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Utility of the Future

Convergence: The emergence of the new energy market and the rise of the shared economy….

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Convergence: The emergence of the new energy market and the rise of the shared economy….

Key questions to consider today:

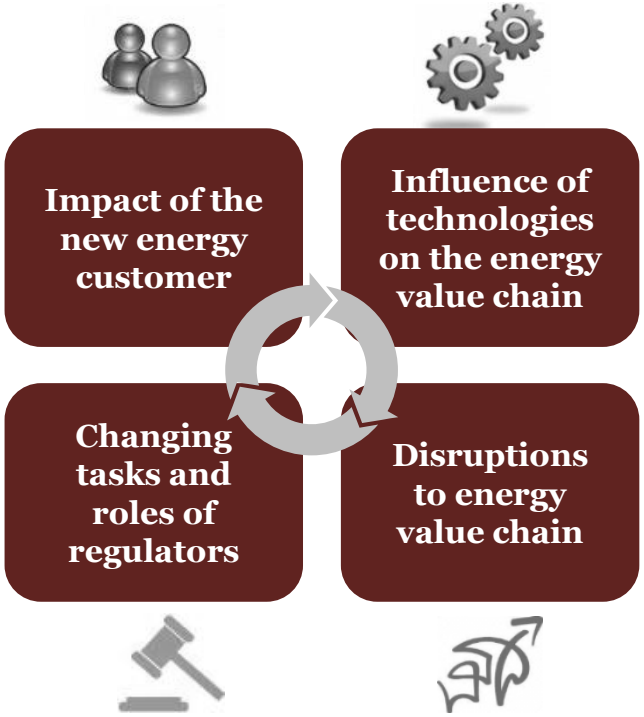
1. What factors are driving the creation of the utility of the future?
2. Disruption and convergence – through a customer lens
3. The digital utility – fact or fiction?

There are four broad interconnected themes that will have a significant impact on the industry over the next decade

Industry trends

- Customers are increasingly mobile, social, interconnected - expect digital engagement
- Increased behind-the-meter activity as customers demand greater control of usage/supply
- Data analytics and engagement becoming core competencies

- Policy-makers face difficult task of balancing supply security, affordability and environmental impact in a changing market
- Changing approach to economic regulation / revenue setting
- Broad energy market reforms on design / planning / governance



- Maturing solar PV, electric vehicles, battery storage, energy efficiency, demand-side management and smart grid technologies
- Exponentially increasing volume of data to be managed with implementation of intelligent grids and smart meters

- Decline of the core fossil fuel generation market, increasing competition from alternate sources
- existing players broadening their offerings as well as new players entering – changing the nature of competition
- New profit pools created, e.g. aggregated demand response
- Stagnant or declining demand for electricity depressing revenue & margins
- Distributed generation and disconnections from the grid via self-generation are a threat to power utility

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What factors are driving the creation of the utility of the future?

We are seeing the impact of megatrends on all sectors across the globe

Megatrends

Demographic and social change

- From 7 to 8 billion people in the next 10 years
- Half of the girls born today have a life expectancy of at least 100 years.

Shift in global economic power

- Welfare growth – by 2030 the E7 will overtake the G7
- How to secure sufficient capital for investments?

Rapid urbanisation

- In 1800, only 2% of the world's population lived in cities – now it is 50%.
- Two-thirds of the world's population will live in cities by 2050.

Climate change and resource scarcity

- A challenge is Supply of resources keeping up with demand growth while reserves are finite
- The carbon target to keep temperature rises to 2°C this century is at risk.

Technological breakthroughs

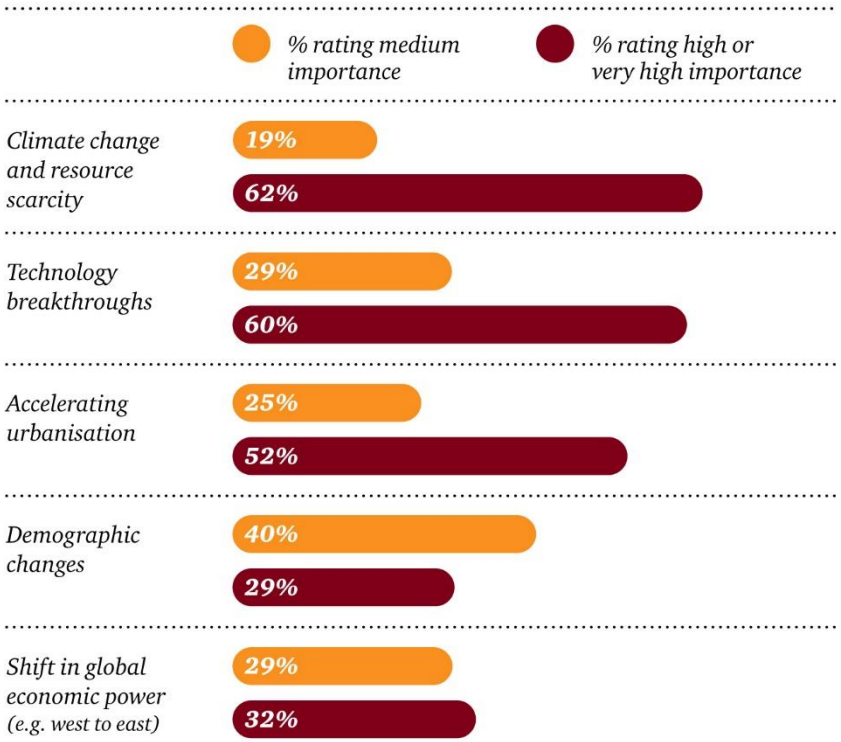
- Costs of new technologies falling dramatically and adaptation speed rising.
- Achieving a 50% penetration rate for telephones took decades, while mobile phones took <5 years.

"Energy is at the heart of these trends, both as an essential resource for feeding and fuelling the world population and economy, and also as a sector strongly influenced by renewable technologies and business model innovation"

E7 = Emerging 7, being China, India, Brasil, Mexico, Russia, Indonesia, Turkey

The five global megatrends we have identified have medium to high importance for most of the companies

Figure 3: Global megatrends – level of importance*



* Score 1 to 5 where 1 = not important; 5 = very important. Scores 3 (medium) and 4/5 reported.
Source: 14th PwC Global Power & Utilities Survey

- Over 80 per cent say technology breakthroughs and climate change / resource scarcity are of importance.
- Urbanisation is also high on the agenda for many companies, with 52 per cent ranking it of medium to major importance.
- Technology breakthroughs and climate change are rated of fairly uniform importance by power utility companies in all regions, while the other megatrends impact power utilities differently depending on their geography and market circumstances.

These megatrends are leading to disruptive dynamics impacting the power sector

Disruptive dynamics

Customer behaviour

"Grid provides back up"

Less need for utilities, consumers produce and store energy themselves

Competition

"Outflanked and outpaced"

More nimble and able competitors seize key revenue segments

Production service model

"Outdated or stranded"

Outdated or out-of-market assets leads to stranded investments

Distribution channels

"Digitalised intervention"

Innovative digital plat-forms matching demand and supply become dominant

Government and regulation

"Caught in the crossfire"

Shifting policy goals and regulatory risk undermine business decisions

Disruption profiles differ by region

Europe

European utilities value reduced by **~60%** between 2008 and 2014

North America

~$20B+ in cleantech venture capital funding between 2008 and 2014

Australia

Customer is becoming king – solar PV uptake and increased policy/ regulation leaning to customers

Asia

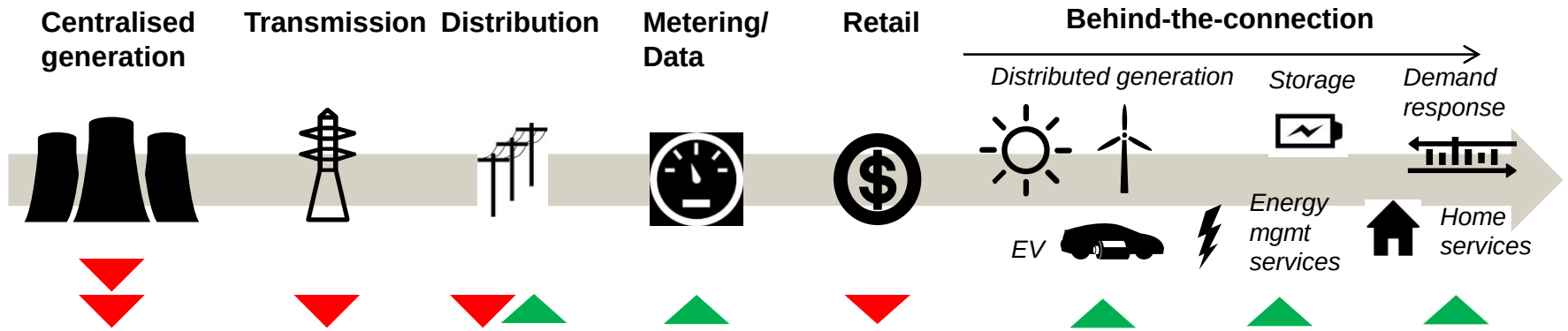
Black outs hinder economic development : **$6.2 trillion** needs to be invested in the power sector by 2035*

Africa

Technology supports policy aims – 160m new grid connections are required to be supplied by micro-grid and off-grid systems

*Investments in China, India and Southeast Asia (2014 - 2035); Source: MSCI index. IEA (2014) World investment outlook 2014 (new policies scenario), IEA (2011) Energy for all.

The energy value chain is evolving - value and control shifting downstream, away from centralised generation



Value growth / decline

Drivers of value shift

Centralised generation
- Falling C&I demand as manufacturing declines
- Significant overcapacity
- Growth in higher-priority renewables and distributed generation
- Low plant utilisation

Transmission / Distribution
- Stagnant demand for grid power
- Continued need to invest for peak loads and system reliability
- Need to invest to manage increasingly complex and volatile energy flows
- Emerging role of the complex system operator

Metering/ Data
- Growth in smart metering / AMI to optimise demand patterns
- New data-driven services, e.g. energy advisory, demand response

Retail
- Falling demand
- Commoditised product/service with price-based competition
- Increased customer churn
- Expanding into energy services

Distributed generation
- More power to consumer
- Maturing DG, storage and EV technologies – new growing market for installation, leasing and service

Storage / Demand response
- Increasing cost of electricity increases value of energy mgmt services
- Demand for usage insights and control solutions
- Demand for holistic home services

Value is broadly shifting to behind-the-connection services and offerings

Sources: *Strategy& analysis, Expert interviews*

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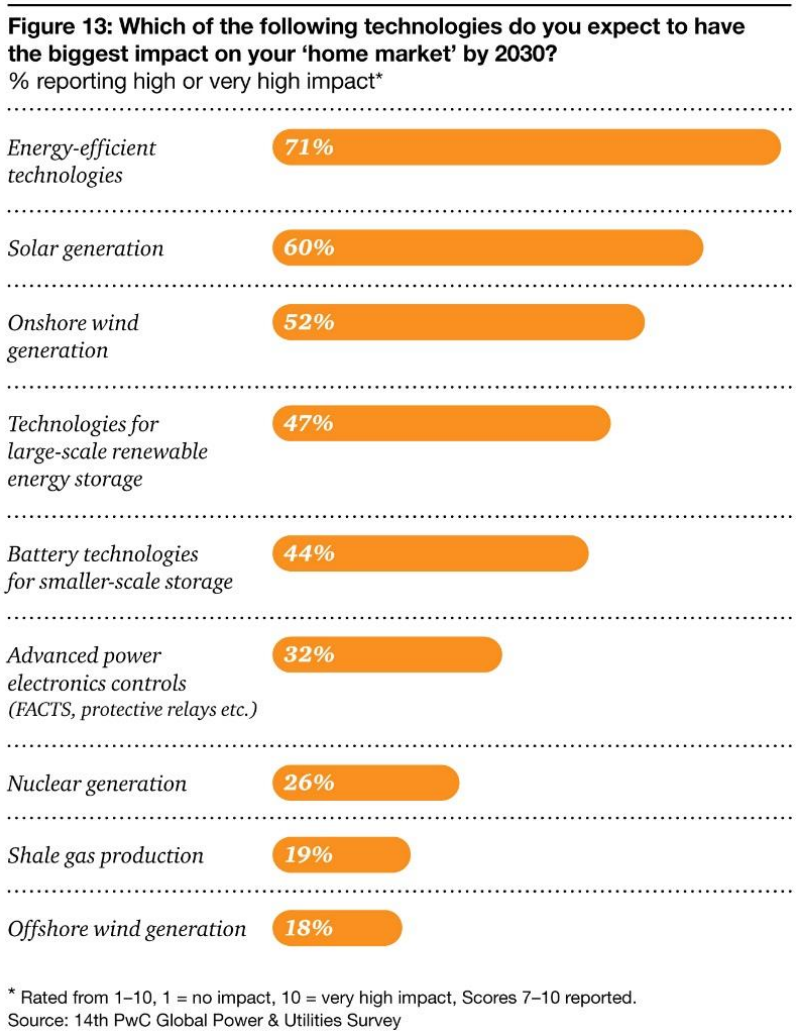
Disruption and convergence – through a customer lens

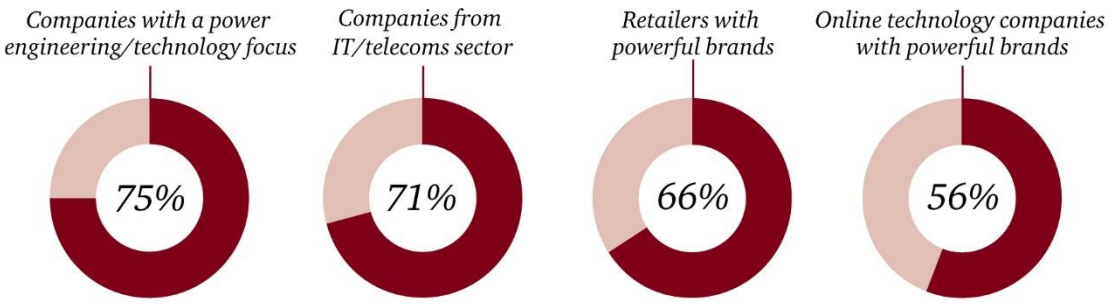
Technological change impacts



- Energy efficient technologies are singled out as having the biggest impact on the power markets between now and 2030.
- Renewable generation from solar and wind are also ranked high in their impact on power markets in the next fifteen years.
- Also both large-scale and smaller-scale technologies for renewable energy storage are expected to have a major impact.

Competition from outside the sector is being taken very seriously

Figure 21: Power utility companies face significant competitive threat from outside the sector
% of respondents reporting medium to high-level future competitive threat*



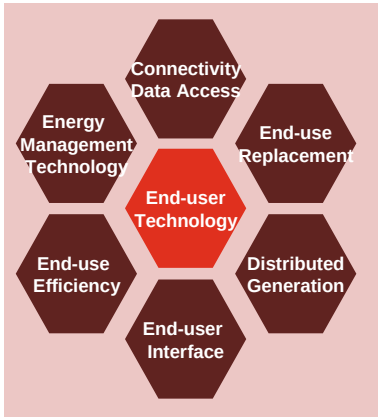
* Rated on a scale of 1–5 where 1 = low; 5 = high. Scores 3, 4 & 5 reported.
Source: 14th PwC Global Power & Utilities Survey

- Three-quarters see a medium to high competitive threat coming from companies with a technology or engineering focus and nearly as many (71%) from companies from the IT/telecoms sector.
- Powerful brands from the retailing or online sectors are also seen as a threat.

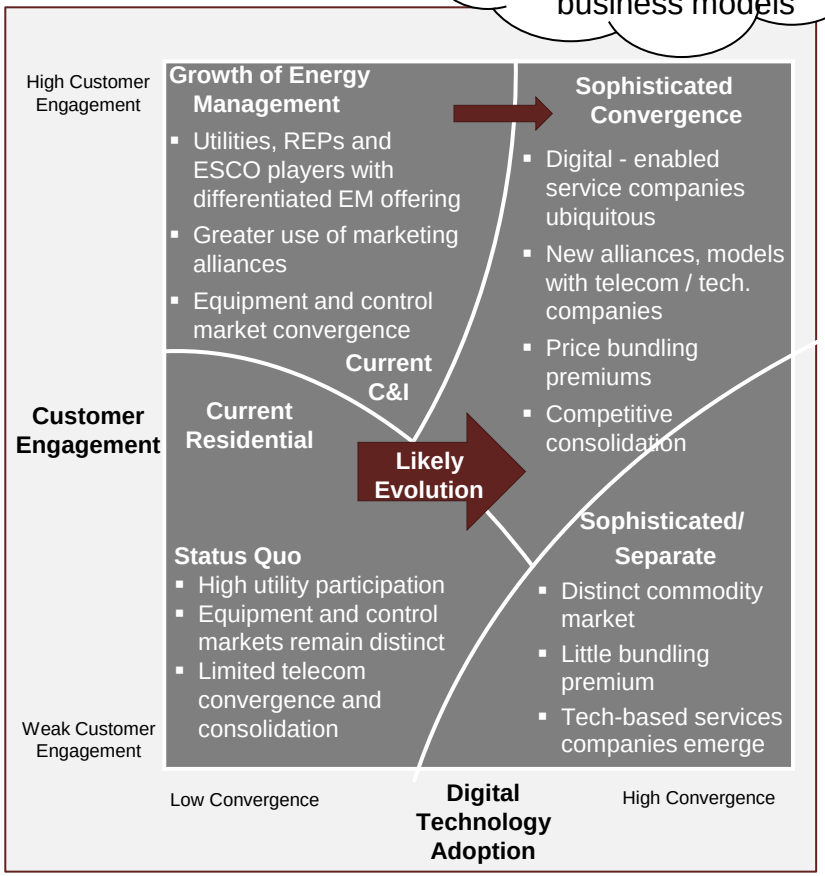
The world is in beta – and the future for utilities is uncertain

Developments in customer preferences and end-user technology drive changes in utility business models

Customer & Technology Trends



Energy Utilities Industry Evolution



Characteristics of the Experience Economy

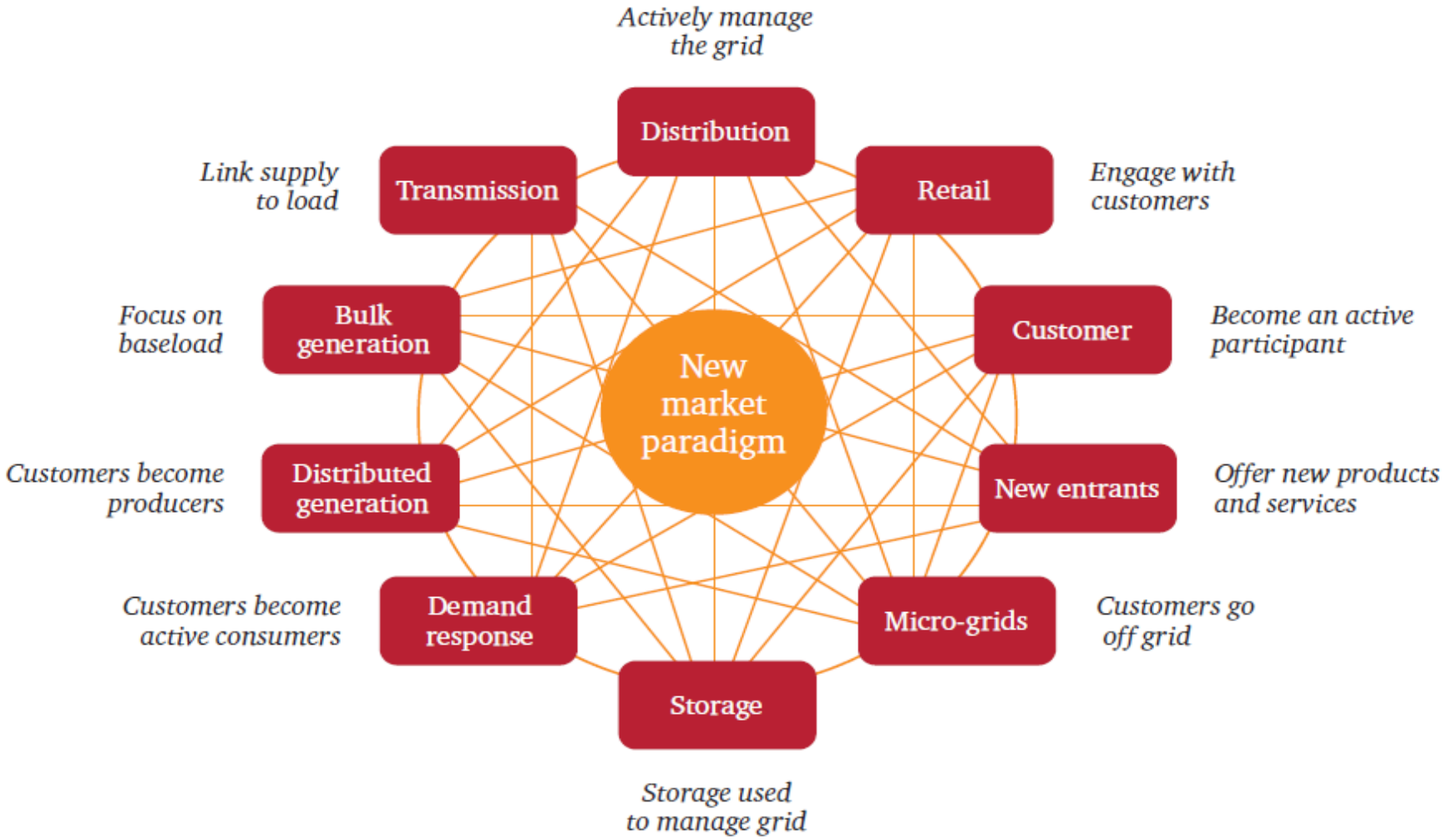
Markets are being disrupted by new entrants.

Customer service expectations are constantly escalating.

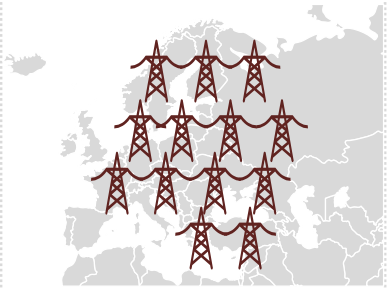
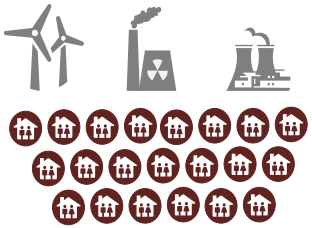
Customers use social media to instantly project bad experiences.

Hyper-connected customers means every touch point matters.

Energy market of the future – a networked model…



New transformational market models will emerge as markets shift away from incremental change

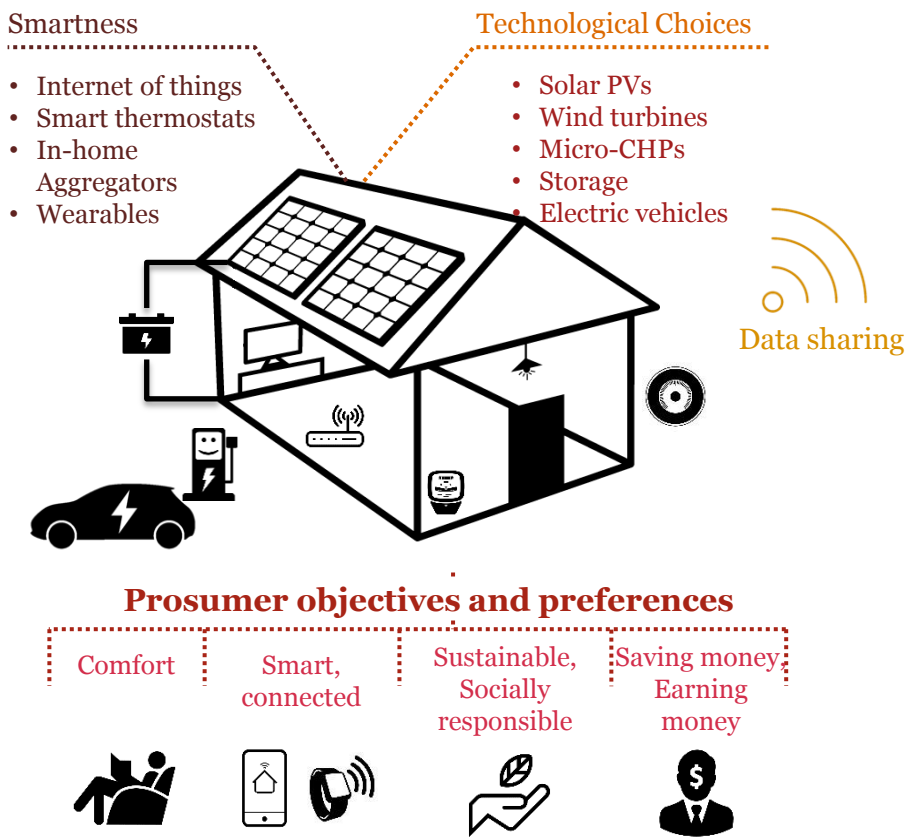
Market models	Regional super-grid	Green command and control	Ultra distributed generation	Local energy systems
				
Characteristics	**low** **high**	**low** **high**	**low** **high**	**low** **high**
Ave generator size				
Consumer role				
Government intervention				
Service delivery digitalisation				
New entrant opportunities				
Local factors	• Mature national infrastructures • Limited indigenous fuel sources • Clear cost benefits of market integration • Political stability	• Limited private sector involvement • Government direction on capital investment • Reliability and price stability are valued over cost	• Mature infrastructure • Strong customer engagement in micro-generation • Interest from private capital • Average/peak demand differential	• Sufficient private funding • Rural electrification policy • Interest from private capital • Local communities taking control

Along the journey of innovation within the Utilities sector, customer-centricity is key

	Today	Intermediate Term	Longer Term
Business Model	**Traditional Utilities Model**	**Value-added Model**	**Virtual power plant/ Aggregator**
Business Model Characteristics	• Electricity as a commodity • Supply-driven system • Demand side flexibility – only from industries • Competition: Price-fighters, pure-play green energy retailers	• Value-add services – solar PV installation, EV charging stations, visualization • HVAC & EV-based flexibility • Competition: Innovative service offerings	• Platform-based balancing and demand response services • Behind-the-meter data becomes a key asset • Competition: Innovative contracts, real time pricing, platform offerings, cross-bundling
Customer typology	**Traditional customer base**	**Connected consumer**	**Prosumer**
Why customer centricity is key	• Commodity market • Intense competition • Low barriers for switching *Customer centricity is the only differentiator*	• Customers are sensitive to technological adoption, opening opportunities for new models • Requires significant investment in new services *Customer alignment required to maximize RoI and lock-in*	• Customer negotiating power increases significantly • Changing market definition, high likelihood of disruptors entering the market • Customer trust become a competitive factor *Customer centricity and agility are key to stay relevant*

The end-game: consumers become prosumers…

The market is redefined by new technologies and new choices consumers have to achieve their objectives



The future consumer has a choice of becoming smart and sustainable while having their own business model

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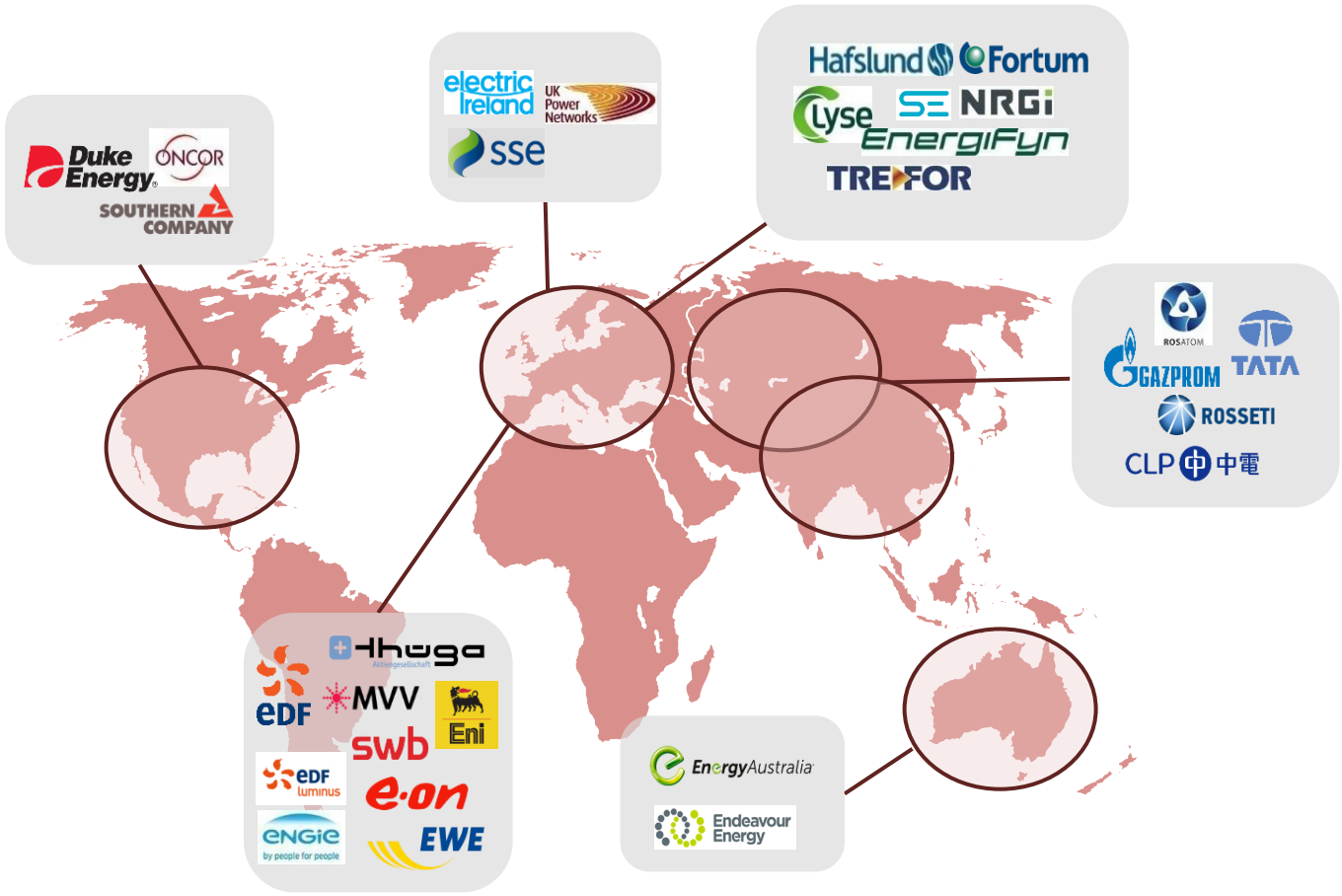
The digital utility – fact or fiction?

We interviewed 29 leading utilities across the world

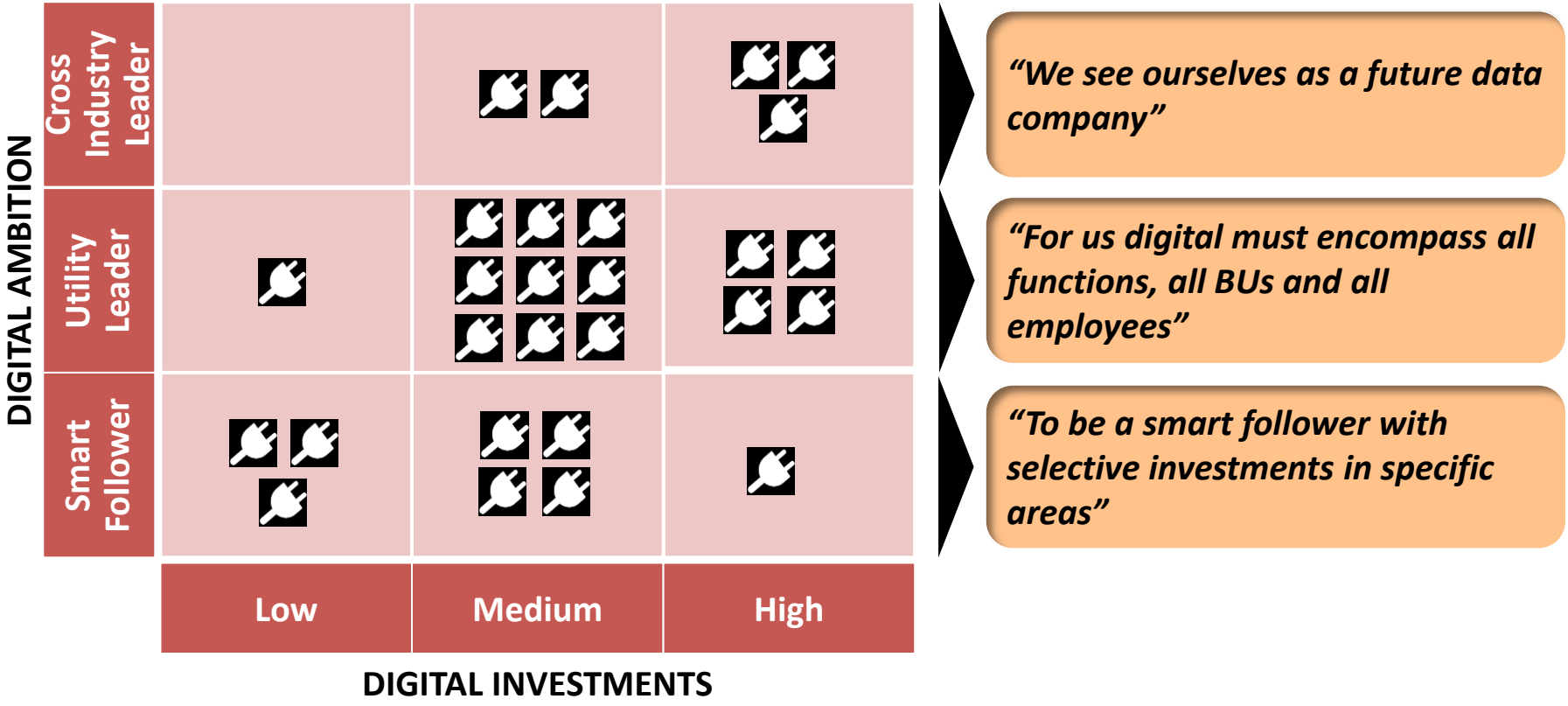
Digital Utility Study Scope



- **Assessment of current digital maturity and future ambition**
- **29 Utilities from 13 different countries (*survey still ongoing)***
- **Assessment based on interviews with utility executives such as CDO's, CIO's, etc.**

Most have high digital ambitions, but not always the investments behind them

Digital Ambition vs Digital Investments



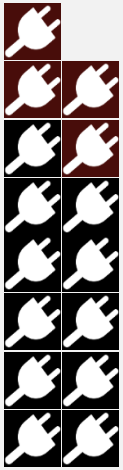
***Digital Investments**: Low – no digital team, no digital budget*
Medium – some digital budget and / or digital team but of small size
High – a significant digital budget and / or a significant digital team

Most utilities are venturing into digital offerings

Offerings in the market

89%

67%



Smart Home

Home energy efficiency, thermostat

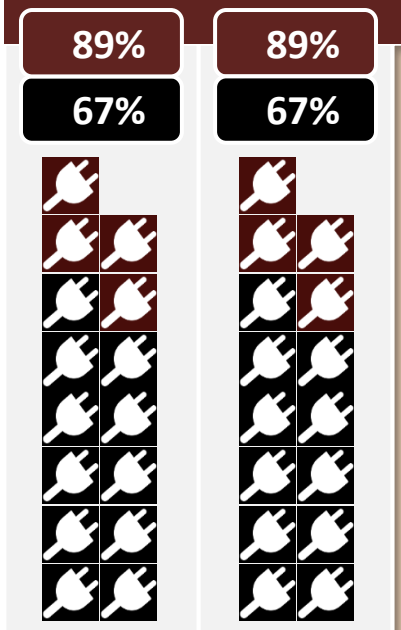
Many see Smart Home as essential to improve customer relationships

Some see Smart Home as a way to offer new services beyond the energy spectrum, e.g. health, security, etc.

Today *In next 3 years*

Most utilities are venturing into digital offerings

Offerings in the market



Smart Home	Energy Analytics
Home energy efficiency, thermostat	B2B energy mng., Smart metering analytics

Most energy analytics services are focused on B2B

Many relying on Smart Meter rollouts to offer B2C energy analytics services

Today *In next 3 years*

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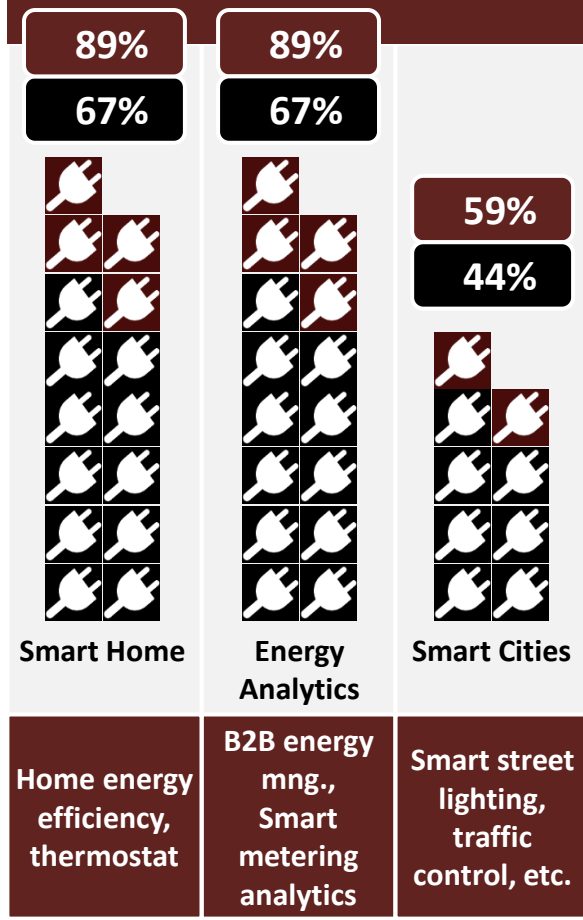
Offerings in the market



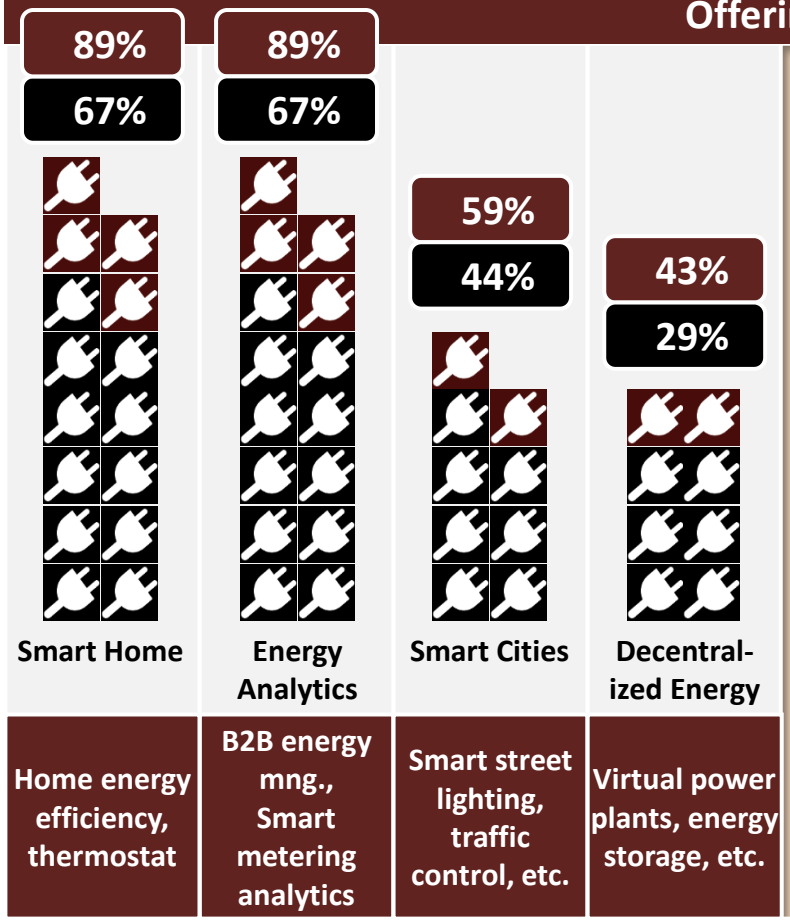
"No large vision but working on daily basis on smart city initiatives and conversations with municipalities"

Most utilities recognize the relevance of smart city concepts, but, after initial attempts most are reluctant to move quickly, primarily due to the high complexity

Today *In next 3 years*

Most utilities are venturing into digital offerings

Offerings in the market



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solarmine™ Mining Solar Energy for Australia

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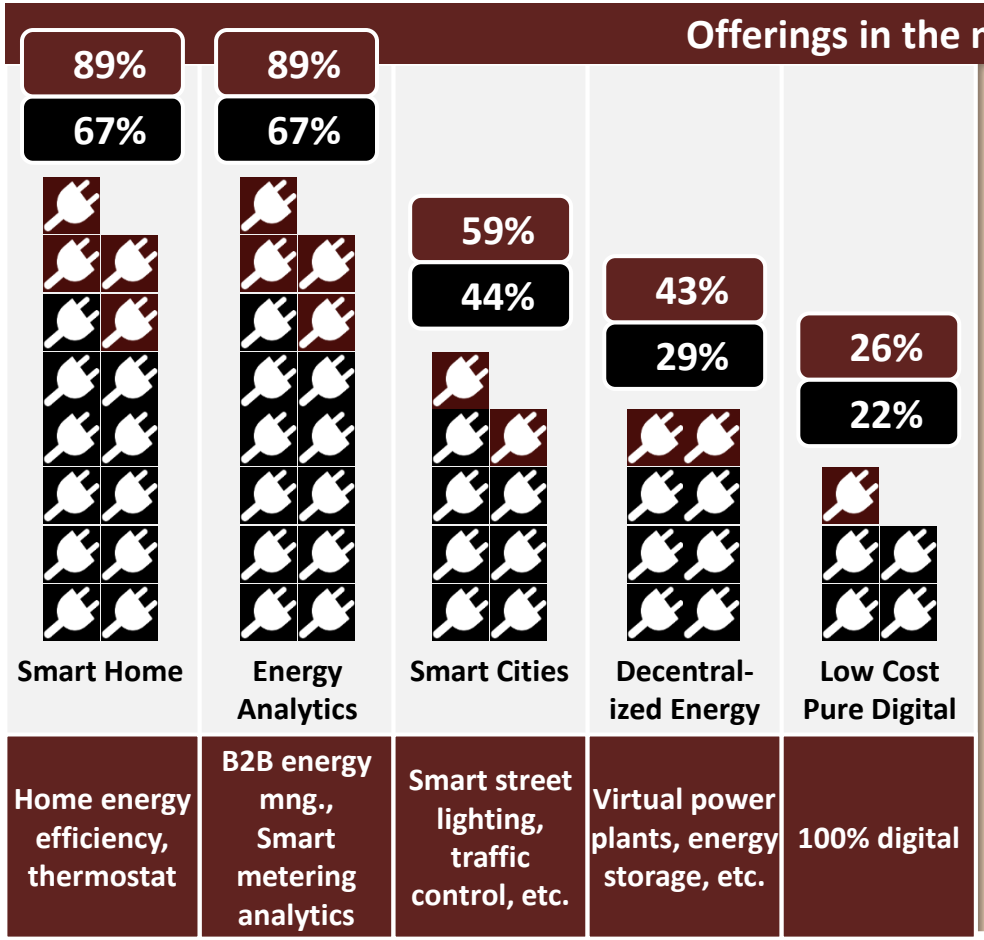
Utilities in countries with strong renewable energy take-up see very high importance in decentralized solutions

"Yes we offer decentralized energy solutions – this is a big growth bet"

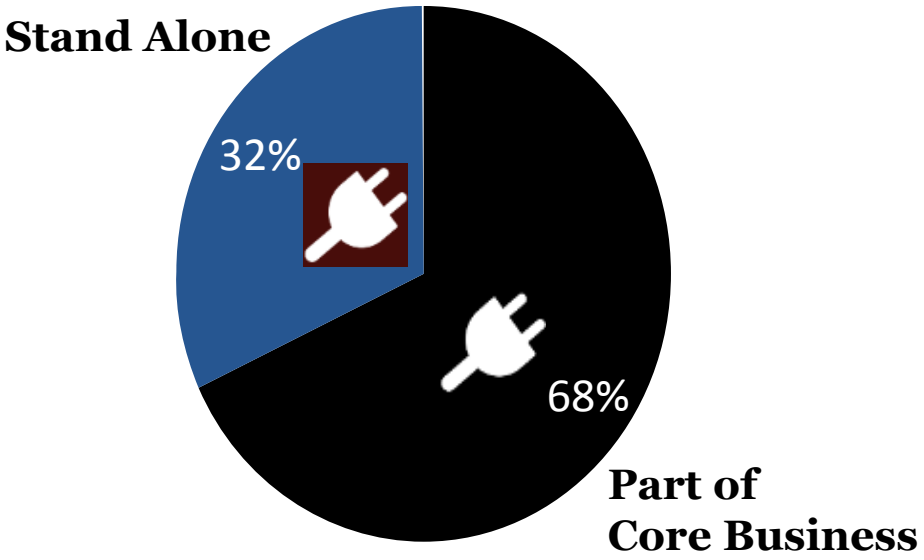
Today *In next 3 years*

Most utilities are venturing into digital offerings



New business models are seen as being a critical part of the future core business

Organisation of new business offerings



- *"New services will be operated as part of the core business – with exception of an offering around smart meters, which will be a stand alone business as it's non-regulated activity"*
- *"Right now our priority is to use digital to optimize our core business"*
- *"We have stand alone entities in order for them to flourish and be as agile as possible, however ultimately we want to integrate them as part of the core business"*

There are four broad interconnected themes that will have a significant impact on the industry over the next decade

Industry trends

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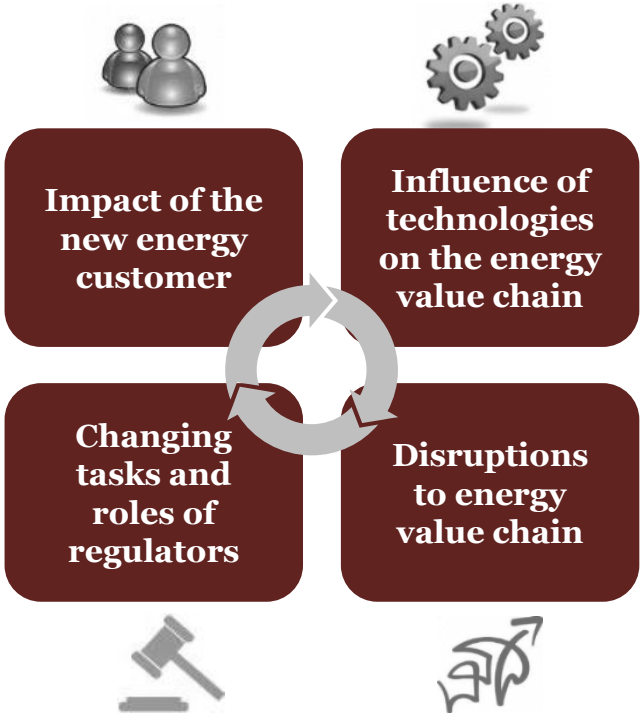

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