teams to carry out targeted spot audits. These meters also allow for greater efficiency as they eliminate the need for manual meter reading, reduce the cost of billing as well as enable remote disconnections and reconnections. This will improve the Company's productivity and help to lower the cost of energy.

Advance the roll-out of **RAMI** infrastructure throughout the period with US$17.3M earmarked for this investment. The RAMI programme is an anti-theft solution to be rolled out in 80 communities where the level of theft is so high that the success of the smart meter programme operating without further technical support may be compromised. The solution involves moving the customer meter to an enclosure on the utility pole and makes tampering extremely difficult. It also dis-incentivizes throw-ups as energy usage would still be recorded on the meters. This

programme will see the conversion of approximately 14,500 consumers to customers using this technology.

13.4 Information Technology

As JPS modernizes its operations, and increase the use of information, technology will play an increasingly significant role in the Company's future success. IT systems can become outdated in a three to five year window as technological advancement takes place. Over the medium term, JPS will be reinvesting in IT infrastructure to keep key functions connected and to unleased new functionalities.

The Company will replace the **Customer Suite Platform** with an upgraded and more interconnected customer service platform to enable shorter processing times and improved internal controls at a cost of US$3.5M. As technologies such as smart meters and smart streetlights are rolled out the functionalities needed on the customer service platform become more automated. The upgraded customer suite platform will enable the business to take advantage of the benefits of these technologies.

JPS will expand its business intelligence and analytical capabilities through a US$3.6M investment. The **Business Intelligence programme** will see the rollout of a data lake, data warehouses and data virtualization platforms to enable JPS to become a truly digital business utilizing analytics and business intelligence. This will enable greater business insights to drive business performance improvements, cost reductions and productivity improvements.The Company will complete the rollout of the **EAM** platform throughout the Generation and Distribution operation units at a cost of US$2.6M completing the programme started in 2017 giving the Company a more structured way of planning and monitoring its assets.

JPS communication network allows for safe and seamless interaction between field teams and system control teams and is the nervous system of the electric grid. The Electric Grid **Communication Network Rehabilitation and Upgrade programme** will be executed over the five years at a cost of US$4.8M to modernize the Core Telecoms Network, carry out Radio Tower Rehabilitation and to update SCADA & Teleprotection Fibre devices to IP based devices. This asset replacement project will improve service delivery through a more robust network supporting centralized and decentralized operating systems, increased productivity and business effectiveness through reliable communications and facilitate a Smart Grid to support loss reduction activities.

As JPS seeks to transform Jamaica's electricity landscape to meet the ever more sophisticated needs of customers while providing a return for shareholders it must ensure its investments are

sound and that proposed benefits are achieved. The investment plan that will accompany this document sets out in detail the development of the capital investment portfolio as well as more exhaustive detail on individual projects and how they will deliver value to customers.

Risk & Uncertainty

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RISK AND UNCERTAINTY

14. Risk and Uncertainty

JPS business model is unique in that its assets blanket the entire country in a very pervasive manner. Coupled with the fact that the product it supplies is potentially life-threatening if not consumed in a responsible manner, risk is inherent in all the Company's business activities. With technological advancements in recent years, customers have access to more options to satisfy their power needs, and as such, the Company operates in an atmosphere of tremendous market uncertainty and growing demands from regulators, shareholders, customers, employees and other stakeholders, which amplifies the risk level in what was a fairly stable unchanging business model for one hundred years. A disciplined approach to managing risk is therefore critical for JPS to become resilient — avoiding unanticipated losses, managing uncertainty and capitalizing on opportunities.

14.1 Risk Management Framework

The Company is guided by a risk management framework, which is geared towards maximizing opportunities and minimizing exposure and losses. This framework includes best practices and global standards utilized in the utility industry. Risk management is embedded in the organization through policies and procedures and is supported by a governance structure, which incorporates the board of directors, audit committee, executive leadership, senior leadership, management, risks council and risk champions. Senior management has responsibility for monitoring and managing risks in their respective business units and report quarterly to the Board of Directors who oversees the risk management framework.

Risk management is integral in the strategic planning process, decision making and day-to-day activities. The risk management framework includes mechanisms for actively identifying, assessing, responding, reporting and monitoring of key risks associated with the Company's business. These risks are captured in a risk register which is completed with clear modalities for responding to each risk should they be realized. The Risk Council meets quarterly and updates the register. Functional leaders are required to routinely make submissions to the risk council and sign off on the completeness of the risk register prior to the register being presented to the quarterly board meeting. The framework supports alignment between strategic objectives, controls and the actions of staff, individually and collectively towards achieving business objectives.

14.2 Major Risks and Mitigation

Some of the major risks factors faced by JPS over the next five years are:

- Prolonged disruption by natural disaster
- Major system failure (power generation / T&D)
- Major supply failure (fuel, transformers etc.)
- Major reputational damage (fatality, injury, spills)
- Major breach of IT systems
- Significant macroeconomic change (foreign exchange, interest rate etc.)
- System losses (regulatory & financial impact)
- Industrial action
- Loss of specialist talent to other companies and countries

PROLONGED DISRUPTION AS A RESULT OF NATURAL DISASTER

Jamaica is susceptible to natural disasters for at least six months of the year (June to November), with the Company's Transmission & Distribution (T&D) infrastructure being especially vulnerable. While Jamaica has not suffered a direct hit in recent years, countries in the region have been less fortunate, with one example being Hurricane Maria in 2017, which almost destroyed the entire electric grid of Puerto Rico. This risk will remain in the future, and as such, the Company prudently manages this ongoing risk as outlined below:

Comprehensive Disaster Management Programme - The program forms the basis of disaster planning, recovery and business continuity, and is tested and improved annually. The effectiveness of this disaster management program is evident when one looks at the historical restoration timeline after a natural disaster event. The Company aims to maintain a high level of emergency planning and disaster preparedness through continued training, simulation, adoption of lessons learned from its experiences and international best practices.

JPS will:

- Continue to train and indoctrinate more personnel in disaster preparation
- Continue to have scheduled disaster simulation and drills
- Increase focus on earthquake simulations
- Adopt lessons learnt
- Continue joint dialogue, training and simulation with mutual aid agencies
- Strengthen construction standards for infrastructure installation

Electricity Disaster Fund (EDF) - The Company, under the purview of the Regulator maintains the EDF. This was established for the sole purpose of responding to damage to the T&D network in

the event of a natural disaster. The EDF has accumulated to a reasonable size which should be sufficient to fund the restoration of a major disaster within reasonable time. The Company is currently exploring other options to provide additional protection for the T&D network as a redundancy to the existence of the fund.

Structural Integrity Programme - This program will see the Company expending approximately US$41.8M over the next five years. Works to be undertaken will include major rehabilitation of poles and pole structures, transmission towers and substation equipment to further harden the network, making it more resilient to natural disaster occurrences.

Business Continuity Plan (BCP) - JPS has a strong track record of preparing for many types of emergencies that could impact its ability to generate and/or deliver power. JPS' business continuity planning includes preparing for events and scenarios that may affect the ability of the Company to provide reliable electric power, as well as events that could severely limit the number of employees able to report to work. Baseline staff requirements and the tools required to sustain operations all have to be contextualized in the development of this plan. Areas of focus in the development of the plan include how to improve risk mitigation, emergency planning and disaster preparedness; remain compliant with regulations and be good environmental stewards throughout the process. The Company recently augmented its BCP preparedness, which focused on resumption of business after a disaster unique to JPS. Preparatory steps include:

- Complete inventory of organizational processes with designated classification (critical, vital, necessary, not required)
- Manpower requirements in line with classification of business processes
- IT system, including restoration priority based on process classification
- Alternate locations from which departments would function, in the event local offices are unavailable
- JPS Business Continuity Plan has several elements and contemplates the occurrence of several significant and adverse events. The two major elements of the business continuity plan are:
    - Disaster preparedness plan to deal with the effects of natural disasters including system restoration
    - A business continuity plan for other eventualities including significant negative impact on the Company's IT and Communication infrastructure. This includes a standing Disaster Recovery Management Team and system backup capabilities including off-site facility and strategic system redundancies.

MAJOR SYSTEM FAILURE

JPS has significant infrastructure assets across the Generation, Transmission and Distribution network which are widely dispersed across the island. Each year the Company invest in maintaining, upgrading and improving its infrastructure. However, they are exposed to varying risks including operational, environmental, sabotage and other malicious attacks including cyber-attacks which could precipitate a system failure.

The electric grid is undergoing transformation that includes changing the mix of generation technologies, utility scale renewable sources, introduction of storage, and the proliferation of smart equipment and sensors on the T&D grid. With each change there are associated risks which must be managed to ensure continuity of service. The Company's infrastructure is made up of aging generating equipment, for which there is an absence of readily available spare parts. It also has aging T&D infrastructure with thousands of devices and equipment which can malfunction. Additionally there are inherent and known grid design constraints. Recent experience includes two system failures experienced in 2016, both emanating from conditions that should have been resolved fairly routinely.

The presence of intermittent renewables on the grid presents a challenge for stability of power supply and risk of a high frequency of power outages especially since the relevant protection measures were absent from the grid design prior to the operation of these assets.

Some of the mitigation measures includes the following:

Annual Risk Engineering Survey - All generating stations are subject to an annual risk engineering survey with an emphasis on operations and maintenance practices, fire protections and staffing. Arising from each survey, recommendations made are implemented if feasible. In addition, there is an internal technical asset review.

BCP - Each power plant has a BCP, with appropriate response mechanisms. All BCPs will be reviewed in 2019, for efficacy and the requisite steps taken to strengthen them over the five year rate review period from 2019 to 2023.

Training – JPS will continue to focus on training and repetition of drills to improve response preparedness, improved instrumentation, situational awareness, and control methods, thereby reducing the risks of operator error leading to cascading failure.

Upgrade and Maintenance - Over the next five years, the Company will continue investing in the grid to mitigate the various risks identified. This investments include undertaking robust maintenance on the generating, transmission and distribution fleet, grid hardening to achieve N-1 contingency compliance, building new lines, addressing known grid deficiencies, feeder

reconfiguration and connectivity improvements, grid modernizations and the installation of a hybrid energy storage system.

MAJOR SUPPLY FAILURE

Given the volatility in the energy market worldwide, there is increased risk surrounding the supply of fuel and gas. A disruption of JPS' fuel supply can have material adverse effect on the generating operations of the Company. JPS is highly vulnerable to disruptions or curtailments in the production of power at its generation facilities if fuel in the form of oil or gas supplies are unavailable. In addition, delivery of fuel to JPS' facilities is dependent upon the infrastructure (including barge facilities, storage facilities, pipelines and roadways) availability to serve each generation facility.

Other risk factors that are external to JPS but can have significant impacts are:

- Credit worthiness and financial condition of JPS' petroleum fuel and natural gas supplier Availability and levels of storage and inventory for fuel
- Government regulation and legislation
- Natural disasters, wars, embargoes and other catastrophic events, including hurricanes which could delay supplies.

Fuel Supply Risk Mitigation - The Company is actively diversifying its fuel mix for generating purposes. Currently 73% of JPS fleet uses HFO and ADO, while 22% uses natural gas. By the end of 2020, 39% of generating capacity will be supplied using dual fuel generation assets (Bogue CC, GT 11). JPS will also be pursuing supplier diversification to mitigate the single supplier risk.

Supply of Equipment and Tools - The Company is also predisposed to supply failure of major parts and equipment for suppliers. JPS has suffered in the past from sole suppliers going out of business, with limited alternatives, resulting in long delays to complete projects which affect the quality of service delivered to customers. These are mitigated by ensuring multiple supplier arrangements are in place for providers of critical components and adequate lead time in placing orders.

New Power Plants missing their Commercial Operation Date (COD) - The SJPC Old Harbour 194 MW Plant, JAMALCO 94 MW, Eight Rivers 37 MW, and possible replacement of 167 MW under JPS ROFR could miss their COD, resulting in a failure to realize targets for O&M, Heat Rate performance and other business imperatives.

Operational Risks Management - There is the likelihood of extending OH2 and OH3 to August 2019, OH4, and B6 to December 2020 to facilitate grid security. Should this case materialize, this would result in an additional O&M cost to maintain these units on line.

MAJOR BREACH OF IT SYSTEMS

There is a high level of risk as it relates to Network Security. Being a nationwide utility provider utilizing SCADA components the risk of malicious activity is ever increasing and the possibility for service disruption is significant. Protocols founded in principles of least privilege, and enabling access control auditing and authorization will assist the Company in closing security gaps. The introduction and distribution of Smart devices in the field now also creates additional vectors for the exploitation or disruption for which JPS must implement mitigating controls. Technologies and practices surrounding secure access and configuration are inherent in the Company's plans, which will result in validated authentications, authorized access, and comprehensive logging which will allow for subsequent auditing and investigations. Risks addressed include:

- Ransomware attacks
- Denial of Service attacks
- Phishing Attacks

The primary cyber security mitigation strategies are education of staff, routine vulnerability scanning and corrections, strict management of access to ports, pre-authorization of devices and robust IT and OT boundary protection.

The Company is also managing aged, end of life and unsupported hardware and software. As a mitigation strategy these are being upgraded and replaced.

MAJOR REPUTATIONAL DAMAGE (FATALITY, INJURY, SPILLS)

Public risks are those associated with the public's exposure to the Company's infrastructure and can result in loss of personal property, bodily injury and death to third parties. The risk is inherent and will remain in the long term. Continued management includes the following initiatives:

Liability Insurance - The Company continues to manage its exposure against potential claims from third parties through a combination of insurance policies. The combined coverage available was increased from US$35M to US$50M any one event in July 2018. In addition, it is a requirement that the Company's agents (third party contractors) carry adequate insurance coverage where applicable.

Safety Programs External - The Company will continue to improve and increase its messaging geared to members of the public, continue vegetation management to remove instances of encroachment on lines and infrastructure and ensure assets are safe including safety shield around the electricity network facilities where practical and the safety of legal access.

SIGNIFICANT MACRO ECONOMIC CHANGE (FX, INTEREST RATE ETC.)

Liquidity Risks - The risk that the Company will encounter difficulty in raising funds to meet commitments associated with financial instruments.

Credit Risk - Is a risk of financial loss if a customer or counterparty to a financial instrument fails to meet its contractual obligations.

Market Risks -Is the risk that changes in market prices of interest rates, foreign exchange availability and fuel prices will affect the value of the Company's assets, the amount of its liabilities and or income.

The unavailability of FX could cause irreparable damage to the Company's operations and reputation if it were unable to settle bills on a timely basis. Fluctuations in interest rates, FX rates and oil prices may cause temporary disruption to operations but the licence provides for the recovery of such costs from customers although such recoveries will not be immediate.

Management of Exposure:

JPS manages its foreign exposure primarily by maintaining adequate liquid resources in appropriate currencies and by managing the timing of payments on foreign currency liabilities and through our liability management strategy which involves asset/liability matching by increasingly on boarding Jamaican dollar debt to match Jamaican dollar revenue streams. Interest rate risk is primarily managed through maintaining an adequate mix of fixed and floating rate loans within the debt portfolio. Liquidity risk is managed mainly through the effective receivables collection practices. The Company is fairly effective in obtaining payment within the prescribed period for the majority of customers and where non-compliance occurs interest or late payment fees are applied to customers' accounts.

SYSTEM LOSSES

System Losses continues to be an area of significant risk and challenge for JPS. Not only does system losses and in particular electricity theft pose the risk of financial losses, but it also poses the risk of damage to property and loss of life. As JPS invests in making the grid more resilient to theft, there is also the risk of damage to infrastructure as a result of frustrated customers and

consumers. Other risks associated with loss reduction is the risk of hostility and violence to JPS employees and contractors from people in the affected communities being impacted by loss reduction initiatives.

Another major risk to the utility is the significant penalties resulting from unreasonable and unattainable regulatory targets. This will create a disincentive for future investment in the sector and ultimately threaten the viability of the utility. For the customer, there is the risk of increased electricity prices as a result of increased electricity theft.

Mitigation:

The mitigation to these risks includes a number of actions: A key action is partnering with the GOJ to address socio-economic conditions, develop initiatives that are within the implementation and enforcement jurisdiction of the GOJ for them to pursue. Another key action is the deployment of operational anti-theft mechanisms to track and detect losses including the implementation of technical losses reduction initiatives.

JPS clearly articulating proposed reasonable and achievable targets supported by associated investment to deliver results in line with licence provisions.

INDUSTRIAL ACTION

JPS employs over 1,500 employees in a multi-contract and multi-union environment. The Company is 96 years old, so there are 2-3 generations of employees currently employed at JPS, many having only ever worked at JPS. This leads to the following key environmental factors:

- With 4 unions representing 78% of employees, there are complex Collective Labour Agreements which determine salaries, benefits and allowances for each category of worker.
- Employees work in a combination of environments ranging from sedentary desk jobs (≅60%) to travelling daily to work in the field (≅40%).
- Eighty present (80%) of employees are on open-ended contracts (permanent) and the remaining 20% are on fixed-term contracts.
- The average tenure of open-ended contract employees is 14 years, while the average contract employee has been engaged on and off for an average of 8 years.

Given the varied nature of employment conditions and the varying needs of employees and union interest, industrial action is a key Company risk.

Mitigation:
Timely negotiation of collective labour agreements and updates of HR policies and procedures will mitigate against industrial action. In addition, HR is rolling out a comprehensive employee communication and engagement strategy that will help to mitigate against industrial action.

LOSS OF SPECIALIST TALENT TO OTHER COMPANIES AND COUNTRIES

Attrition in the wider utility industry (27%) is much higher than in Jamaica (4%). This may be because JPS is an island utility. In North America or on other continents, it is easier to transfer to a neighbouring state to work in another utility, so the ability to migrate to work overseas is a barrier to leaving, especially for the highly skilled Linemen, IT professionals and Engineers.

Notwithstanding, the loss of technical staff, primarily to overseas jurisdictions has been a reality for JPS. In recent years, the Company has seen a recruitment drive especially from Canadian utilities, to attract highly skilled technical employees, and, while the attrition rate remains unaffected, it has adversely affected the skills pool.

Mitigation: -

The following activities will mitigate against the loss of talent:

- Increase the annual intake/onboarding and training of linemen
- Implement a formalized succession planning programme
- Revamp the compensation structure inclusive of recognition and reward system
- Strategic internship programme with Universities and Colleges to ensure a constant supply of talent

OTHER RISK MITIGATION:

Insurance Coverage

JPS continues to employ a proactive insurance program, which seeks to identify and optimally mitigate against the risk exposure of the company, given its dynamic operating environment. The various policies protect the Company's assets and provides liability coverage as required. All insurance policies have deductibles, which the organization inherently self-insures. Over the next five years, insurance will continue to be a key risk transfer and mitigation tool for the organization. Mindful of external market conditions over which the Company has no control, the organization reaffirms its commitment to create synergies among new coverage requirements, existing coverage maintenance and premium costs, in line with material operational changes.

Some of these coverages includes:

- Property All Risks Insurance: This coverage protects the Company against accidental loss or damage to its assets on the ground. In addition, a business interruption component provides recovery for lost earnings arising from insured events.
- Provides further protection should business activities be adversely affected for a prolonged period. The Company strives to continuously improve its overall risk rating through proactive programmes including, where justifiable, implementing recommendations from Annual Engineering Risk surveys.
- Motor Insurance: The Company maintains a sizeable vehicle fleet to efficiently undertake field operations. Consequently, relevant insurance coverage is in effect for the Company's fleet.