



# Medium Term Investment Plan

2019 - 2023

## Executive Summary

JPS Medium Term Capital Investment Plan 2019-2023 outlines to the nation the investment priorities for the Electricity sector over the next five years. The main objectives are to further improve customer satisfaction and to enhance the Company's efficiency. To this end, the Company will execute close to 72 individual projects and programmes through its investment portfolio to deliver improvements to power quality, reliability, reduce electricity losses, improve power generation efficiency, boost productivity and improve customer service.

The projects to be executed are at various stages of planning driven by the critical path to execution and have gone through an extensive internal review and approval process that considers the global economic benefits to be derived, the risk to the network, the available alternatives and the potential impact to customer's bills. The investment plan also considers that an Integrated Resource Plan (IRP) for the island is due in short order and has avoided investments that may be in conflict with the finalized IRP. Major efficiency improvement projects have been identified using system models developed through system studies, risk registers maintained by JPS as well as strategic reviews conducted over the past two years.

The investment plan is required as part of the Five Year Rate Review Process outlined in schedule 3 of the Electricity License and Criterion 6 (Table 7) and 7 of the OUR's Final Criteria. The plan also contains accompanying business cases requested in the Final Criteria provided by the Office of Utilities Regulation (OUR) which provides justification for projects.

The JPS investment plan, seeks to make the right investments in the right assets at the right time and will see the Company investing approximately US\$478.8M over five years in its regulated business to achieve its operational and financial targets. The key outcomes to be delivered are a 2.30%-point reduction in electricity losses, 20% improvement in reliability of supply, 1.9% improvement in productivity and the achievement of the regulated Heat Rate annually.

Based on deficiencies pointed out by the OUR at the initial submission JPS has adjusted key assumptions, incorporated alternatives for major projects as well as included annexes to the submission to support assumptions made in business cases.

This investment portfolio will form part of the revenue requirement in the JPS tariff application. The OUR is charged with the review and approval of the plan, facilitating the subsequent tariff adjustments to enable its execution.

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## Capital Programme Summary

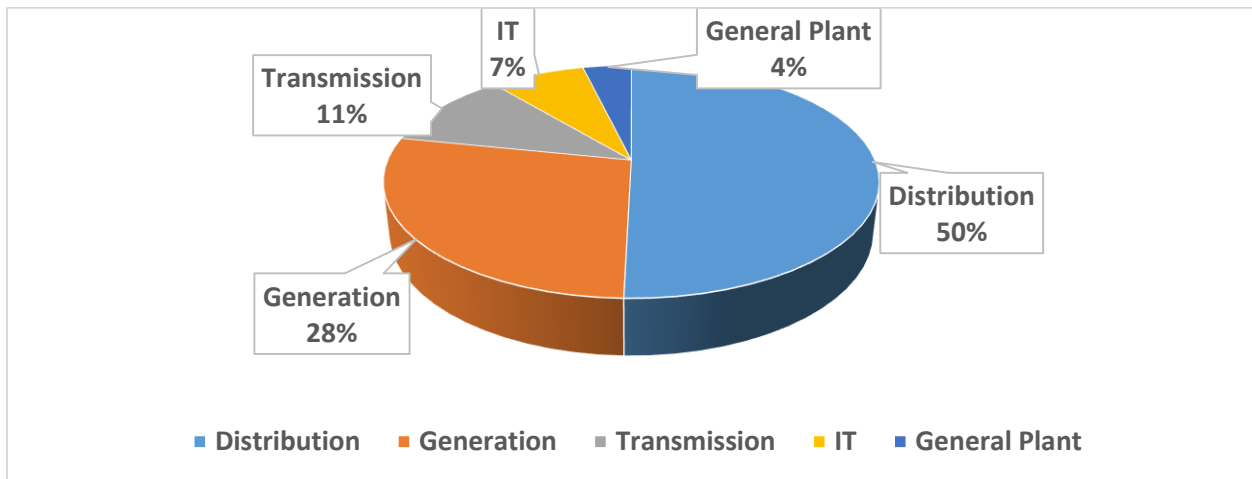
As Jamaica’s integrated electric utility JPS operates Generation, Transmission and Distribution assets to enable its core business of supplying electricity to customers. The Company is also the system operator and utilizes Information Technology and General Plant assets to execute its mission. The electricity industry by nature is a capital intensive one that demands a continuous investment programme to ensure sustenance and improvement of the customer experience.

The five-year business plan includes both operational improvements and investment actions, as focusing only in either of them would yield an inefficient and partial solution to the sectorial needs. With this in mind, JPS proposes the following investment profile for the medium term. The Company will commit 51% of its investment to replacing and upgrading assets on its Distribution network (inclusive of meter replacement programs), 11% of total investment is committed to the expansion and reconditioning of the transmission infrastructure while 28% will support the replacement and recapitalization of Generating units. To support these systems and to effectively serve customers and other key stakeholders with timely and relevant information, the Company will also invest 11% of its capex across its IT infrastructure and its General Plant.

**Table 1 – Distribution of planned investments by asset class**

Asset Class	2019	2020	2021	2022	2023	Total	%
Distribution	60,288	54,823	57,078	48,225	36,691	<b>257,106</b>	<b>50%</b>
Generation	18,563	16,511	13,643	22,208	13,277	<b>84,203</b>	<b>28%</b>
Transmission	16,637	10,233	20,087	22,439	21,541	<b>90,937</b>	<b>11%</b>
IT	3,045	6,947	7,878	7,712	3,825	<b>29,407</b>	<b>7%</b>
General Plant	3,149	3,139	4,173	3,060	3,614	<b>17,136</b>	<b>4%</b>
<b>Grand Total</b>	<b>101,683</b>	<b>91,652</b>	<b>102,859</b>	<b>103,644</b>	<b>78,949</b>	<b>478,788</b>	<b>100%</b>

**Chart 1 – Share of planned investments by asset class**



## Programme Development and Investment Drivers

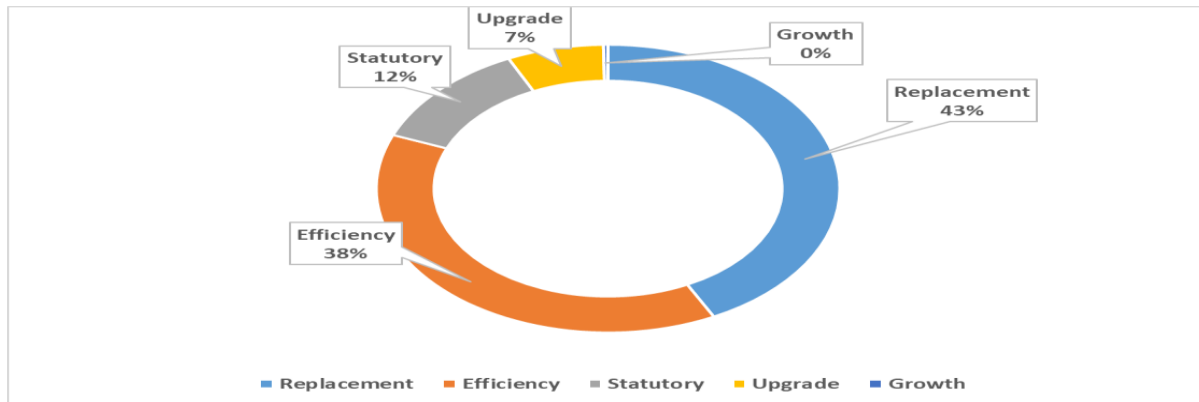
The portfolio of projects and programmes included in JPS’ Investment plan are grouped as shown below in Table 2; The groups are Growth, Efficiency, Statutory, Replacement/Maintenance and Upgrades. The groupings outline the drivers that motivate JPS to invest in particular assets.

- **Replacement/ Maintenance:** Investments to maintain the current productive capacity of assets either through predictive or corrective maintenance and the replacement of aged and defective assets.
- **Efficiency:** These projects provide improvement of JPS’ key business activities by facilitating investment in new assets and advanced systems, notably loss reduction and reliability improvement.
- **Statutory:** capital expenditures required to comply with mandatory actions imposed on JPS by either the power sector regulation (including the license) or any governmental or regulatory authority. Compliance with guaranteed standards is included in this category.
- **Upgrade:** Upgrade of an existing asset’s capacity to be able to supply larger amounts of load or improved service to customers.
- **Growth:** investments required to connect and supply the demand of new customers and the growing demand of existing customers. It includes the extension of the system to new delivery points.

**Table 4 – Investment by Investment Driver**

Investment Drivers	2019	2020	2021	2022	2023	Total	Percentage %
Replacement	39,444	39,563	40,637	49,064	35,786	204,495	43%
Efficiency	32,730	30,480	42,308	44,755	32,922	183,196	38%
Statutory	15,558	15,370	12,379	7,415	6,435	57,158	12%
Upgrade	13,451	5,646	7,135	2,410	3,806	32,448	7%
Growth	500	592	400	-	-	1,492	0%
<b>Grand Total</b>	<b>101,683</b>	<b>91,652</b>	<b>102,859</b>	<b>103,644</b>	<b>78,949</b>	<b>478,788</b>	<b>100%</b>

**Chart 2 – Distribution of investments by Driver**



## Strategic Investment Highlights

The Medium Term Investment Plan developed by JPS is a demonstration of the Company’s values and pays down on the Company’s vision for the energy grid of the future. It codifies the Company’s commitment to being the nation’s main energy partner. JPS intends to make the prudent investments that will deliver continued value for the Company and its customers while providing the energy security required to power Jamaica’s economic transformation.

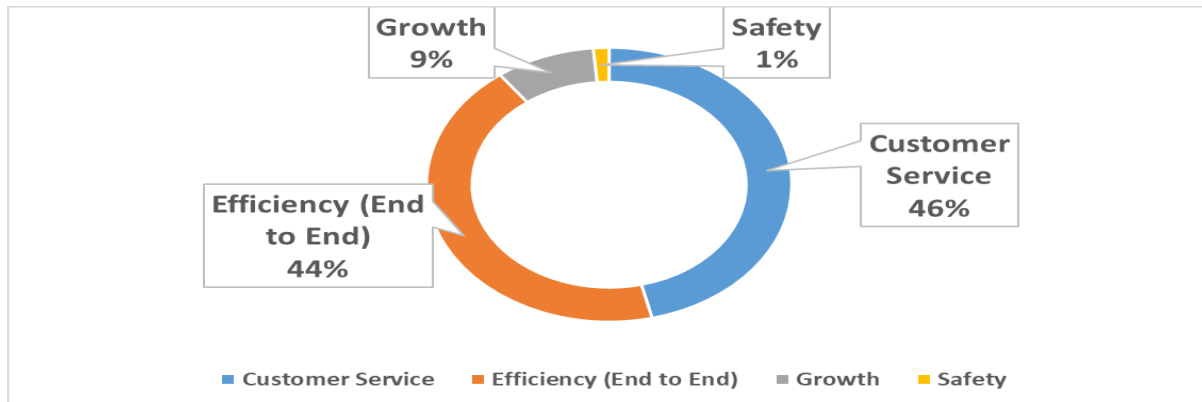
### Alignment with Strategic Priorities

To secure the energy future that customers and other key stakeholders demand, JPS will unlock investments that are aligned to its strategic plan and that are prioritized to deliver the best return for the invested dollar. Having identified Customer Service, Efficiency, Growth and Safety as its strategic priorities, the Company have aligned its investment activities to ensure these priorities are achieved. The table below outlines the annual investment by strategic priorities that the Company will execute. It shows that 46% of the investments will be to improve Customer Service and 44% slated to improve the efficiency with which the Company operates, in other words, 90% of the investment plan is focused on improving the quality of the service perceived by its customers and on reducing inefficiencies to provide them with more cost-efficient electricity.

**Table 2 – Level of investment by Strategic Priorities**

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%
<b>Grand Total</b>	<b>101,683</b>	<b>91,652</b>	<b>102,859</b>	<b>103,644</b>	<b>78,949</b>	<b>478,788</b>	<b>100%</b>

**Chart 2 – Share of planned investments by Strategic Priorities**



## **Customer Service**

JPS is aware that electricity prices and the reliability of supply are key concerns for customers. Matters of a safe environment are also of increasing concern. JPS shares these concerns and the 2019-2023 investment plan reflects the priority placed on customer service. To deliver on the pledge of improved customer service, JPS will construct a new 43KM transmission line from Old Harbour to Hunts Bay in the corporate area. This US\$37M investment in transmission expansion will also include rebuilding the 8 KM Duhaney to Hunts Bay 138kv transmission line and upgrading the 8 KM Tredegar to Duhaney from 69KV to 138KV. With planned generation retirements and the growth of demand in the corporate area, the electric grid will not be able to safely or economically supply corporate area customers without a new transmission line to bring bulk power from the generation facility in Old Harbour. The project will also eliminate the transmission bottleneck at the Duhaney S/S with this critical bypass line leading to improved N-1 contingency under normal and abnormal operations.

The service provided to customers will also improve when the Company completes the change-out of streetlights across the island by the end of 2021 with an investment of US\$24.3M. The programme will see approximately 63,000 high pressure sodium (HPS) lamps replaced with Smart light-emitting diode (LED) lamps bringing the total to 105,000. This programme will reduce 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.

Furthermore, improvements in the metering scheme (included in end-to-end efficiency) and in Information and operation technology solutions, will contribute to further enhancement of our customers' experience.

## **End to End Efficiency**

To deliver End to End Efficiency improvement, JPS will roll out 470,000 new smart meters covering customers as well as pole mounted transformers. This will lead to over 95% smart meter penetration rate by the end of the five-year cycle. This proliferation will enable the accurate detection and measurement of losses, while transforming the way the utility operates. The meter reading function that has been a key O&M cost throughout the life of the utility will virtually be eliminated by 2023. The billing process will be digitized and automated with customers empowered with near-real time access to their consumption trends. This will aid energy conservation effort as customers will have the power of information in their hands.

Once full implementation of the smart meter rollout is achieved, Jamaica will become a leading example of advanced accuracy and transparency in electricity metering and billing not only at the regional level, but globally. Such a strategic investment will not suppose a burden to our customers as it will be repaid through the savings in energy losses and operations cost reductions that it will enable.

The Company will also execute the overhaul 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.

Completing the development of Enterprise Asset Management will facilitate greater efficiency and accountability as the proper management of assets becomes more structured, scientific and achievable.

## **Growth**

Customer number growth in Jamaica is moderate, but new assets are still required to answer the new needs of existing and future customers, which are increasingly more energy intensive. New technological solutions such as distributed generation and electric vehicles have become economically interesting and JPS is ready to invest and help the nation benefit from them.

The agenda for growth will see JPS commission at least two Distributed Generation projects during the period. This will see no less than 14 MW of generation placed directly on feeders where large customers reside, boosting reliability and reducing the incentive for grid defection. This is a major prong of the growth strategy as it encourages commercial and industrial customers to remain on grid while allowing them to reliably expand their production. These distributed generation investments will lay the foundation for the establishment of micro-grids in Jamaica. Micro-grids will bring the benefits of improved reliability, lower technical losses, reduced grid congestion, and a lower peak load.

JPS will also roll out 20 electric vehicle charging stations as the base requirement for the development of the Jamaican electric vehicle industry. This investment will provide the means through which EV owners in Jamaica can overcome range anxiety, giving them the peace of mind to travel the island without fear of being out of charge. The potential for growth from electrification of transportation can be exponential for JPS and therefore have a price benefit for customers. The Company expects 30% EV penetration by 2030.

JPS will also make the investments needed to add 60 GWh of new demand to the grid over the next five years. This will require a US\$31M investment in customer growth on the distribution network. This is a critical project in keeping the price of electricity low for customers as the revenue cap mechanism requires growth in on-grid demand to reduce the average tariff.

## **Safety**

JPS holds safety as its number one strategic priority, believing all staff should be able to return home from work each day as safely as they came. While safety is not a capital intensive area the Company will make key investments to improve its safety culture. JPS will complete the roll out of digital mobile radios to operations staff and continue the installation of security cameras at critical locations.

Information Technology Security is also valued by JPS especially as data storage needs grow. To this end cloud security, firewall infrastructure and other data security programmes will be rolled out throughout the period to enhance the safety of staff as well as customers and their data.



## Investments by Segment of Activity

To achieve the outlined outcomes, the Company will make prudent investments in its Generation, Transmission and Distribution as well as General Plant. Some of these investments will be transformative to the operations of the utility.

**Table 3 – Summary Planned Investments 2019-2023 by Segment**

JPS	US\$'000					Total	Average
	Forecast						
	2019	2020	2021	2022	2023		
Generation							
Generation Routine	18,563	16,511	13,643	22,208	13,277	84,203	16,841
<b>Generation Sub-Total</b>	<b>18,563</b>	<b>16,511</b>	<b>13,643</b>	<b>22,208</b>	<b>13,277</b>	<b>84,203</b>	<b>16,841</b>
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
<b>Transmission Sub-Total</b>	<b>16,637</b>	<b>10,233</b>	<b>20,087</b>	<b>22,439</b>	<b>21,541</b>	<b>90,937</b>	<b>18,187</b>
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
<b>Distribution Sub-Total</b>	<b>33,189</b>	<b>33,576</b>	<b>31,859</b>	<b>27,692</b>	<b>26,239</b>	<b>152,555</b>	<b>30,511</b>
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
<b>Rate Base Total</b>	<b>101,683</b>	<b>91,652</b>	<b>102,859</b>	<b>103,644</b>	<b>78,949</b>	<b>478,788</b>	<b>95,758</b>
Business Development (Non-Rate Base)	2,500	6,800	5,700	5,000	5,000	25,000	5,000
<b>Grand Total</b>	<b>104,183</b>	<b>98,452</b>	<b>108,559</b>	<b>108,644</b>	<b>83,949</b>	<b>503,788</b>	<b>100,758</b>

## Generation

The JPS Generating Fleet with the capacity to deliver 640 MW of power on a daily basis will see total investment of US\$84.2M over the medium term. These investments will enable the overhaul of units that have reached their OEM recommended running hours for overhaul. Customers can expect improved customer service and greater efficiency as fuel conversion and plant availability measures will improve on a year by year basis. Along with the previously highlighted power plant at Hunts Bay, the investment plan will enable several key investments. The Combined Cycle Plant at Bogue will see investment of US\$32M over the period with overhauls to GT12 and GT13 in 2019 and 2020 as well as in 2023. A full Overhaul of the highly efficient ST14 will take place 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 turbine and generator units at five Hydro Plants will also be upgraded at a combined cost of US\$8.5M, these systems are

all degraded and outdated, with their productive capacity reduced, resulting in forced outages. The upgrades will result in improved efficiency of the hydro generation fleet.

## T&D

JPS as Jamaica's sole electricity Transmission and Distribution company must ensure the T&D grid is capable of reliably moving power from power plants to customer's premises; while ensuring safety and stability are maintained. Interruptions of supply have economy-wide impacts and are detrimental to the country as a whole. To ensure customers are served with improved reliability, JPS will invest US\$243M over the next five years to address some known deficiencies while enhancing the resilience of the grid. The plan will require the company to expand, upgrade and replace defective assets to become more compliant with grid codes while staying true to the service area concept. These investments will enable JPS to achieve its strategic objectives of Customer Service and Growth thus improving the customer experience while lowering energy bills.

One Major T&D project to be executed over the period is the construction of a **new 69kV Transmission line** from Bellevue to Roaring River in the northern side of the island. The line will be built at a cost of US\$6.8M to solve the chronic low voltage condition in and around the Ocho Rios area. With the expansion in tourism expected in the area, this line will provide the stability required to the existing 50,000 customers in the area while allowing for new additions. This new line has been required for several years as the system design requires a new access point to eliminate the radial design in the service area. This new transmission line will also put the grid closer to N-1 contingency compliance as required by the Grid codes.

A refresh of the transformer network is another significant feature of the investment plan. By investing US\$17M over five years JPS will replace or add 8 **Distribution Transformers** and 4 **Interbus Transformers** to the grid. The transformers chosen for replacement are the most overloaded or most at risk of failure given ongoing operations tests conducted. Transformers to be added will facilitate the connection of new load across growing population centers. The programme will also aid the transferability of power within service areas enabling greater grid code compliance and reducing the effect of maintenance outages on customers.

JPS will also make a significant US\$18M investment to continue the **Voltage Standardization** programme; moving 12 feeders across north central Jamaica from 12 kV to 24 kV. This will reduce technical losses thus improving efficiency while facilitating transferability of load to neighboring substations. With the ability to transfer load the customer service experience on these feeders will significantly improve. Previous feeders that have been upgraded have seen the duration of outages reduced by up to 70%. This is therefore a major customer service improvement programme for JPS over the medium term.

The Company will invest US\$13M to continue the **Grid Modernization** Programme. This will see close to 1,500 smart devices rolled out across the distribution network including 1,250 trip savers and 110 DA switches and 180 fault circuit indicators. These devices will address transient 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 20% 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 see 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, example, poles, cross arms and insulators. JPS's 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. Keeping in mind that this level of defect increases each year as equipment age; the Company will invest some US\$40M over the next five years to replace or rehabilitate defective poles and equipment so as to improve customer service helping to achieve a 20% SAIDI and SAIFI reduction. Through the investment activities JPS will replace or rehabilitate close to 37,000 aged distribution poles and 59,000 pieces of equipment over the five-year period. Over 2,700 Transmission poles will be impacted along with 1,600 insulators and 166 steel towers. These investments will result in a 15% improvement of the overall T&D asset health index, reduce risk of asset failure and improve customer service.

### **Loss Reduction**

JPS knows that Losses is one of the greatest inefficiencies that currently exists within the Company with 26.38% of energy produced being lost. This inefficiency presents a cost that impacts the Company's profitability as well as electricity prices. To tackle the problem of Losses and deliver a 2.30%-point improvement the Company will take on two major investment programmes.

JPS will complete the roll-out of **Smart Meters** and supporting **field area network** within the five-year period at a cost of US\$85M. Smart Meters will optimize the remote detection and measurement of losses, enabling response teams to carry out spot audits. These meters also allow for end to end efficiency as they eliminate the need for 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 for each customer.

The continued roll-out of **RAMI** infrastructure will continue throughout the period with US\$17M 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 smart meters may be compromised. The solution involves moving the customer meter to an enclosure on a pole and makes tampering extremely difficult. It also disincentives throw-ups as energy usage would still be recorded on the meters. This programme will see the conversion of 20,800 customers across 80 communities to this technology.

### **IT Business**

As JPS modernizes its operations, information and operational technology investments will play an increasingly significant role in future success. JPS must therefore calibrate its IT investments to take advantage of new technologies to improve its operational performance and overall productivity. JPS strives to integrate any new technology that is cost-effective for its customers and provide them with the advantages of modern management and information exchange solutions. IT systems can become outdated before its intended six-year service life as technology increase the rapid pace of advancement. Within the medium term, JPS must reinvest in its IT infrastructure to keep key functions connected and to unleash new functionalities.

The Company will replace the **Customer Suite platform** for US\$2.8M with an upgraded and more interconnected customer service platform to enable shorter processing times and improved internal controls. As technologies such as smart meters and smart streetlights are rolled out the functionalities needed in a customer service platform changes to create automation from meter

reading to billing. The upgraded customer suite platform will enable the business to take full advantage of the benefits of these technologies.

JPS will also seek to expand its **Business Intelligence** and analytical capabilities with a US\$3.6M investment. This will enable the Company to put in place the necessary systems to deliver actionable business insights on a timely basis to give decision makers the needed tools to drive service delivery and business improvements. As JPS' data volume grows the Company must put itself in a position to take advantage of big data. 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 higher level analytics to optimize operations. This programme will drive the reduction of O&M costs and lead to productivity improvements.

The Company will complete the rollout of the **Enterprise Asset Management** platform throughout the Generation and Distribution operation units with a US\$2.6M investment. This investment will enable the Company to complete the programme started in 2017 and give it a structured way of planning and monitoring its asset management efforts. The project will support the JPS asset management philosophy for each asset class and will give all stakeholders a scientific way of tracking assets throughout their lifecycle.

As a telecommunication Company JPS must also invest in its communication network infrastructure. The communication network is the nervous system of the electric grid and allows for safe and seamless interaction between field teams, system control teams and other monitoring or management teams. The **Electric Grid Communication Network Rehabilitation and Upgrade** programme will be executed over the five-year period at a cost of US\$4.8M to modernize the Core Telecoms Network, carry out Radio Tower Rehabilitation and to update SCADA & Teleprotection Fiber devices to IP based devices. This rehabilitation and upgrade project will improve service delivery through a robust network supporting centralized and decentralized operating systems, real-time control of field devices, increased productivity and business effectiveness through reliable communications and facilitate a Smart Grid to support loss reduction business ventures.

The IT investments JPS will make also extend to the system control function that the Company plays. The Automated Distribution Management System (ADMS) will be rolled out between 2020 and 2021 at a cost of US\$0.7M. This will see the introduction of a **Distributed Energy Resource Management System** (DERMS) to enable system control visibility of Photo Voltaic (PV) installations, Distributed Generation systems and micro-grids so as to enable safe and reliable dispatch of generated power. The programme will also see to the replacement of the end of life **Outage Management System** for US\$2.2M. The new system will integrate well with new smart devices and provide accurate and timely outage information across the network.

With threats to data security on the rise and as electric grids become a greater target, JPS will also make investments to improve **IT Security**. This will protect the critical assets and data resources of customers and the company and its customers. The need for this investments continues to grow as JPS adds more smart devices to the Grid.

## Conclusion

As JPS seeks to transform the Jamaican electricity landscape to meet the ever more sophisticated needs of customers while providing a return to shareholders it must ensure its investments are sound and that proposed benefits are achieved. The investment plan that accompanies this filing, sets out in greater detail the development of the investment portfolio as well as more exhaustive detail on individual projects and how they will deliver value to customers. In the absence of an integrated resource plan, this investment program reflects the best electricity investments for Jamaica at this time. The Plan will deliver a reduction in the duration and frequency of outages across the island by 20%, facilitate a 2.30% reduction in system losses; help to improve productivity by 1.9% and ensure JPS meets its generation efficiency targets. It reflects the right investments in the right assets at the right time.