



ARE WE AT THE TIPPING POINT TO REIMAGINE THE FUTURE UTILITY ?

AFEER 2018 – Annual Conference

November 2018

EUROPE'S UTILITIES INDUSTRY CONTINUES TO BE

PROFOUNDLY DISRUPTED



A series of events is causing disruption and is driving transformational changes in developed economies

This is the age of decarbonization, digitalization and decentralization

Utilities have been slow to react

A



Supply demand imbalance

B



Renewable penetration

C



New technologies gaining speed



3 key facts

€143bn write offs in the past 6 years

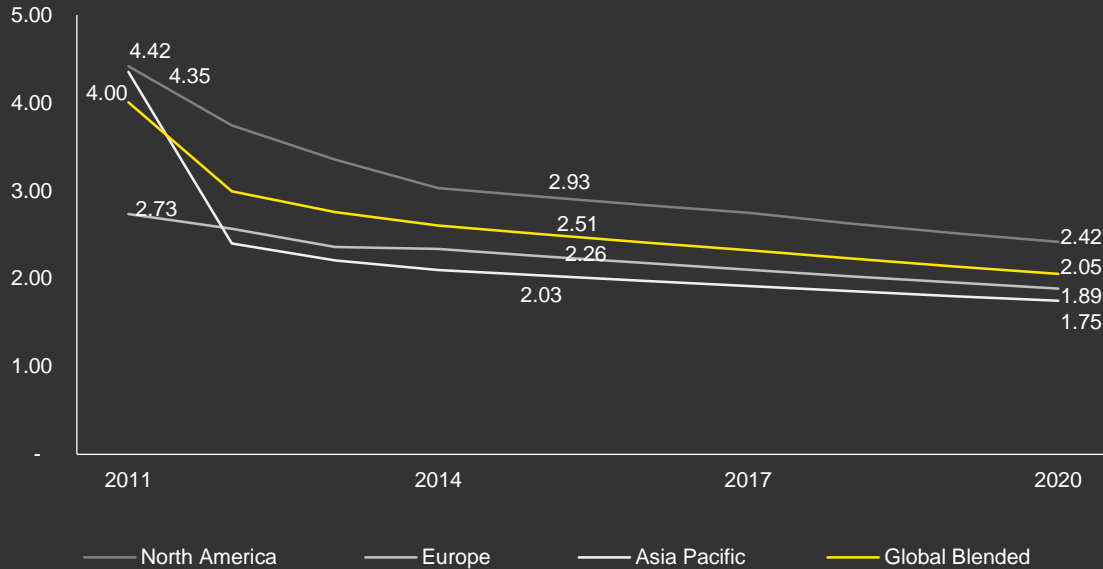
400 GW of Europe's around 900 GW installed capacity is at a loss or barely making profits

Market cap of top 20 utilities has been halved from **1.3 trillion**

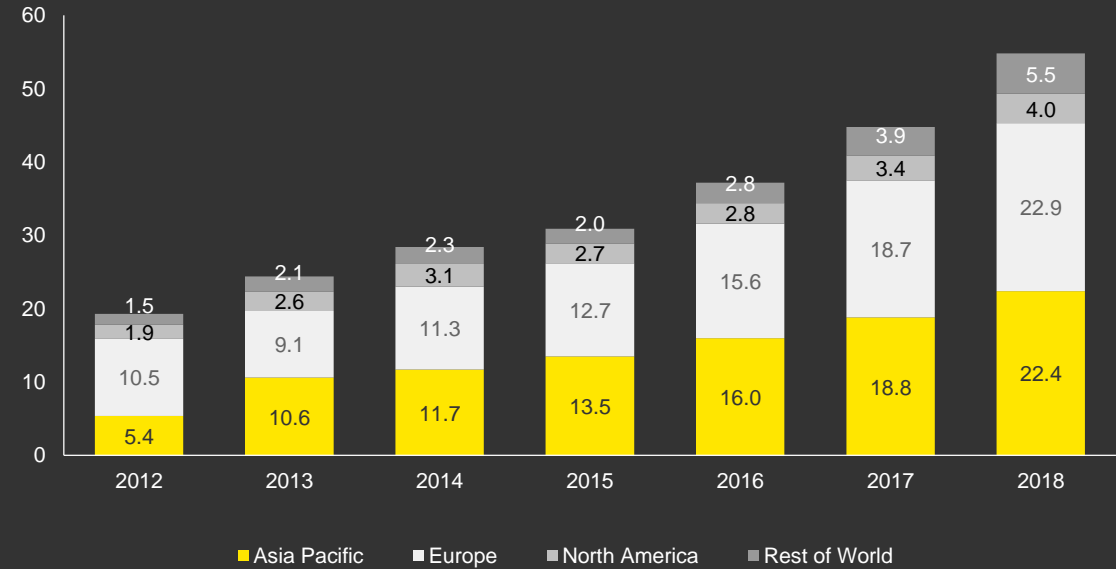


The mass adoption of solar surprised the market – as the levelized cost reduced, technology became increasingly cost competitive

Average Solar PV Installed Price (US\$/W)



Annual installed distributed solar PV capacity by region (GW)



- ▶ Growth in production and economies of scale have facilitated a continuous decrease in the installed price of solar PV

- ▶ Asia Pacific has become the market leader for installed distributed solar PV followed closely by Europe

42%

decline in global average PV installation cost since 2011

23%

decline in European average PV installation cost since 2011

14%

Expected decline in European average PV installation cost over next 5 years

Source: Navigant Research

A number of core technologies are fundamentally set to change the electricity market

Delivery technologies



Solar PV

Solar systems, both utility-scale and smaller on-site, producing energy that can be consumed



Battery storage

On-site batteries used to store electrical energy, including both stationary as well as EV batteries



Electric vehicles

Plug-in passenger EVs, including battery electrical vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs)



Microgrids

A group of distributed energy resources (DER) and electrical loads with clear network boundaries. Can operate in island-mode. Controllable as a single entity.



Home and building energy systems

Energy management systems that enable the most efficient and cost effective measurement, monitor, control, and optimization of energy consumption

Enabling technologies



Smart meters

Records consumption of electric energy in intervals of an hour or less and communicates the information back to the utility for monitoring and billing every day



Artificial intelligence

AI/cognitive systems that formulate possible answers and automatically adapt based on available evidence and training by ingesting vast amounts of data



Grid edge technologies

Includes devices, such as synchrophasers/smart grids, which helps record, monitor, control and optimize energy distribution



Cloud

Defined by public cloud sharing of electric utility spending on software, server and storage.



Peer-2-peer energy exchange

Technology which helps prosumers to exchange excess electricity with other consumers

The future of power and utilities (P&U) is emerging rapidly and will materialize through three disruptive “tipping points”

Tipping point 1

“Grid cost parity” of non-utility* solar plus storage systems

The birth of the new energy system



Tipping point 2

The price of battery electric vehicles reaches cost parity and performance parity with ICE** vehicles

Electricity and mobility industry convergence



Tipping point 3

The cost of transporting electricity exceeds the cost of generating and storing it locally

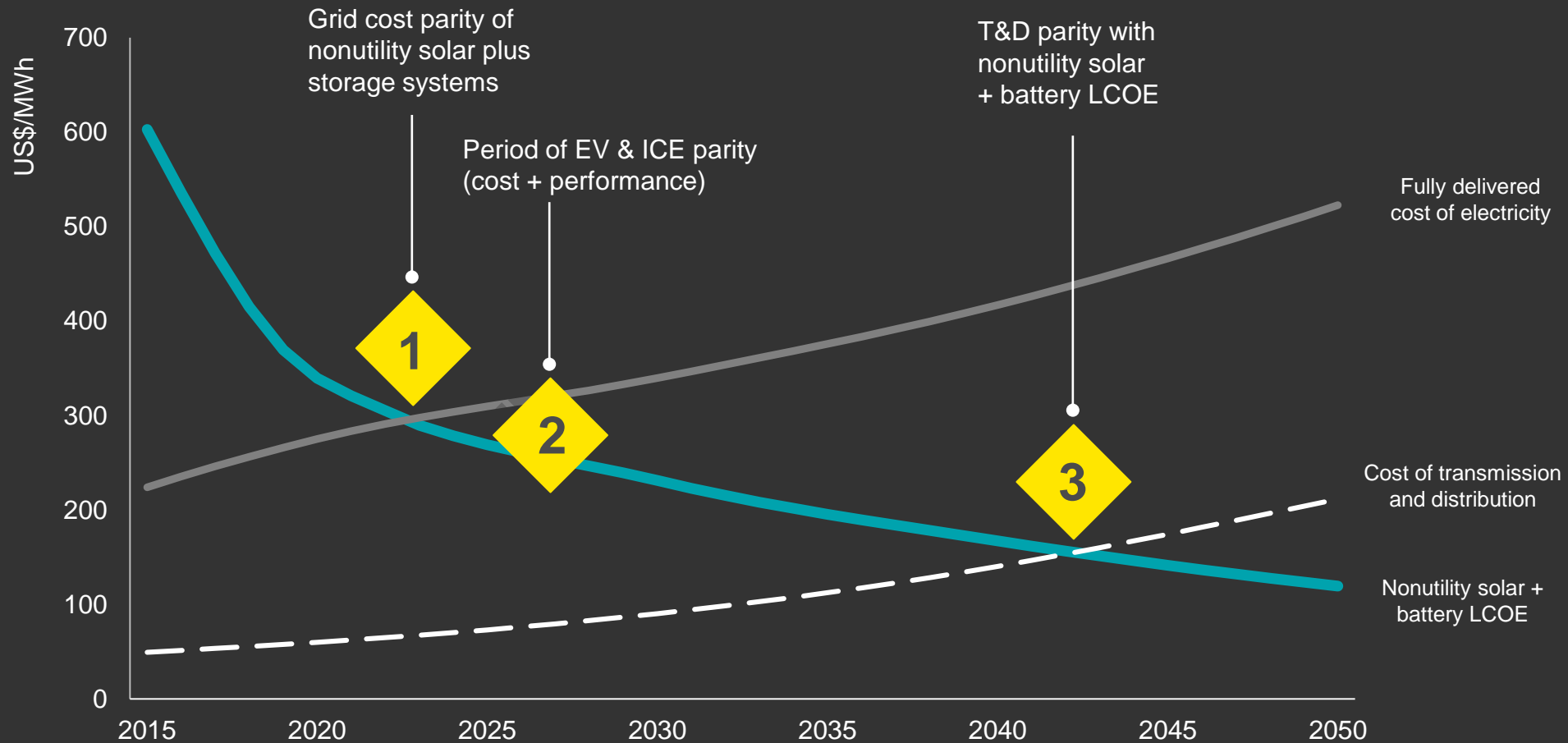
The digital energy market place



* Non utility: households and business customers producing electricity

** ICE: internal combustion engine

The pace of change in Europe will be defined by three technologies: nonutility solar, battery storage and EVs



Source: Utility impact model central scenario Europe - EY analysis.

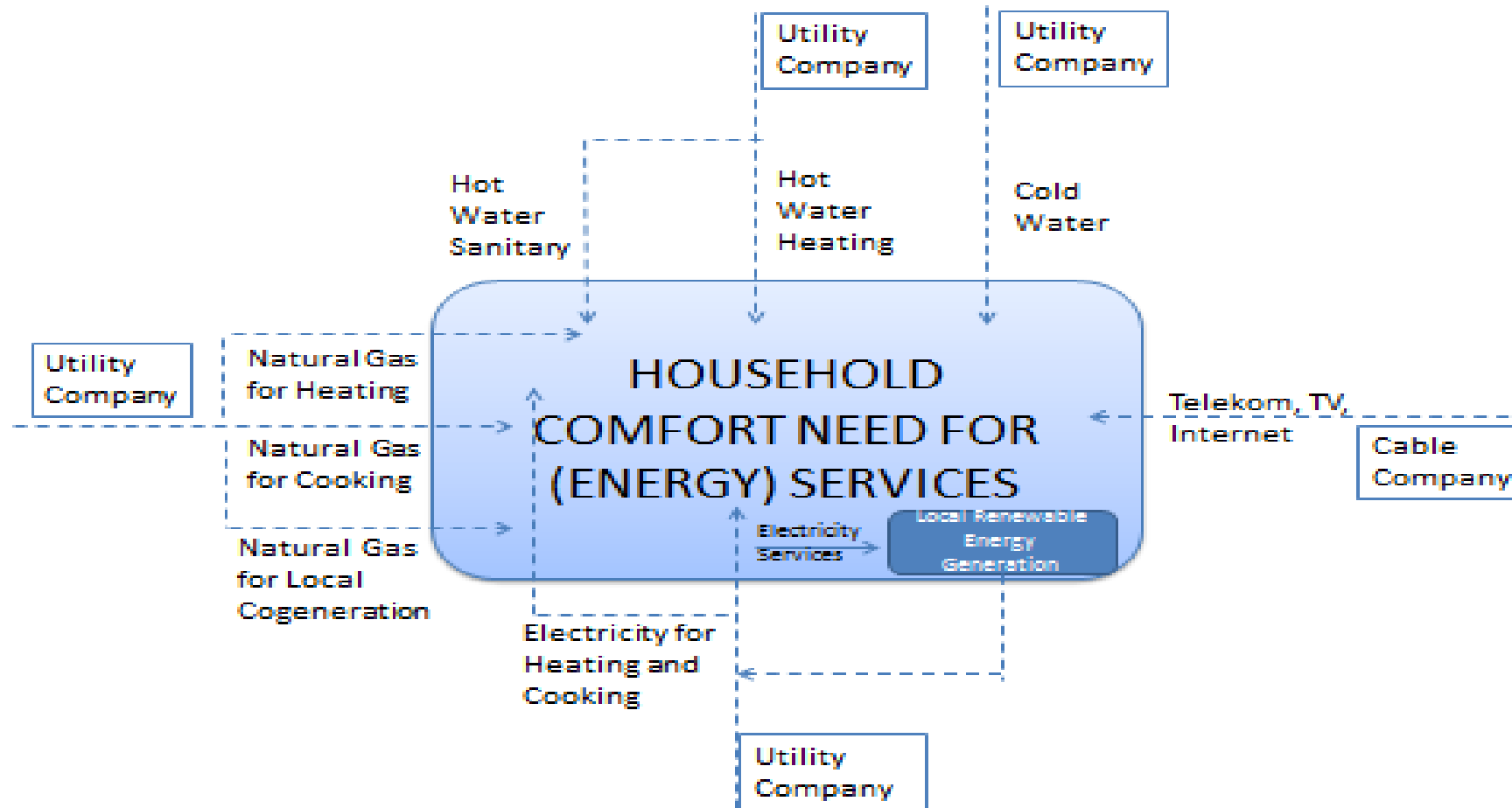
* Analysis is based on average profiles. In each geography, there will be segments of the customer base for whom the economics improve much sooner.

THE MOST PROMISING RESPONSES TO DISRUPTION
INVOLVE USING INNOVATION TO INTRODUCE

NEW PRODUCTS AND SERVICES TO THE MARKET



The battle for the Romanian residential customer – from supply of energy as a commodity, to supply of energy and services – to supply of energy services

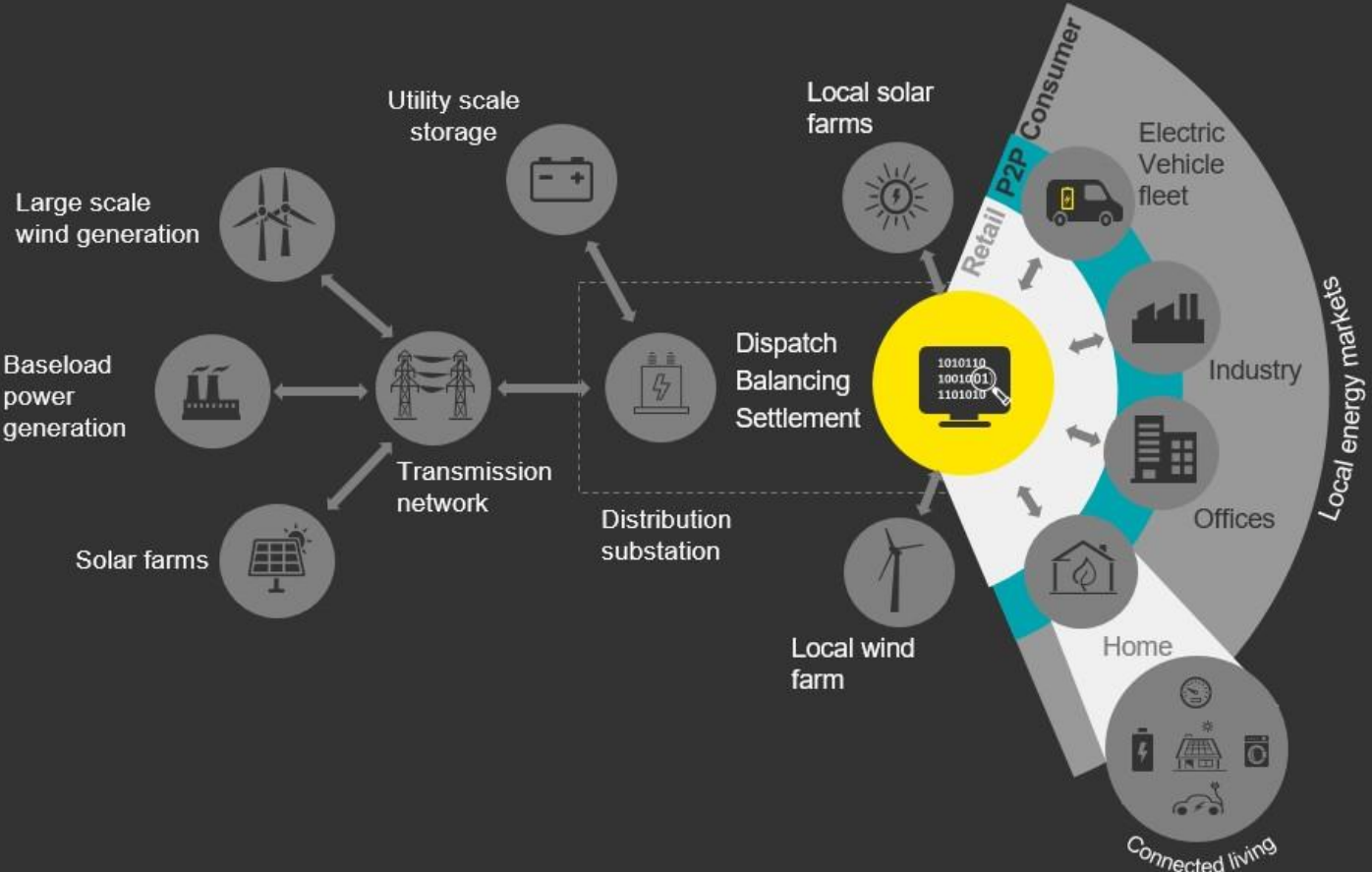


We are speeding towards a **NEW ENERGY SYSTEM**

... Interconnected by digital technologies

... where power & information flow in both directions

There will be range of value shifts in the industry which will produce significant winners and losers



NEW MARKET ENTRANTS, LARGE TECH COMPANIES, OTHER INDUSTRIES AND START-UPS ARE ENTERING THE SCENE

MOST OF THEM HAVE A COMPETITIVE ADVANTAGE



AAA Average rating of new large entrants compared to Utilities' average credit rating slipped to BBB+

465bn Apple, Google, Facebook, Microsoft and Cisco combined are sitting on half a trillion USD in cash, ready to invest in further innovation

\$746m During the last two years, new energy-focused start-ups have raised US\$746m of funding through series A and B rounds.

3,761 Amount of energy companies referenced in Techcrunch's Crunchbase database of disruptive innovation companies

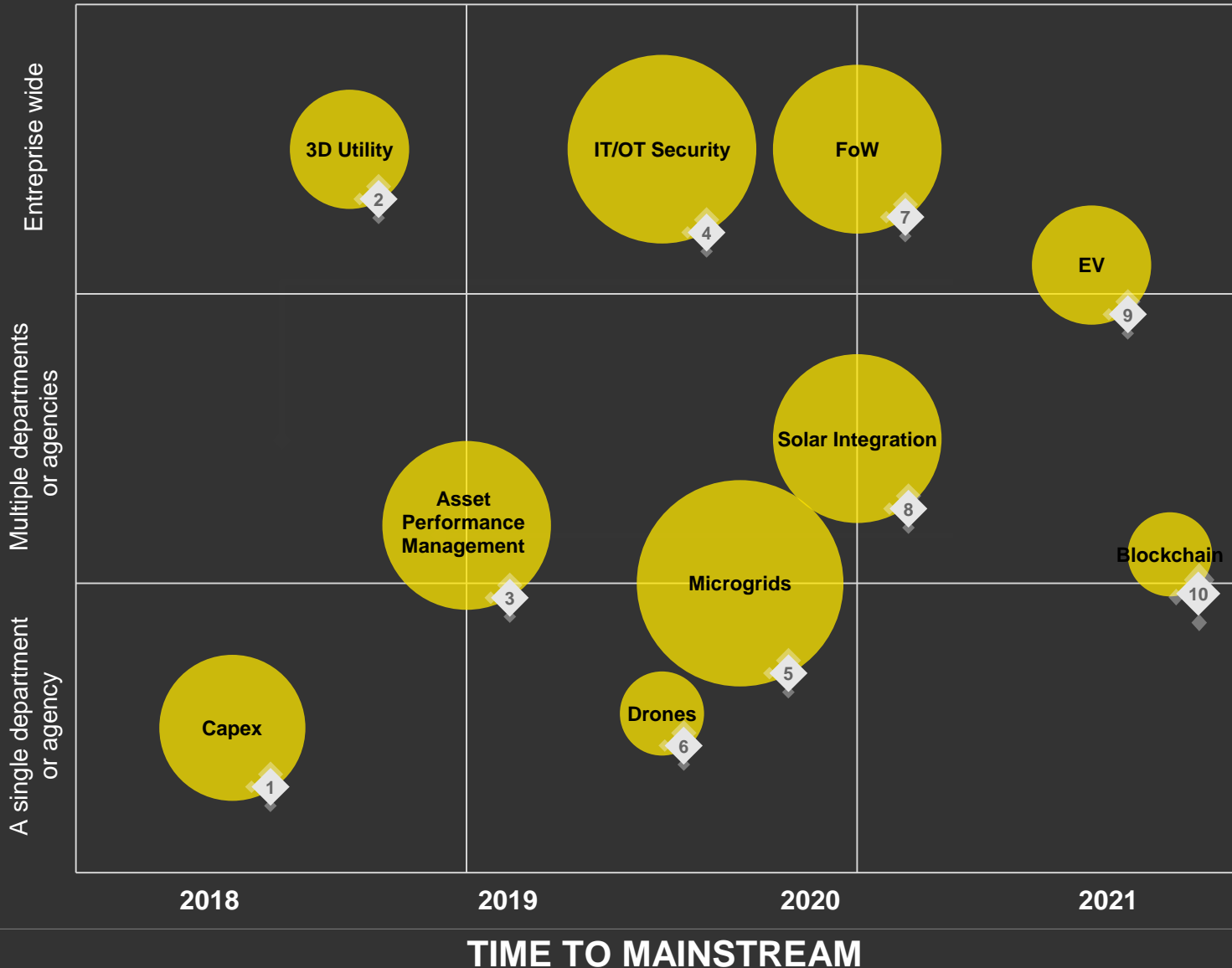
THE RESPONSE TO THESE THREATS IS TO START PLAYING IN THE FIELD OF
**EMERGING
TECHNOLOGIES**



PREDICTIONS ON THE UTILITIES MARKET

Source – IDC FutureScope : Worldwide Utilities 2018 Predictions

ORGANISATIONAL IMPACT



- 1 In 2018, gas and electricity suppliers will dedicate 50% of their capex – related IT budgets to digital channels, product marketplaces, and personalized services.
- 2 By 2019, 85% of utilities in the G2000 will have established a new business unit with its own financing and governance, or a separate company, to speed up innovation and business transformation.
- 3 By 2019, 75% of utilities will be using some form of Asset Performance Management APM, leading to an improvement of up to 10% in operational performance.
- 4 By 2019, 30% of utilities will have modified their security approaches, in favor of a resiliency-oriented model, which integrates IT and OT, cybersecurity and physical security, and data protection and privacy.
- 5 Through 2020, emerging markets will offer the largest growth opportunity for microgrids, creating new revenue streams for up to 25% of utilities worldwide in the form of microgrids as a service.
- 6 By 2020, 50% of all electricity T&D utilities will be using drones to evaluate service lines, achieving savings of up to 5% and 30%, respectively.
- 7 By 2020, 25% of utilities will have moved from traditional talent sourcing strategies and models to virtual, borderless, and task-oriented approaches, integrating online communities and platforms to acquire skills and temporary staff.
- 8 Through 2020, solar will drive up distributed energy management system implementations and expansions of existing automated demand side management (ADSM) by as much as 50%.
- 9 With an increase in EVs of 150% expected over the next three years, by 2021, the number of utilities with business units for e-mobility services will have doubled.
- 10 By 2021, 50% of utilities that are currently piloting distributed ledger technologies will move to commercial deployment in at least one use case.



EMERGING TECHNOLOGIES ARE CRITICAL ENABLERS FOR TOMORROW'S ENERGY SYSTEM

EY HAS IDENTIFIED 3 AREAS WHERE INNOVATION & EMERGING TECHNOLOGY WILL PLAY A CRUCIAL ROLE

REQUIRED TO MAKE THE GRID DYNAMIC



- **Artificial Intelligence** algorithms will be required for the arbitrage to STORE, CONSUME or SELL energy
- **Blockchain** technology will be to administer the high volume of distributed transactions

REQUIRED TO EXECUTE THE TRANSFORMATION



- Efficient workforce enablement tools such as **AR/VR** will be required to support roll-out and maintenance of new assets
- Accurate forecasting solution will be required to plan for the right assets and investments

ENABLING NEW BUSINESS MODELS & REVENUE



- Looking for new sources of value through new business models
- Developing new products and services
- Opening the market to increasing levels of competition

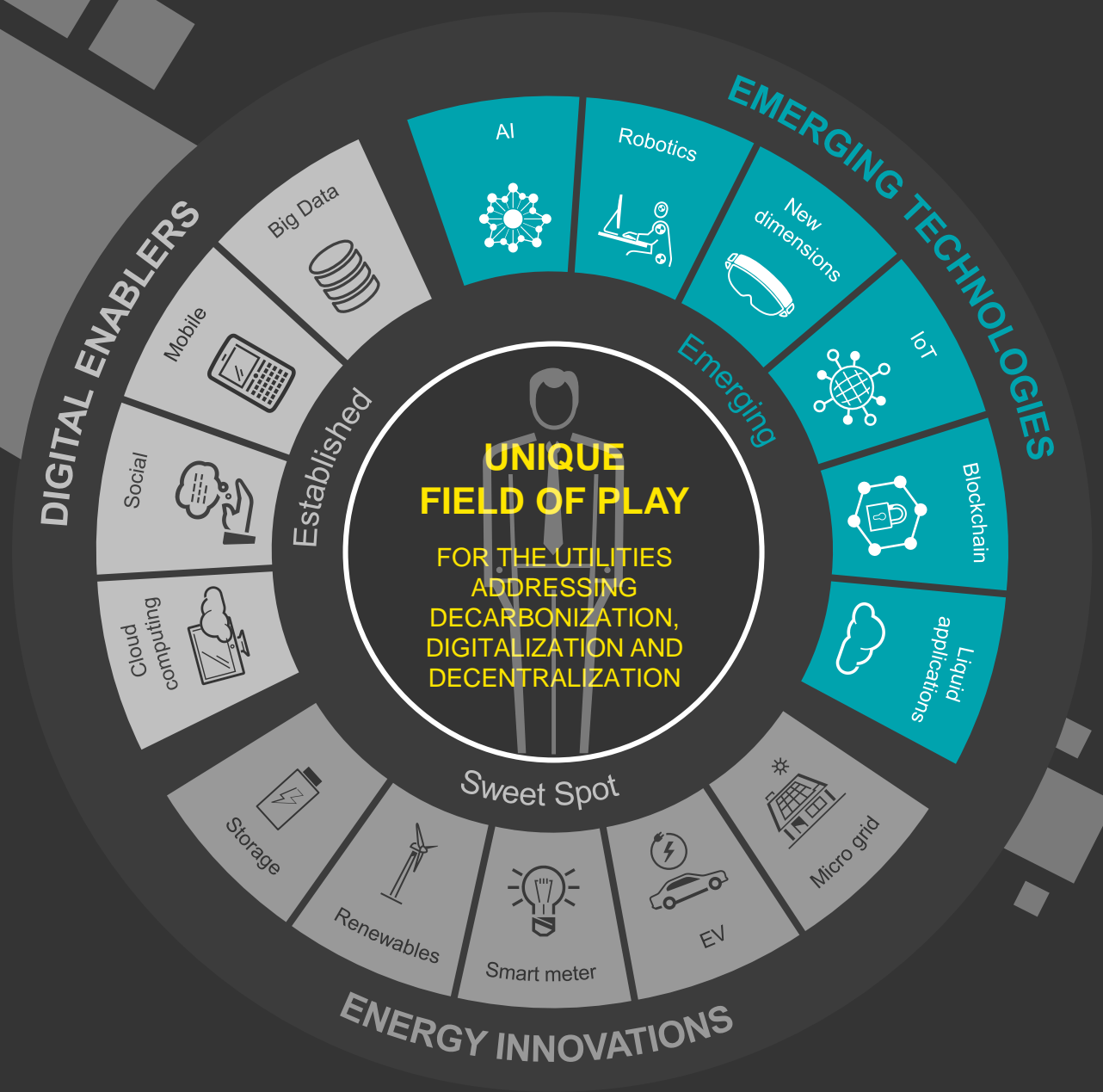
“Two important non human abilities that AI possesses are connectivity and updtateability.

Since humans are individuals, it is difficult to connect them to one another and to make sure they are up to date. In contrast, computers aren't individuals, and it is easy to integrate them in a flexible network. Hence what we are facing is not the replacement of millions of individual human workers by millions of individual robots and computers. Rather, individual humans are likely to be replaced by an integrated network.... We should compare the abilities of a collection of human individuals to the abilities of an integrated network. “

**UNDERSTANDING
EMERGING TECHNOLOGY
IS CRUCIAL TO REMAIN
RELEVANT AS
A UTILITY**



AS TECHNOLOGY EVOLVES EVER FASTER, THERE IS A UNIQUE OPPORTUNITY FOR UTILITIES TO COMBINE DIGITAL, EMTECH & ENERGY INNOVATIONS - BRINGING VALUE TO THEIR CUSTOMERS AND SOCIETY



Lessons learned/expected evolutions for the future

- ▶ Binig (2008, AFEER): “Suppliers without assets will face hardships” - Assets: distribution, generation, services; DATA IS AN ASSET!
- ▶ Electricity&Natural Gas Law- articles 23, 28 – no new large scale centralized power generation projects with private financing;
- ▶ Draft Energy Strategy: Large new projects, long time horizon;
- ▶ High CO₂ prices, grid parity of decentralized solutions;
- ▶ Expected proliferation of decentralised solutions – microgrids, VPPs – Romanian paradox, similar to the RES history;
- ▶ Suppliers to grab the opportunities – design, permitting, installation, maintenance, operation, etc, to compensate for decrease of sales of centrally generated power; AGGREGATORS!
- ▶ The future is decentralized, decarbonated, digital;

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