

Hardware Replacement

Regulatory Business Case (RBC) 2024-29

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1. Summary

This business case has been prepared to support the 2024-29 Regulatory Proposal. The business case demonstrates that Power and Water has undertaken appropriate analysis of the need and identified a full suite of credible options that will resolve the need, to ensure that Power and Water continues to meet the National Electricity Objectives and manage the network prudently and efficiently.

The proposed expenditure identified in this business case will undergo further assessment and scrutiny through Power and Water's normal governance processes prior to implementation and delivery.

This business case addresses the technical end-of-life of the in-scope hardware assets that underpin key business systems which in turn support Power and Water's critical business processes.

1.1 Business need

ICT infrastructure underpins Power and Water's key business systems which in turn support Power and Water's critical business processes.

Regularly refreshing critical ICT enterprise infrastructure is required to maintain the reliability of the services provided by the infrastructure. ICT infrastructure assets over time reach either:

- Technical end-of-life – when the assets are either:
 - No longer supported by the vendor
 - Not capable of performing the required function
 - At heightened risk of failure.
- Economic end-of-life - when the costs of refresh/replacement is exceeded by the costs of asset unreliability and/or constrained functionally.

It is common industry practice to replace critical infrastructure (which includes the ICT infrastructure within scope) before they are at increased risk of failure and this is Power and Water's current practice.

Failure to replace ICT hardware can lead to the following consequences:

- Hardware failure leading to business disruption
- Insufficient cyber security protection, undermining Power and Water's drive to improve its cyber security maturity
- Loss of productivity
- Repair costs in addition to replacement costs.

ICT infrastructure replacement is a recurrent activity with the timing of replacements and upgrades determined by the infrastructure lifecycle.

1.2 Options analysis

The options considered to resolve this need are shown in the table below.

Table 1 Summary of credible options

Option	Option name	Description	Recommended
1	Replace on failure	No proactive replacement is undertaken; a replace on failure strategy is adopted	No
2	Vendor-based replacement	Replace hardware based on the vendors' recommended asset life cycle	No
3	Risk-based replacement	Refresh ICT infrastructure assets based on assessment of risk – this typically allows extension of asset lives beyond those recommended by vendors without a material change in risk	Yes
4	Migrate to Infrastructure as a Service (IaaS)	Adopt an IaaS model as the de facto approach, moving from on-premise devices	No

1.3 Recommendation

Option 3 – risk-based replacement or upgrade of enterprise ICT hardware is the recommended option at an estimated capital cost of [REDACTED] (real 2021/22) for the 2024-29 regulatory period. This is the least-cost technically viable solution and is a continuation of the hardware replacement program in the current regulatory period.

This option¹ is

- Aligned to Power and Water's corporate Strategic Plan (2020 – 2030) and to the ICT Strategy.²
- Prudent and has been carefully considered and informed by current data and information.
- Not in excess of the amount required to efficiently support our network investment and day-to-day operational activities.

Table 2 shows a summary of the expenditure requirements for the 2024-29 regulatory period.

Table 2 Forecast annual capital and operational expenditure (\$m, real 2021/22)

Item	FY25	FY26	FY27	FY28	FY29	Total
Capex	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Opex	-	-	-	-	-	0.00
Total	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

¹ This business case outlines the hardware replacement program, however, the scope, impacts, interdependencies, sequencing, resourcing, schedule and costings for individual projects will be completed as part of Power and Water's internal final business cases.

² Power and Water, ICT Strategy 2024-2029

The forecast expenditure for the next regulatory control period allocated to Standard Control Services as per the CAM is outlined in Table 3.

Table 3 Forecast annual capital and operational expenditure – allocated to SCS (\$m, real 2021/22)

Item	FY25	FY26	FY27	FY28	FY29	Total
Capex	■	■	■	■	■	■
Opex	-	-	-	-	-	0.00
Total	■	■	■	■	■	■

The forecast expenditure for the next regulatory control period allocated to recurrent and non-recurrent categories is outlined in Table 4.

Table 4 Forecast annual capital expenditure – recurrent and non-recurrent

Item	FY25	FY26	FY27	FY28	FY29
Recurrent	100%	100%	100%	100%	100%
Non-recurrent	-	-	-	-	-

2. Identified need

This section provides the background and context to this business case, identifies the issues that are posing increasing risks to Power and Water and its customers, describes the current mitigation program and its delivery status, and provides a risk assessment of the inherent risk if no investment is undertaken.

2.1 Asset condition and emerging issues

ICT infrastructure components such as servers have an operational lifespan of 4-5 years. Several ICT infrastructure items supporting current business systems will reach their end of life in the 2024-29 regulatory period. These need to be replaced to mitigate the risk of infrastructure failure³ that will adversely affect the availability of business systems and minimise disruption to the ongoing operating capability of Power and Water.

The operational life of this hardware is determined by several factors, including:

- Availability and cost of spare parts: beyond 5 years, manufacturers no longer produce replacement components, sourcing these components becomes more challenging increasing the likelihood of extended system outages
- Cyber security requirements: Power and Water needs to improve its cyber security maturity level to respond to the updated *Security of Critical Infrastructure Act* 2018 ('SOCI Act') and to the increasingly challenging threat landscape
- Business continuity: high reliability hardware is critical to avoid business disruption and the associated costs
- Functionality: supporting related projects and environments: Support the requirements of the Capability Uplift project⁴ and corporate SCADA environments such as OSI Historian
- Performance: the increasing demands of users, systems, and [data management] lead to the need for increased functionality of the underlying hardware and firmware.

Obsolescence of equipment is a major driver for the replacement of ICT hardware. As assets reach their end-of-life the following risks increase:

- Reliability risk: the risk of unrecoverable failure increase rapidly due, for example, to obsolescence of the hardware and firmware, including lack of replacement parts needed for the infrastructure and lack of vendor support (for the hardware and firmware); the rate of failure for this sort of equipment is not linear and increases with age
- Cyber security – the risk of exposure to cyber security attacks increases due to the combination of the increasing threat landscape and because firmware is not updated.

Power and Water's ICT environment is changing and which will increase demand on, and criticality of, existing hardware and firmware. To ensure the hardware is fit-for-purpose, upgrade or replacement of selected end-of-life items will be required during the next RCP. This cost has been allowed for in this business case.

³ Current replacement strategies to manage hardware to specification have successfully avoided infrastructure failure

⁴ Refer to Transformation Capability Uplift business case

2.2 Current management program

It is common industry practice to replace critical infrastructure (which includes the ICT infrastructure within scope) before they are at increased risk of failure and this is Power and Water's current practice.

ICT infrastructure replacement is a recurrent activity with the timing of replacements and upgrades determined by the infrastructure lifecycle.

The ICT assets within the scope of this business case are:

- Servers for virtualisation, communication, applications and networks
- Communication network infrastructure for providing network services, monitoring, switching and routing
- Databases (data storage, backup and recovery)
- Disaster recovery and business continuity infrastructure
- Enterprise application and data integration infrastructure
- Enterprise digital and physical security infrastructure
- Software and licences required to sustain operating environments and functions (operating systems and database management systems) bundled with the hardware.

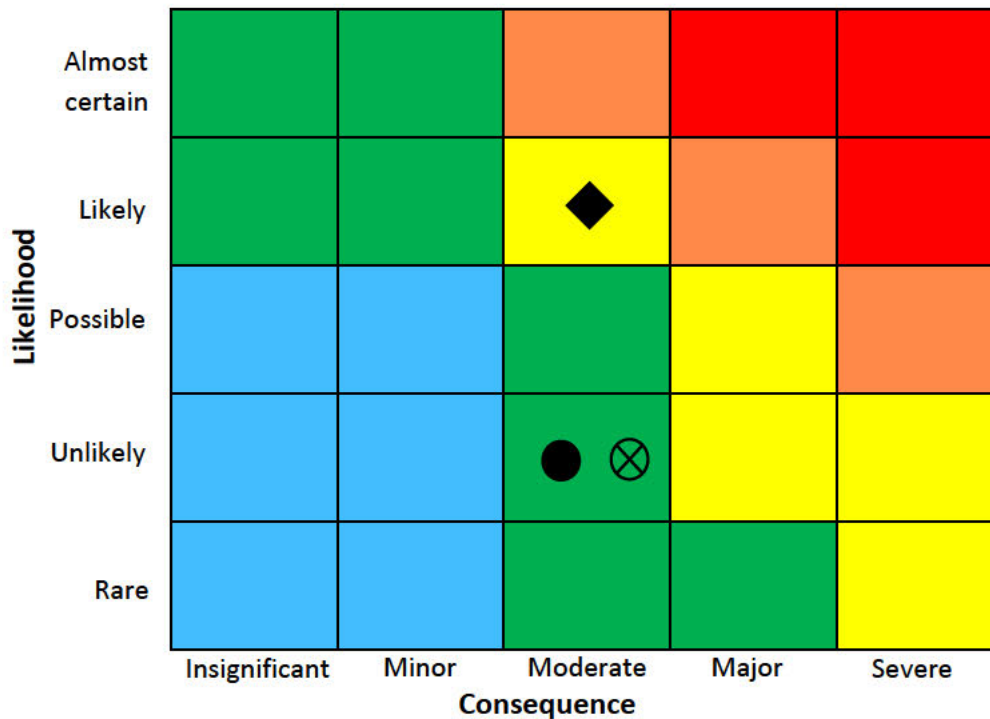
Power and Water have a recurrent hardware replacement program in place in the current regulatory period, which is on average estimated to incur [REDACTED] (real 2021/22) per annum for FY23 and FY24.

2.3 Risk assessment

The figure below shows the current risk rating, inherent rating in 2029 (if no proactive action is taken), and the residual risk ratings. The basis for the rankings is summarised below, with supporting information provided in Appendix B.

- **Current Rating** is 'Medium': Although Power and Water currently refreshes, upgrades, or replaces hardware in accordance with our risk-based assessment (i.e. whether it is at end-of-life) which should mean failures are unlikely, the criticality of the hardware means that the consequences of disruption will be at least moderate
- **Inherent rating** is 'High': without any action during the course of the next RCP to refresh, upgrade or replace critical hardware assessed to be at end-of-life, the consequences described in the table below are likely to eventuate by the end of the next RCP (i.e. FY29); as the highest risk is Moderate, this is taken to be the overall risk rating.
- **Residual rating** is 'Medium': for the same reasons discussed for the 'current rating', the proposed refresh/upgrade/replacement of hardware during the course of the next RCP will mean that the risk of business disruption (including from cyber-attacks) remains as 'Medium'.

Figure 2 Risk matrix for hardware replacement issues



Legend: ● Current rating ◆ Inherent rating (do nothing) ⊗ Residual rating (project completion)



Table 5 Risk analysis

Risk Title	Residual Risk Rating			
	Option 1 Do Nothing	Option 2 Vendor-based replacement	Option 3 Risk-based replacement	Option 3 IaaS
Major disruption to key system as a result of asset failure	High	Moderate	Moderate	Moderate
Inability to service capacity needs of future projects	High	Low	Low	Low
Cyber security vulnerability	High	Low	Low	Low

2.4 Summary

Regularly refreshing critical ICT enterprise infrastructure is required to maintain the reliability of the services provided by the infrastructure. ICT infrastructure assets over time reach either:

- Technical end-of-life – when the assets are either:
 - No longer supported by the vendor
 - Not capable of performing the required function
 - At heightened risk of failure.
- Economic end-of-life - when the costs of refresh/replacement exceeds the costs of asset unreliability and/or constrained functionally.

Failure to replace ICT hardware can lead to the following consequences:

- Hardware failure leading to business disruption
- Insufficient cyber security protection, undermining Power and Water's drive to improve its cyber security maturity
- Loss of productivity
- Repair costs in addition to replacement costs.

It is common industry practice to replace critical infrastructure (which includes the ICT infrastructure within scope) before they are at increased risk of failure and this is Power and Water's current practice.

3. Options analysis

This section describes the various options that were analysed to address the identified need and to identify the recommended option. The options are analysed based on ability to address the identified needs, prudence and efficiency, commercial and technical feasibility, deliverability, benefits and an optimal balance between long term asset risk and short-term asset performance.

3.1 Comparison of credible options


























Credible options are identified as options that address the identified need, are technically feasible and can be implemented within the required timeframe. The following options have been identified:

- Option 1 – Replace on failure. No proactive replacement is undertaken; a replace on failure strategy is adopted for this option.
- Option 2 – Vendor-based Replacement. This option proposes to replace hardware based on the vendors' recommended asset life cycle.
- Option 3 – Risk-based Replacement. This option proposes to refresh ICT infrastructure assets based on assessment of risk – this typically allows extension of asset lives beyond those recommended by vendors without a material change in risk.
- Option 4 – Infrastructure as a Service (IaaS). This option proposes to adopt an IaaS model as the de facto approach, moving from on-premise devices.

A comparison of the four identified credible options and the issues they address in the identified need is depicted in Table 6.

These options are described and assessed in detail in the sections below.

Table 6 Summary of options analysis outcomes

Assessment metrics	Option 1	Option 2	Option 3	Option 4
NPV (\$m, real 2022)	<option 2			
Capex (\$m, real 2022)	<<option 2			
Opex (\$m, real 2022)	>>option 2			
BCR	n/a	n/a	n/a	n/a
Meets customer expectations				
Aligns with Asset Objectives				
Technical Viability				
Deliverability				
Preferred	✗	✗	✓	✗

Ranking	4	2	1	3
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- ☒ Fully addresses the issue
 ☒ Adequately addresses the issue
 ☒ Partially addresses the issue
 ☐ Does not address the issue

n/a = not applicable; note that a cost-benefit analysis has not been undertaken as the expenditure is not benefits-driven

3.1.1 Option 1 – Replace on failure

This option will mean retaining key enterprise infrastructure/hardware that has reached their individual economic or technical lives and replace only on failure. In practice this means continuing to rely on infrastructure which is more than six or seven years old.

The advantage of this option is that it defers capital expenditure until failure. The disadvantages of this option are:

- Increasing risk of system failure: hardware failure risks will increase exponentially with age beyond the technical end-of-life which is usually 5-6 years for the in-scope assets, leading to:
 - unplanned production outages affecting organisational productivity
 - increase operating expenditure (recovery/repair/replacement)
- Functionality deficit: unable to address strategic imperatives and architectural weaknesses.
- Technology debt: upgrade costs in the future are likely to be higher due to outdated infrastructure requiring a more complex upgrade process.
- Cyber security risk: vulnerabilities may be exploited given that the cyber security improvements that typically are embedded in upgrades infrastructure will be foregone.
- Workarounds may be necessary: Power and Water may have to develop workarounds for enterprise applications that can no longer be supported.

This option is not recommended.

3.1.2 Option 2 – Vendor-driven replacement

This option proposes replacing hardware based on vendors' recommendations. On average, the end-of-life replacement determined by this method is up to five years for the hardware in scope.

The estimated capex is [REDACTED] (real 2021/22).

In Power and Water's experience, which is common in the IT industry, vendors' end-of-life recommendations for hardware (and firmware) are conservative, prioritising failure risk avoidance over cost of service. Vendors' recommended asset lives are the starting point for Power and Water's asset replacement planning process, but as discussed, risk-based replacement (Option 3) is applied in practice.

The advantages of this option are:

- Reduces cost of failure of hardware in service compared to current asset management practice.
- Issues associated with the availability and cost of infrastructure spare parts are avoided.
- The increasing demands of users for infrastructure and hardware performance are met.
- Cybersecurity vulnerability risks relating to ageing infrastructure are mitigated.
- Software support is available for infrastructure and business systems.

Whilst presenting a lower risk of disruption than the preferred option 3, it is considerably more expensive for a marginally lower risk profile.

This option is not recommended.

3.1.3 Option 3 - Risk-based replacement

This option proposes replacing hardware based on a risk assessment, which balances the risk of deferment of replacement beyond the vendor's recommended end-of-life with the savings from prudent deferment. Power and Water's experience is that there is a small risk premium but an approximately 20% cost reduction overall from deferring the replacement by 12 months (i.e. from 5 years to 6 years, on average). This is Power and Water's current practice to maintain enterprise infrastructure in a cost-effective manner of maintaining the reliability, security and supply of services.

The estimated cost of this option is [REDACTED] (real 2021/22) for the 2024-29 regulatory period.

The advantages of this option are:

- Cost efficient: it requires approximately 10% less capex than Option 2 for minimal increase in failure risk
- Maintains reliability of supply:
 - provides a quality, reliable and secure platform for users to conduct core Power and Water business processes.
 - Maintains risk of ICT infrastructure failure to impact business operations and avoids any associated cost to manage this risk at an acceptable level (i.e. risk-cost trade-off).
- Issues associated with the availability and cost of infrastructure spare parts are avoided.
- The increasing demands of users for infrastructure and hardware performance are met.
- Cybersecurity vulnerability risks relating to ageing infrastructure are mitigated.
- Software support is available for infrastructure and business systems.
- Consistent with good industry practice.

The disadvantages of this option are:

- Performance degradation and service reliability at somewhat higher risk due to age of infrastructure.
- Increased maintenance cost.
- ICT applications generally require regular updates to remain within vendor support parameters as well as to take advantage of improved capabilities.

Whilst Option 2 results in a lower risk than Option 3, the overall risk-cost trade-off is sufficient to recommend Option 3. It is a commonly used strategy in practice at other DNSPs and is likely to meet the expectations of customers and other stakeholders for Power and Water to act prudently, noting that not all hardware replacements/upgrades will be deferred beyond the vendor's recommendations.

This option is recommended.

3.1.4 Option 4 - Infrastructure as a Service (IaaS)

Infrastructure as a Service is a type of cloud computing service that offers essential compute, storage, and networking resources on demand, on a pay-as-you-go basis. IaaS is one of the four types of cloud services, along with software as a service (SaaS), platform as a service (PaaS), and serverless.

Although there are some advantages of this service, continuing to host on-premise is the more cost effective option and is aligned with Power and Water's current ICT strategy.

Cloud hosting means the Power and Water will not have control over the end of life of the hardware; the cost for external hosting will extend once the contract period finishes. If Power and Water sees an opportunity for cost saving by extending the life of a particular set of hardware, this can be achieved. Having complete control over ownership of the equipment means that this can be done. This cannot be achieved by moving to an IaaS hosting service and Power and Water could pay more for something they don't need to.

The advantages of this option are:

- Pay for what you use: fees are based on usage.
- Dynamic scaling is available: rapidly add capacity in peak times and scale down as needed.
- Future-proofing - access to state-of-the-art data centre, hardware and operating systems is available as part of the fee.
- Self-service provisioning: access via simple internet connection.
- Highest and best use of IT resources: IT staff can be reallocated to undertake higher value activities.
- Boost speed: developers can begin projects once IaaS machines are provisioned.
- Enables innovation: new capabilities can be added and APIs leveraged in partnership with developers.

The disadvantages of this option are:

- Unexpected costs: monthly fees can add up, or peak usage may be more than expected.
- It is the highest cost option (for those options costed).
- Process changes: IaaS may require changes to processes and workflows.
- Runaway inventory: instances may be deployed, but not taken down.
- Complex integration: challenges with interaction with existing systems.

SAAS applications generally require regular upgrades to remain within vendor support parameters as well as to take advantage of improved capabilities. As a result, Power and Water would be at time forced to take upgrade regardless of capacity and or priority clashes. This option is not recommended.

3.2 Non-credible options

No non-credible options were identified.

4. Recommendation

It is recommended that Option 3 – risk-based replacement or upgrade of enterprise ICT hardware at a cost of [REDACTED] for the 2024-29 regulatory period. This is the most prudent and cost-effective approach to meet the business need.

Enterprise ICT infrastructure underpins Power and Water’s key enterprise business applications which in turn support the Power and Water’s critical business processes. Regularly refreshing critical ICT enterprise infrastructure is required to meet planned business demands on ICT services and maintain reliability of infrastructure services that underpins Power and Water’s core business processes and systems for reliability supply of network services.

The proposed program is consistent with the National Electricity Rules Capital Expenditure Objectives as the expenditure is required to maintain the quality, reliability, and security of supply of standard control services and maintain the safety of the distribution system.

4.1 Strategic alignment

The “Power and Water Corporation Strategic Direction” is to meet the changing needs of the business, our customers and is aligned with the market and future economic conditions of the Northern Territory projected out to 2030.

This proposal aligns with Asset Management System Policies, Strategies and Plans that contributes to the D2021/260606 “Power and Water Strategic Direction” as indicated in Table 7.

Table 7 Strategic alignment

Strategic direction focus area		Strategic direction priority
1	Customer and the community at the centre	Improve Public Health and Safety
2	Always Safe	Cost Prudence

4.2 Dependent projects

No dependent projects have been identified.

4.3 Deliverability

Delivery risk is low. Power and Water regularly updates hardware in partnership with the vendors and integrators. Power and Water ICT adopts known industry frameworks, such as ITIL v4 and PRINCE2, to support internal processes.

Power and Water ICT adopts known industry frameworks, such as COBIT, ITIL v4 and PRINCE2, to support internal processes.

Power and Water has a well-designed and documented implementation model to direct and guide architectural choices and investments. A set of integrated architectural principles has been formulated to ensure that a holistic approach is taken in deciding on the most prudent, balanced and cost-effective approach to deliver the desired outcome.

4.4 Customer considerations

Evolving customer expectations driving higher standards Service and reliability expectations are increasing across all industry sectors, and the NT community will continue to demand high standards from Power and Water

Our customers also expect us to adopt the economically prudent solution and provide a reliable service to customers. This project will assist achieve this objective.

4.5 Expenditure profile

Table 8 shows a summary of the expenditure requirements for the 2024-29 regulatory period.

Table 8 Forecast annual capital and operational expenditure (\$m, real 2021/22)

Item	FY25	FY26	FY27	FY28	FY29	Total
Capex	█	█	█	█	█	█
Opex	-	-	-	-	-	0.00
Total	█	█	█	█	█	█

The forecast expenditure for the next regulatory control period allocated to Standard Control Services as per the CAM is outlined in Table 9.

Table 9 Forecast annual capital and operational expenditure – allocated to SCS (\$m, real 2021/22)

Item	FY25	FY26	FY27	FY28	FY29	Total
Capex	█	█	█	█	█	█
Opex	-	-	-	-	-	0.00
Total	█	█	█	█	█	█

The forecast expenditure for the next regulatory control period allocated to recurrent and non-recurrent categories is outlined in Table 10.

Table 10 Forecast annual capital expenditure – recurrent and non-recurrent

Item	FY25	FY26	FY27	FY28	FY29
Recurrent	100%	100%	100%	100%	100%
Non-recurrent	-	-	-	-	-

This expenditure is categorised as Recurrent ICT as it is related to maintaining existing ICT services, functionalities, capability. Power and Water maintain a program whereby the ongoing refresh of ICT hardware is provisioned every five years. This is in alignment with industry standards.

4.6 High-level scope

The following activities are included within the scope of work for this program:

- The procurement and installation of server infrastructure to replace end-of-life servers that have been nominated for replacement
- The procurement and installation of additional server infrastructure within Power and Water Virtual Machine (VM) farm to support future resourcing, capacity and redundancy requirements.
- Decommissioning and disposal of retired infrastructure.
- Capture asset information of all infrastructure purchased.
- Changes to documentation.

Appendix A. Cost estimation

The cost estimates for Option 3 and Option 4 are based on a bottom-up build of costs which in turn are based on recent upgrades (escalated as necessary), vendor quotes and indicative quotes. Option 2 was not independently costed, rather it was estimated to incur a 10% higher capex than Option 3. This is considered a conservative assumption, as this could be as high as 20%.

Table 11 Option 3 – Risk-based replacement cost estimate (\$, real 2021/22)

Description	Category	FY25	FY26	FY27	FY28	FY29	Total
Power SCADA IT Assets Refresh	Materials	-		-	-	-	
Power SCADA IT Assets Refresh	External Services	-		-	-	-	
Power SCADA IT Assets Refresh	Internal Labour	-		-	-	-	
Server Replacement Refresh	Materials						
Server Replacement Refresh	External Services						
Server Replacement Refresh	Internal Labour						
Total							

Table 12 Option 4 – IaaS cost estimate (\$, real 2021/22)

Item	Quoted total
Original quote (no EMS equipment)	
Addition of EMS Equipment (same amount as Preferred option)	
To account for management of data and cloud services	
Total of estimate	

Appendix B. Key assumptions

The following assumptions have been made in the estimation of this budget based on:

- The existing rolling replacement planning is based on 4-5 year replacement cycle.
- Power and Water will continue to host and manage systems.

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