NOVEMBER 2025

The Next Era of Utilities Innovation

Jessica Hernández
Analyst

US: Severe cold, power outages in Texas turn deadly — ALJAZEERA

2021

Feb

Exclusive: Power surge crashes Pakistan grid, plunging millions into darkness — Reuters

2023

Jan

State of emergency declared after blackout plunges most of Chile into darkness — CNN

2025

Feb

Iberian peninsula hit by massive blackout and left in the dark — EURACTIV

2025

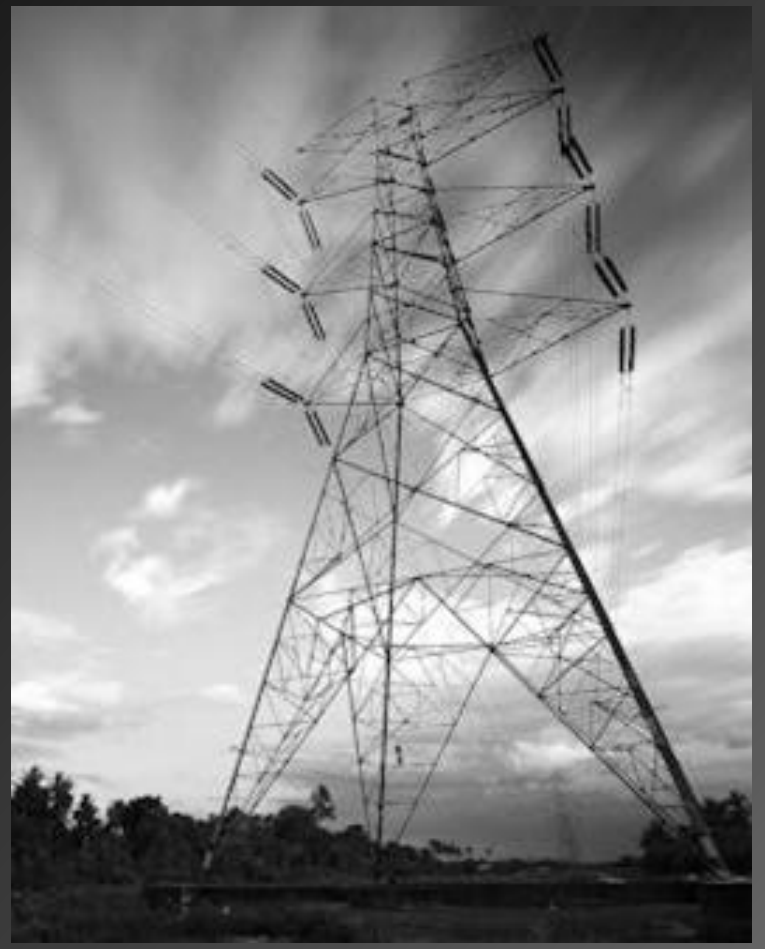
Apr

Image sources: Texas Electricity Ratings, CNBC, CNN, Reuters

Demand Growth

Decarbonization

Resilience & Reliability



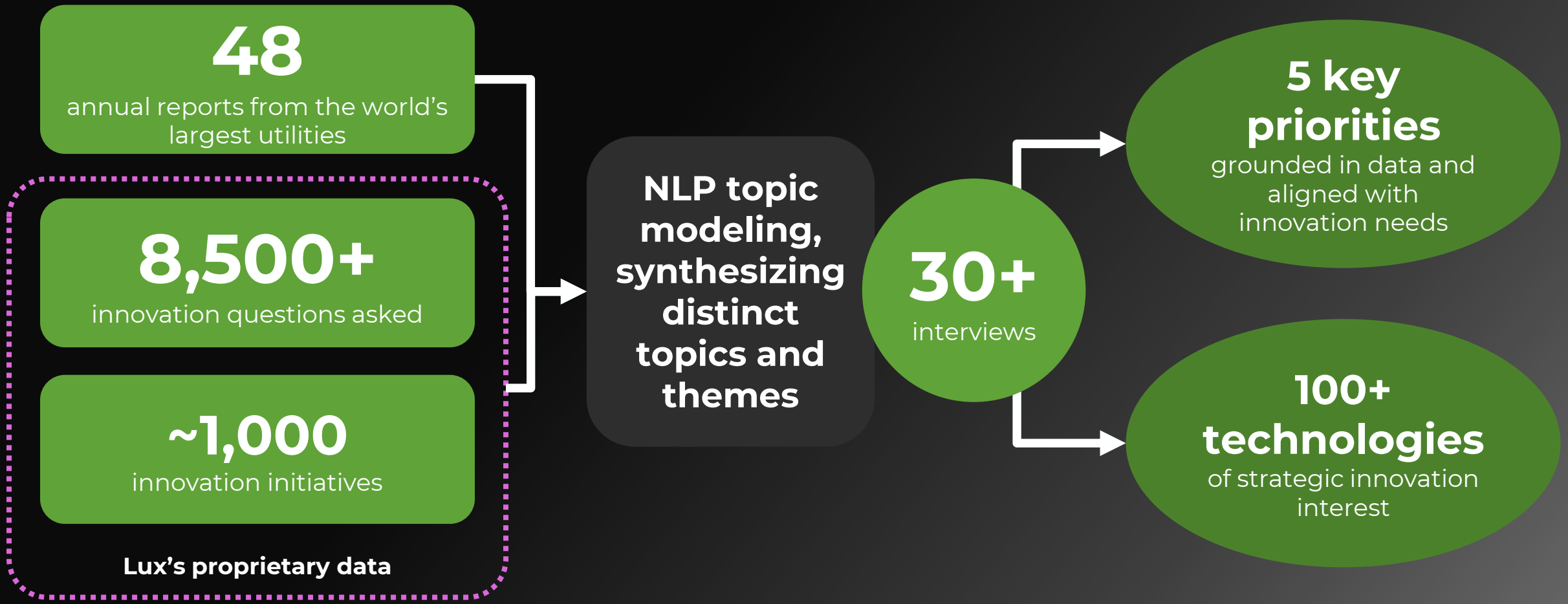
Agenda

01 | Unbiased, customer-centric methodology

02 | Priority analysis for Utilities Innovation Leaders

03 | Capitalizing on the next era of utilities innovation

Unbiased, customer centric

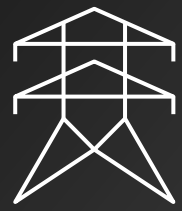


Lux for Innovation Leaders

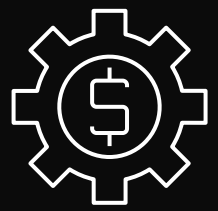
Utilities

Innovating at the Grid Edge

Low-Carbon Electrons



Enhancing Resilience & Reliability



Asset Management

Meeting Demand for Power

Policy and Regulations

Innovating at the Grid Edge

Develop solutions to manage and optimize power at the grid edge by managing distributed energy resources.

The rapid growth of assets at the grid edge — such as EVs, rooftop solar, and BTM stationary batteries — is transforming how electricity is produced, consumed, and managed.

Engaging consumers and their assets as active participants in energy markets will be key to creating mutual value, resulting in not only economic benefits but also supporting grid infrastructure.

> *How do **EV charging technologies** compare in their ability to manage their impact on the grid?*

> *What is needed to scale **microgrid** deployments to ensure high resilience value to consumers while meeting growing power demands?*

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Innovation in Action

In June 2025, **Enel X** launched the first of three **virtual power plants** to orchestrate flexible demand from C&I sites, unlocking 95 MW of **demand response** capacity.

Low-Carbon Electrons

Identify sources of low-carbon power generation or consider concepts like carbon capture that can mitigate emissions from existing power plants.

While solar and wind will be the backbone of the energy transition, their variability demands complementary, low-carbon dispatchable power sources to ensure reliability and energy security.

Utilities Innovation Leaders must develop strategies that integrate diverse, low-carbon generation assets while exploring technologies like carbon capture to decarbonize existing plants.

> *Will **enhanced geothermal** technologies enable broader deployment and disruption in this mature sector?*

> *What are the expected changes in cost and efficiency associated with **low-carbon combustion** technologies?*

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Innovation in Action

In January 2025, **Masdar** and **Emirates Water and Electricity Company** announced the first solar-plus-storage project, combining 5.2 GW of **solar PV** with 19 GWh of **Li-ion battery storage** to provide 1 GW of electricity 24/7.

Enhancing Resilience & Reliability

Identify solutions that can allow the grid to maintain operations in stressful conditions, both from extreme weather and demand events.

As the grid continues to shift toward more intermittent and variable power flows, energy storage is becoming critical to balance supply and demand in real time.

Resilience should be embedded across all stages of operations — from new asset planning to real-time management of existing infrastructure — to ensure assets and networks can withstand current and future disturbances.

> *Which **grid-enhancing technologies** are the most relevant for utilities in the near and long term?*

> *What are the latest advancements in **lithium battery** technology, and how do **novel battery chemistries** compare?*

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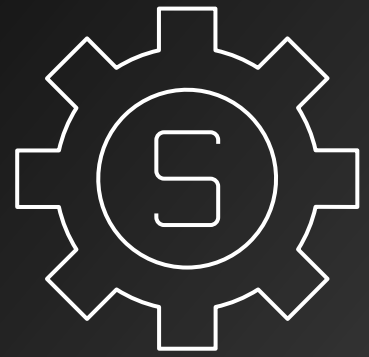
Innovation in Action

In September 2025, **Salt River Project** and **Google** announced they will co-fund non-lithium **long-duration energy storage** pilots to analyze operational performance and accelerate scale-ups.

Asset Management

Guarantee current assets are used efficiently and maximize revenues as well as figure out what investments should be made to ensure the most optimal infrastructure in the future.



In preparation for a more decentralized, low-carbon grid, utilities are facing pressure to maximize the performance of existing infrastructure while expanding networks and increasing capacity.

Utilities Innovation Leaders should leverage digital technologies and performance-based insights to enable predictive, data-driven decisions.

> *What **digital innovations** can be retrofitted to improve performance of energy generation, storage, and grid assets?*

> *Which **DERMS platforms** can help improve grid management operations?*

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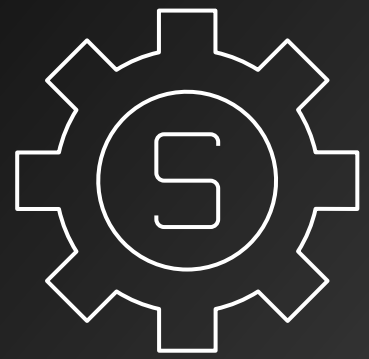

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Innovation in Action

After Spain's blackout in April 2025, **Portugal** allocated EUR 137 million for **grid reinforcements** and will auction 750 MW of **energy storage** to support renewables integration.

Meeting Demand for Power

Gain foresight on how other industries are decarbonizing, and using electricity, while watching for new sources of load growth.

Meeting the growing demand for electricity requires utilities to act with foresight as electrification accelerates across transportation, industry, and digital sectors.

Utilities Innovation Leaders should identify where and when demand will rise, distinguish which applications can be services with existing infrastructure, and plan for strategic investments in assets that ensure reliable supply.

> *What current and emerging technologies can help meet the growing demand for **low-carbon heat**?*

> *How can utilities meet the growing demand from **data centers** with reliable low-carbon power?*

Meeting Demand for Power

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Innovation in Action

In July 2025, **Eneco**, **PepsiCo**, and **Liander** signed a new type of electricity agreement, allowing PepsiCo to only charge its **thermal energy storage system** outside of peak hours and when grid capacity is available.

Priority Analysis for Utilities Innovation Leaders

Lux for Innovation Leaders

Utilities

71%

Innovating at the Grid Edge

92%

Low-Carbon Electrons

90%

Enhancing Resilience & Reliability

98%

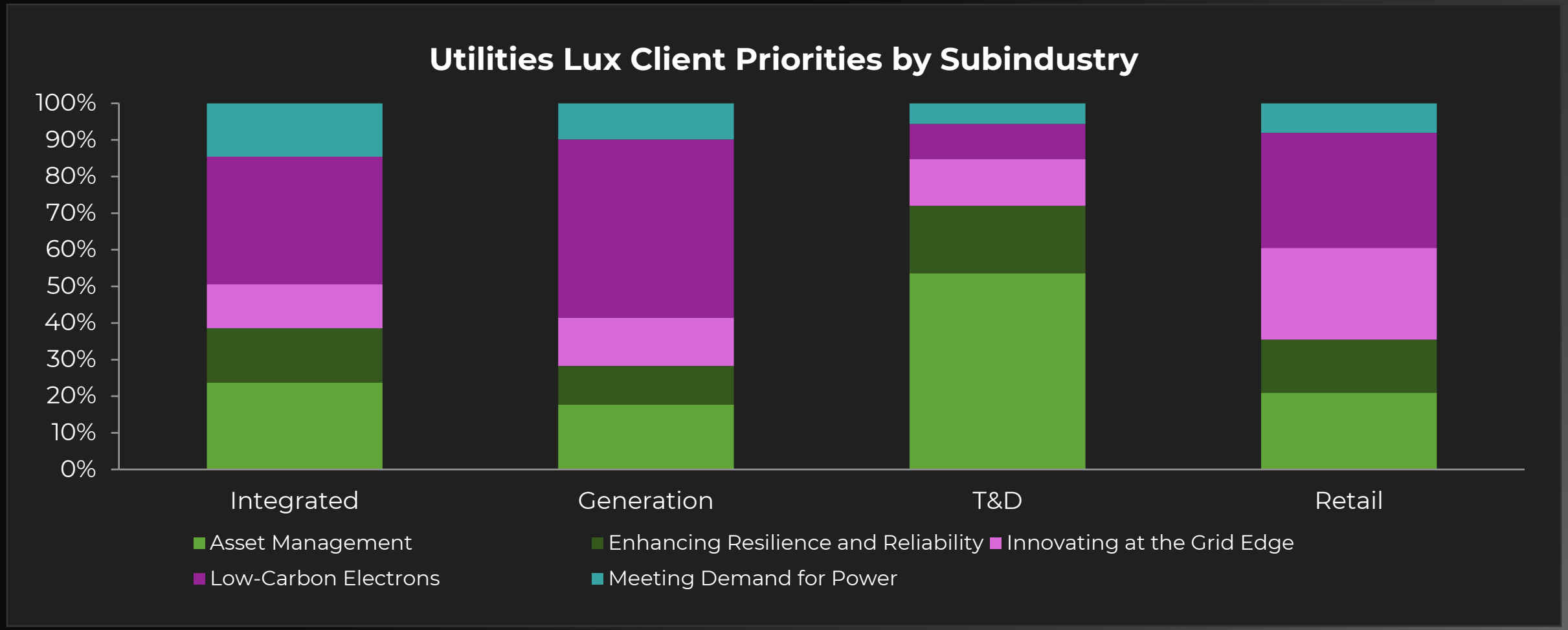
Asset Management

77%

Meeting Demand for Power

Policy and Regulations

Priorities by subindustry



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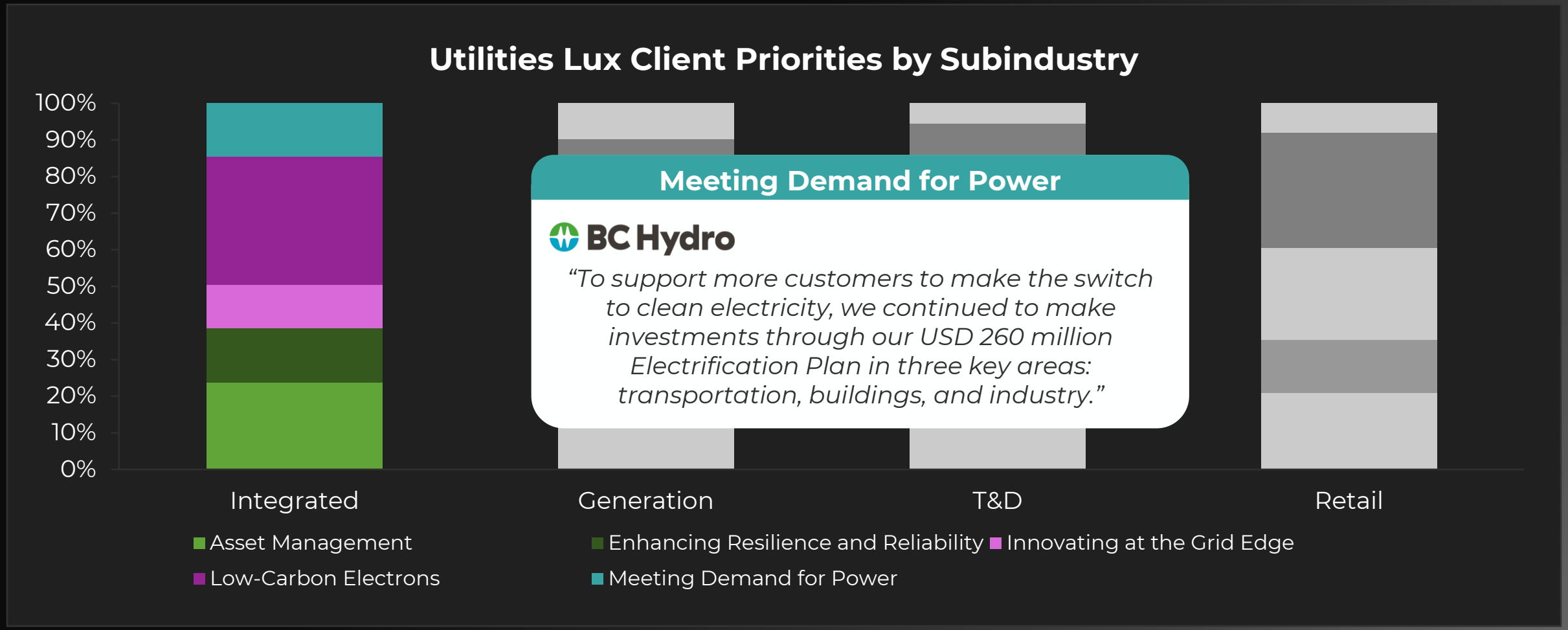

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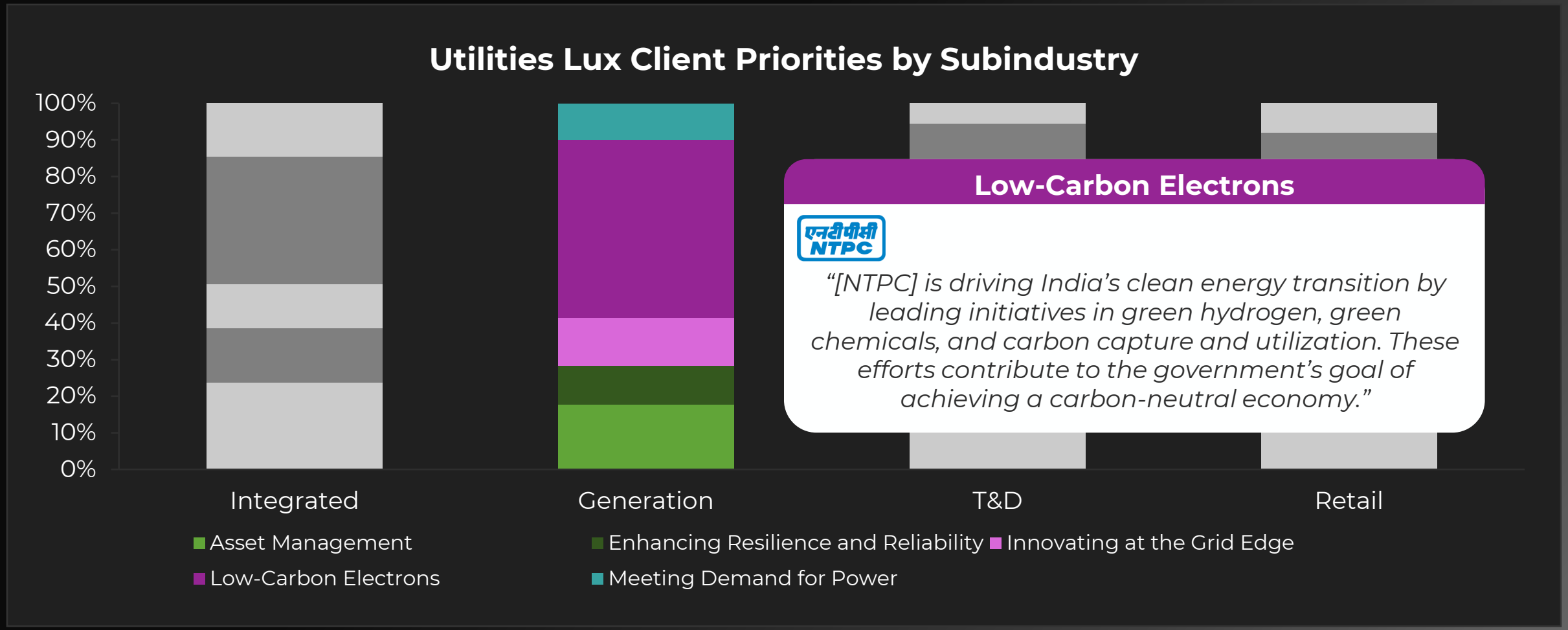

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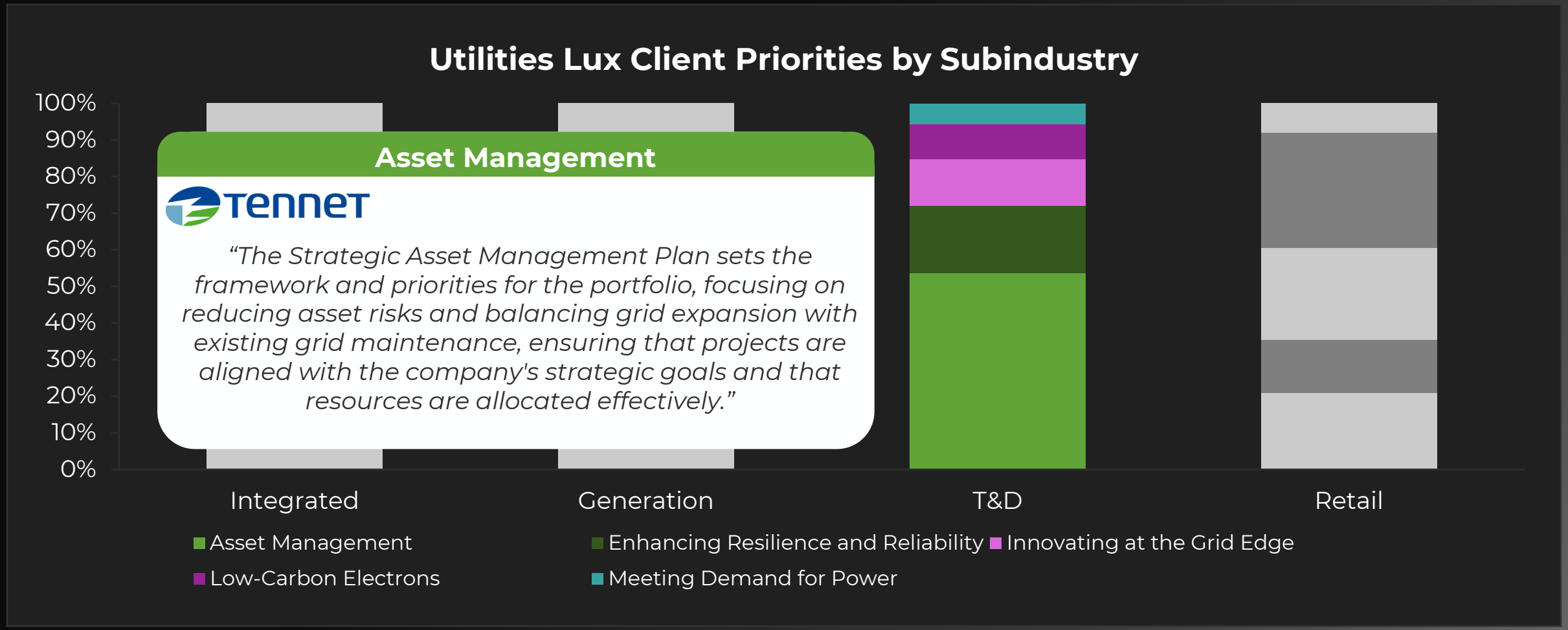
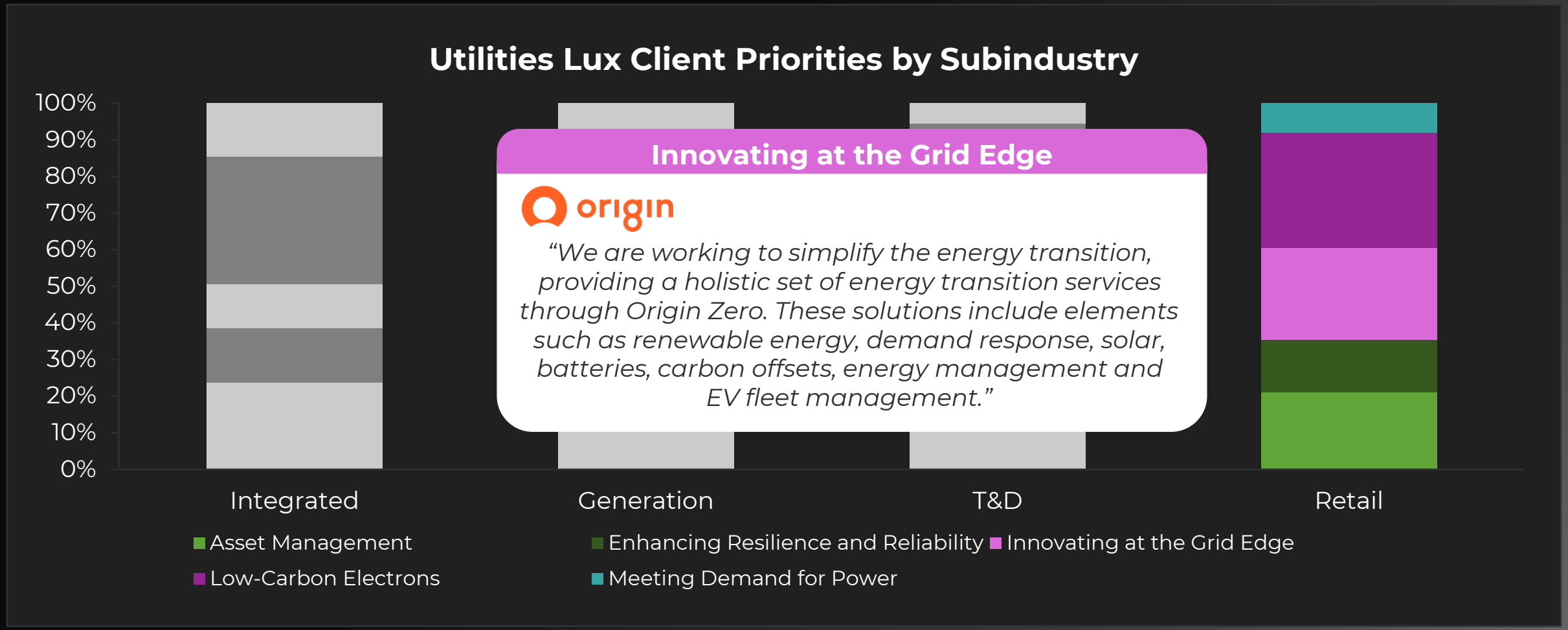


Asset Management

TenneT

"The Strategic Asset Management Plan sets the framework and priorities for the portfolio, focusing on reducing asset risks and balancing grid expansion with existing grid maintenance, ensuring that projects are aligned with the company's strategic goals and that resources are allocated effectively."

Priorities by subindustry

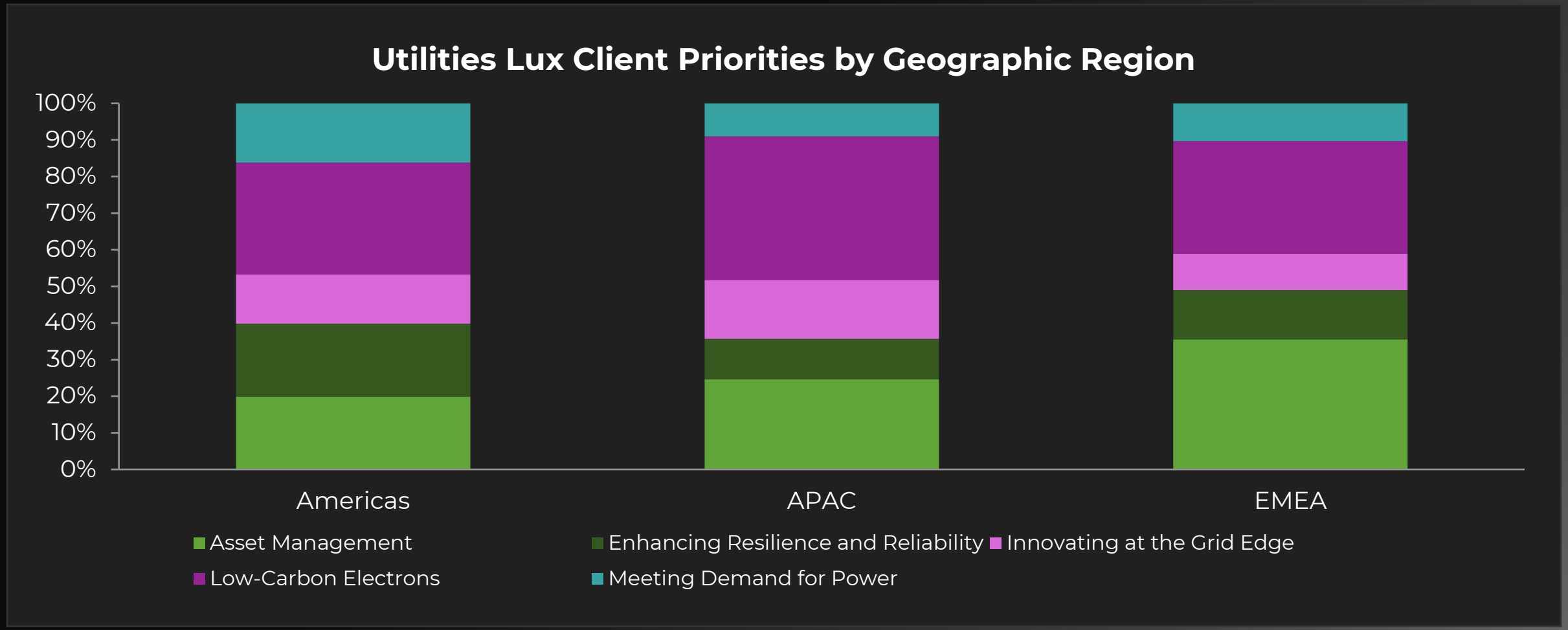


Innovating at the Grid Edge

origin

"We are working to simplify the energy transition, providing a holistic set of energy transition services through Origin Zero. These solutions include elements such as renewable energy, demand response, solar, batteries, carbon offsets, energy management and EV fleet management."

Priorities by region



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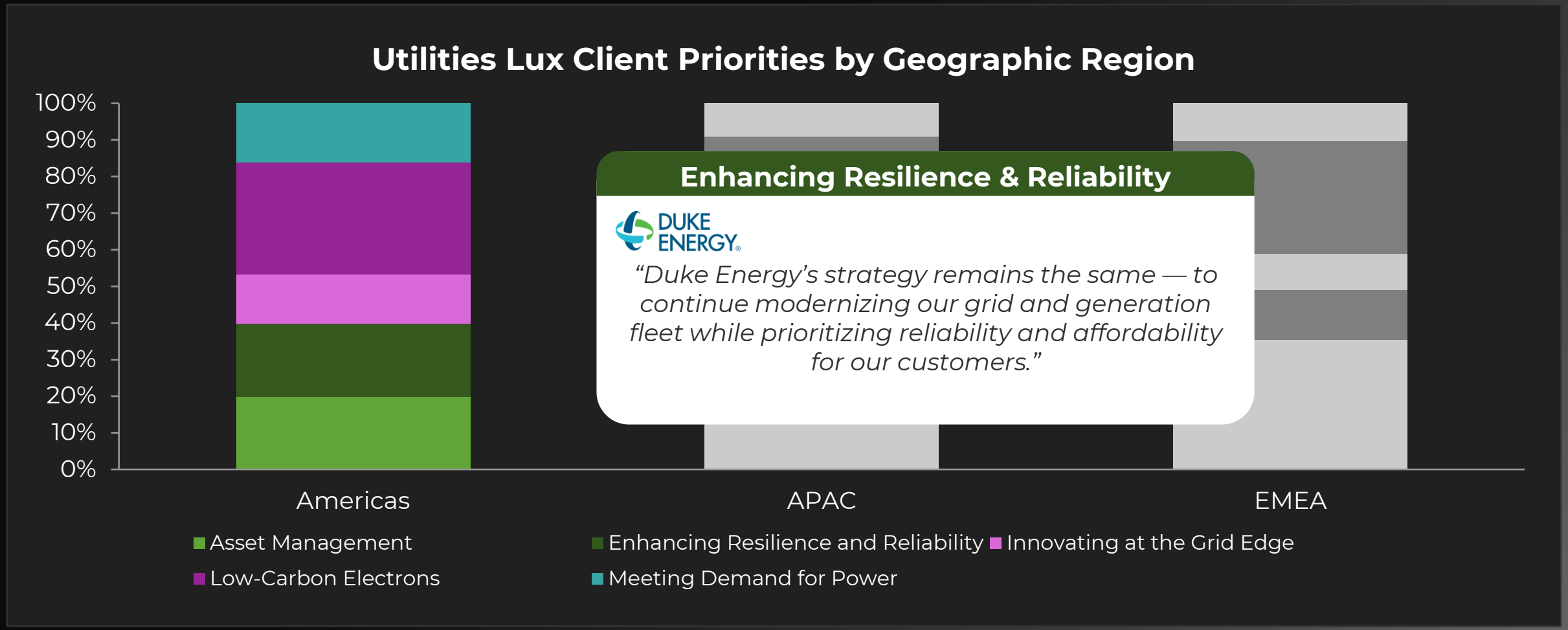

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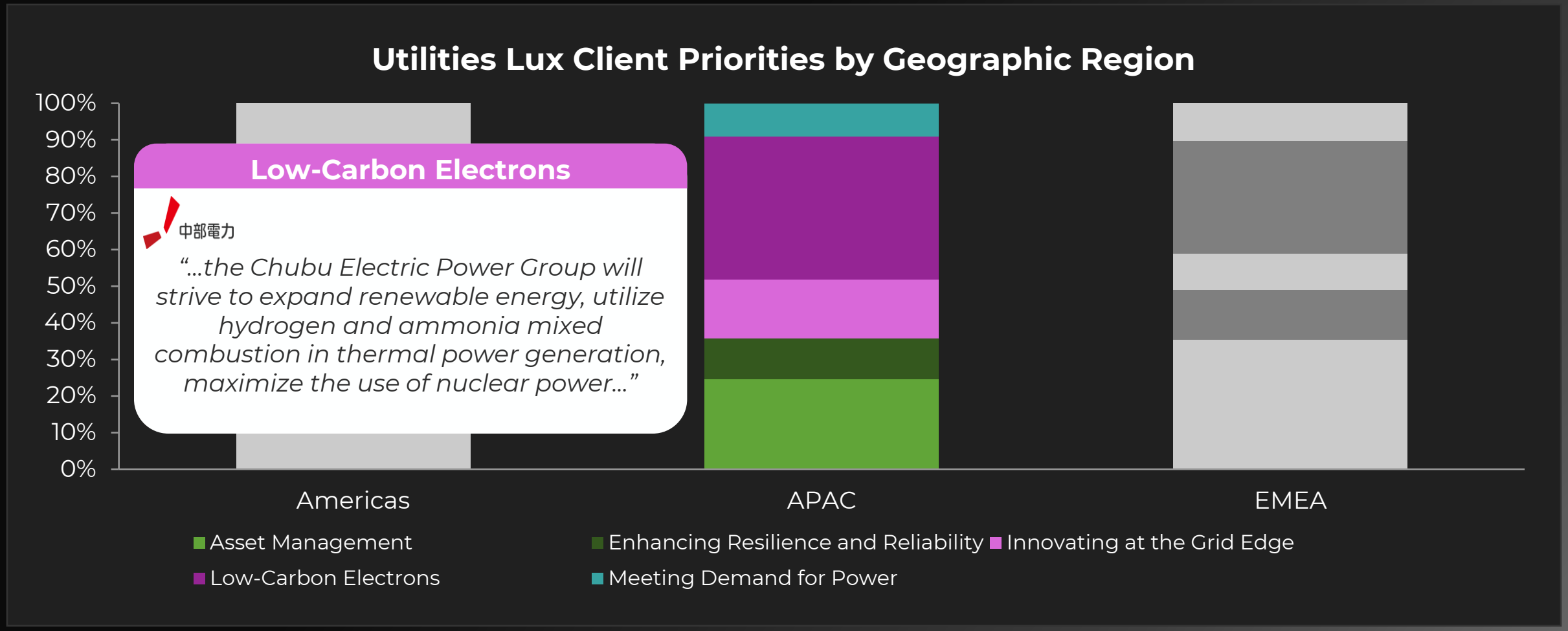

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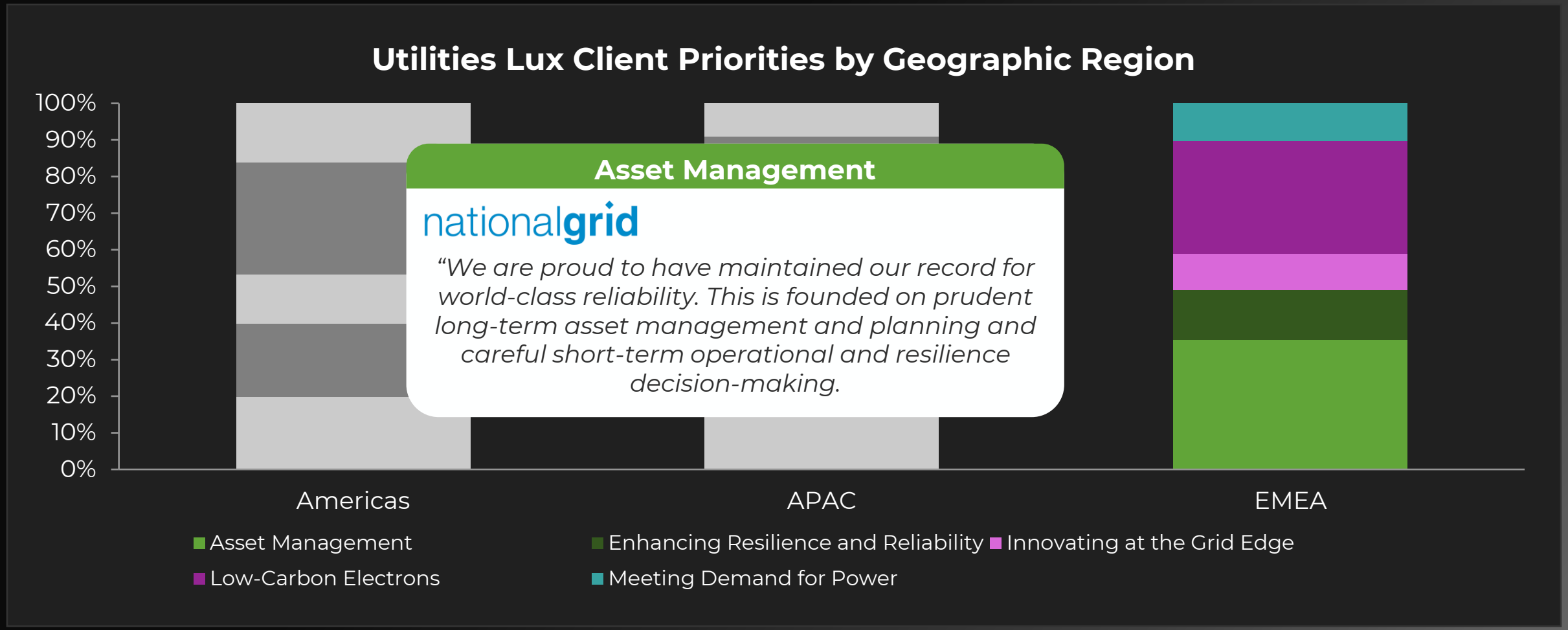


Asset Management

nationalgrid

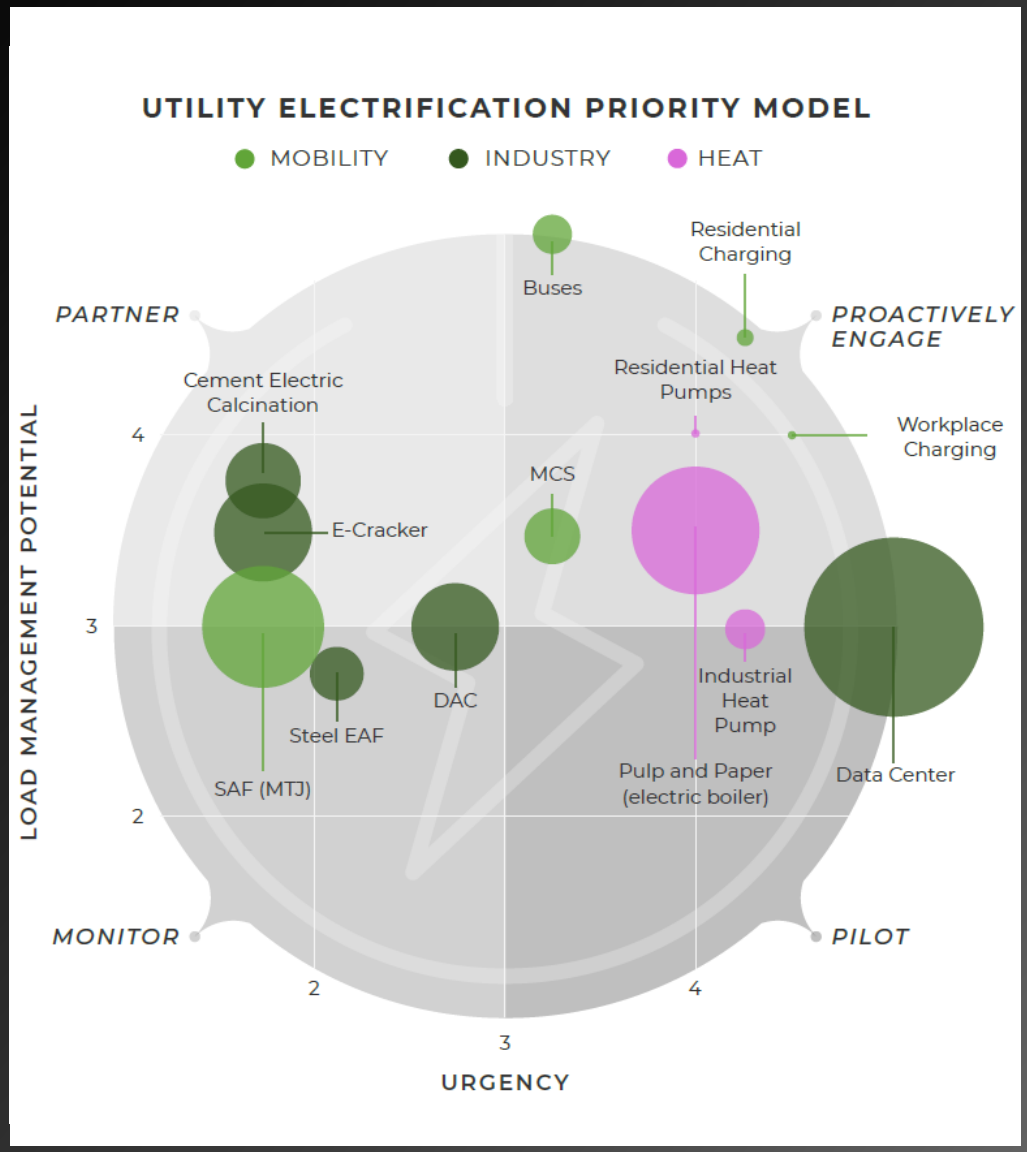
"We are proud to have maintained our record for world-class reliability. This is founded on prudent long-term asset management and planning and careful short-term operational and resilience decision-making.

Capitalizing on The Next Era of Utilities Innovation

Opportunity assessment

Identify emerging gaps and investment opportunities.

Utilities must develop a deeper understanding of how and where supply and demand are shifting to strategically prioritize investments.



Technology roadmap

Deploy technologies that drive decarbonized growth.

Utility innovators must pinpoint the technologies that enable them to meet rising demand, deliver on decarbonization goals, and enhance operational performance.

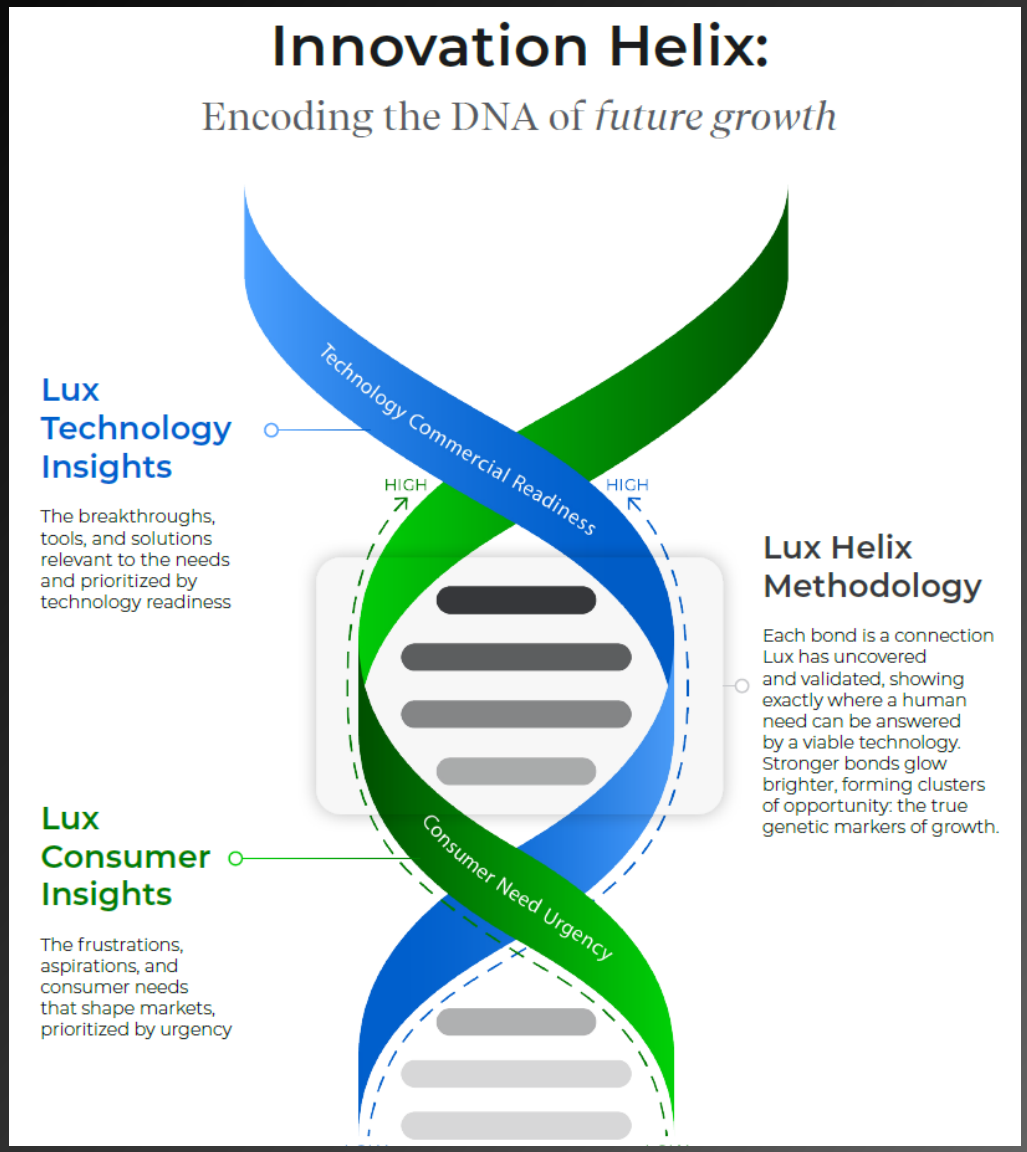
Reliability values for combinations of solar and storage capacities

Solar capacity (multiple of load) \ Storage capacity (multiple of load)	1x	2x	3x	4x	5x	6x	7x	8x	9x	10x	11x	12x	13x	14x	15x	16x	17x	18x	19x	20x
1x	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
2x	38	40	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
3x	42	46	49	53	56	57	58	59	59	59	59	59	59	59	59	59	59	59	59	59
4x	44	48	51	55	58	62	65	68	71	73	74	75	75	75	75	75	75	75	76	76
5x	45	49	53	56	60	63	66	70	73	76	79	82	85	87	88	89	90	90	90	91
6x	46	50	53	57	61	64	67	71	74	77	80	84	87	90	93	96	97	98	98	98
7x	47	50	54	58	61	65	68	71	75	78	81	84	88	91	94	97	98	99	99	99
8x	47	51	55	58	62	65	68	72	75	78	82	85	88	91	94	97	99	99	99	99
9x	48	51	55	59	62	65	69	72	76	79	82	85	89	92	95	97	99	99	99	100
10x	48	52	55	59	62	66	69	73	76	79	82	86	89	92	95	98	99	99	100	100
11x	49	52	56	59	63	66	70	73	76	79	83	86	89	92	95	98	99	99	100	100
12x	49	52	56	59	63	66	70	73	76	80	83	86	89	92	95	98	99	99	100	100
13x	49	53	56	60	63	67	70	73	77	80	83	86	89	93	96	98	99	99	100	100
14x	49	53	56	60	63	67	70	74	77	80	83	86	90	93	96	98	99	99	100	100
15x	49	53	56	60	63	67	70	74	77	80	83	87	90	93	96	98	99	99	100	100
16x	49	53	57	60	64	67	70	74	77	80	84	87	90	93	96	98	99	99	100	100
17x	50	53	57	60	64	67	70	74	77	80	84	87	90	93	96	98	99	99	100	100
18x	50	53	57	60	64	67	71	74	77	81	84	87	90	93	96	98	99	99	100	100
19x	50	53	57	60	64	67	71	74	77	81	84	87	90	93	96	98	99	99	100	100
20x	50	53	57	60	64	67	71	74	77	81	84	87	90	93	96	98	99	100	100	100

Consumer integration

Empower stakeholders to shape the future grid.

Utilities must gain insights into the evolving energy needs and strategies of non-utility stakeholders that are also shaping the energy landscape and impacting the whole power value chain.



Key Takeaways

01 Utilities are facing unprecedented pressure to innovate — balancing rising demand, decarbonization goals, and the need for greater resilience.

02 Asset management is taking center stage, emerging as the cornerstone of utilities transformation.

03 Utilities that effectively identify emerging gaps, build robust technology roadmaps, and collaborate with different stakeholders will define the next era of innovation.

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The "Lux Take" is trusted by innovation leaders around the world, many of whom seek our advice directly before placing a bet on a startup or partner — our clients rely on Lux insights to make decisions that generate fantastic business outcomes. We pride ourselves on taking a rigorous, scientific approach to avoid the hype and generate unique perspectives and insights that innovation leaders can't live without.

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