



India | New Delhi

Plenary session 4: Uptake of Clean Technologies: Disruption and Coexistence of New and Existing Technologies - the Way Ahead

Background Paper



Disclaimer

The observations presented herein are meant as background for the dialogue at the 16th International Energy Forum. They have been prepared in collaboration with The Boston Consulting Group and should not be interpreted as the opinion of the International Energy Forum or The Boston Consulting Group on any given subject.

Introduction

Market Context

- Energy related technology is evolving at a fast pace impacting operations and business models. To ensure a reliable and sustainable transition, clear and predictable policies are needed
- There is certain uncertainty related to which new technologies should be promoted, if any, and how to ensure limited impact on existing assets and technologies
- Policy makers face challenges around how to achieve a well-balanced regulatory framework to foster innovation balancing sustainable, cheap and reliable/secure energy



Session Objectives

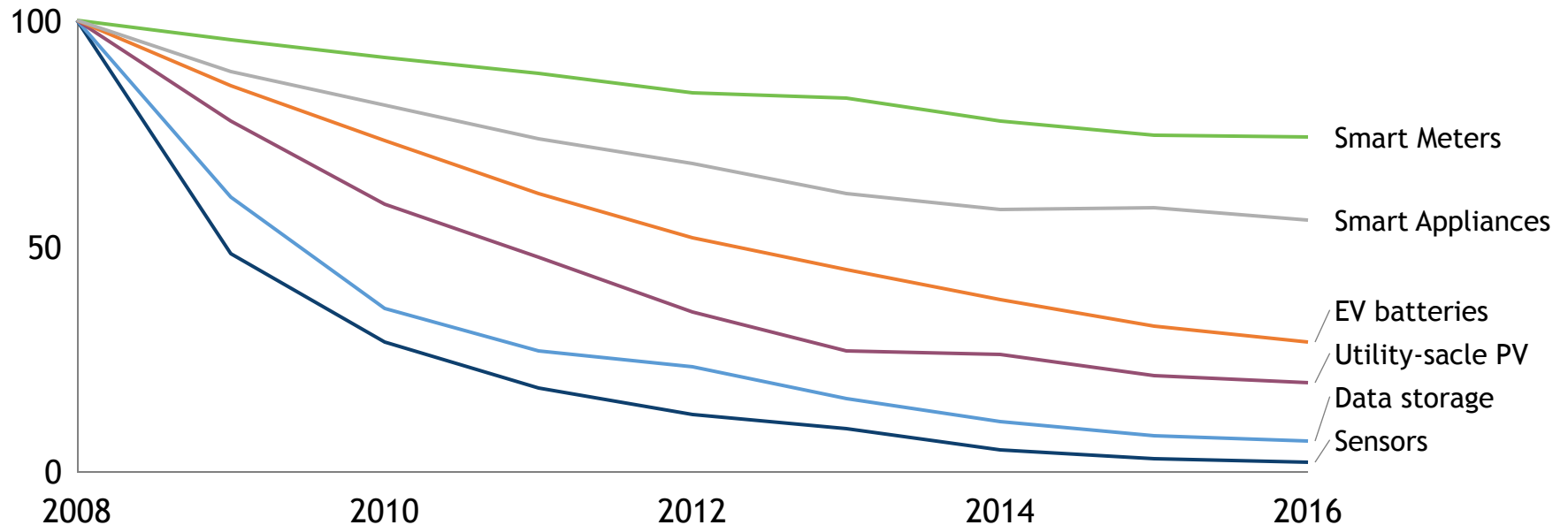
- Discuss the role of energy policy and the regulators in the technological progress in the sector
- Share experiences on potential initiatives that can be implemented to foster technological progress without endangering market stability and/or energy security
- Seek common goals that could be pushed in a coordinated manner at international level to foster introduction of new technologies in the energy sector

Key Question: How can energy policy makers foster new technologies as a way to achieve long term energy strategy: cheap, sustainable, reliable and secure energy?

Fast technological progress allowing to produce and consume clean energy cheaper than ever

Price reduction in different technologies

Price in 2008 = 100



Source: IEA. Based on BNEF (2017), Utilities, Smart Thermostats and the Connected Home Opportunity; Holdowsky et al. (2015), Inside the Internet of Things; IEA (2017), Renewables; Tracking Clean Energy Progress; World Energy Investment; Navigant Research (2017), Market data: Demand Response. Global Capacity, Sites, Spending and Revenue Forecasts

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Fostering a number of disruptions in the energy industry



Internet of things
and sensors



Robotization



Renewables
and DER



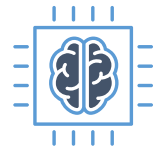
Smart grids



Vehicle
electrification



Batteries



Peer to peer
trading



Shale gas



Smart energy
efficiency



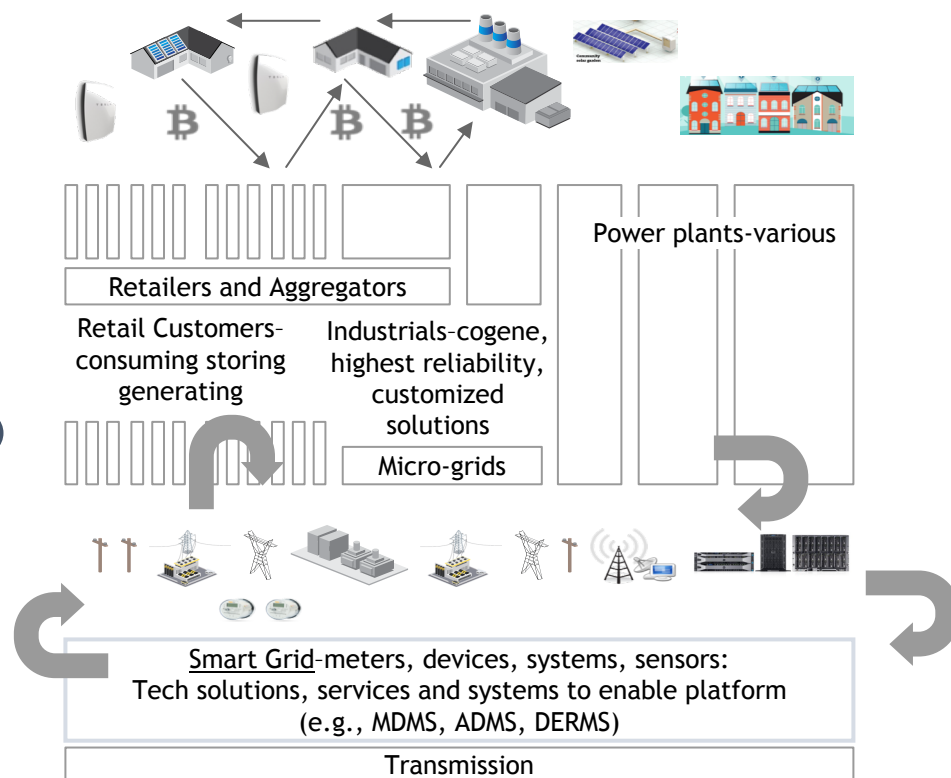
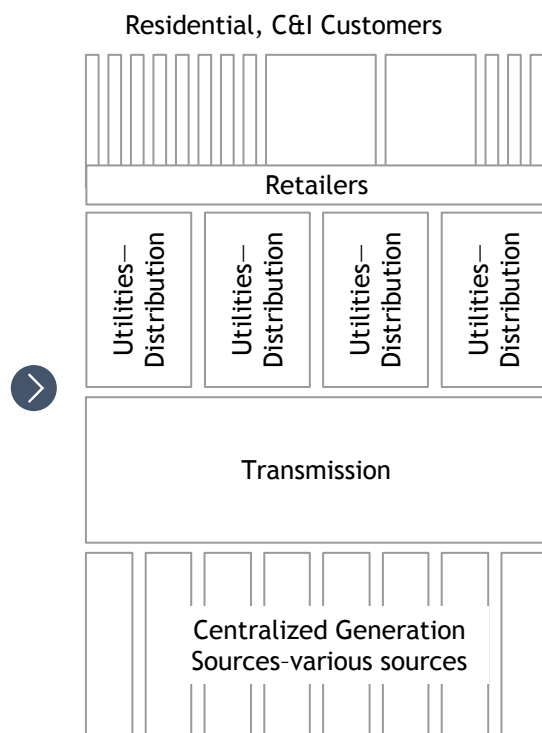
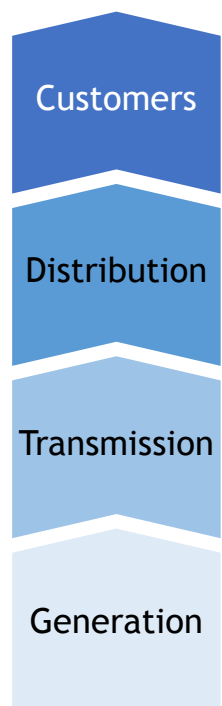
Electrification
of thermal load

At the same time, policy makers trying to reform the market through a set of initiatives

Illustrative example from Europe

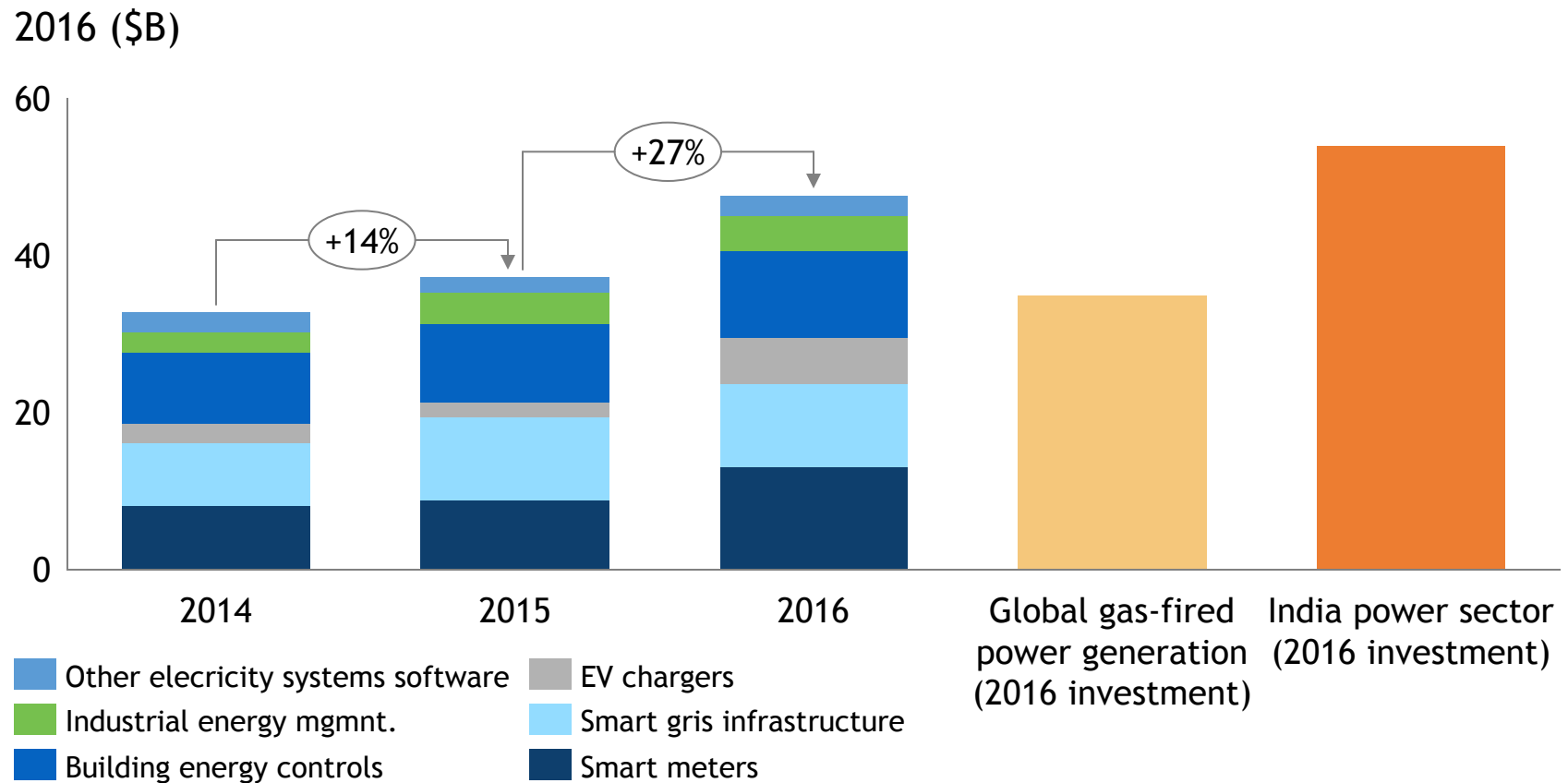


A fundamental shift in power sector stack architecture is underway in the Power sector



Leading to shifts in investment and value pools

Investments in smart electricity infrastructure and software vs investment in global gas generation or the Indian power sector



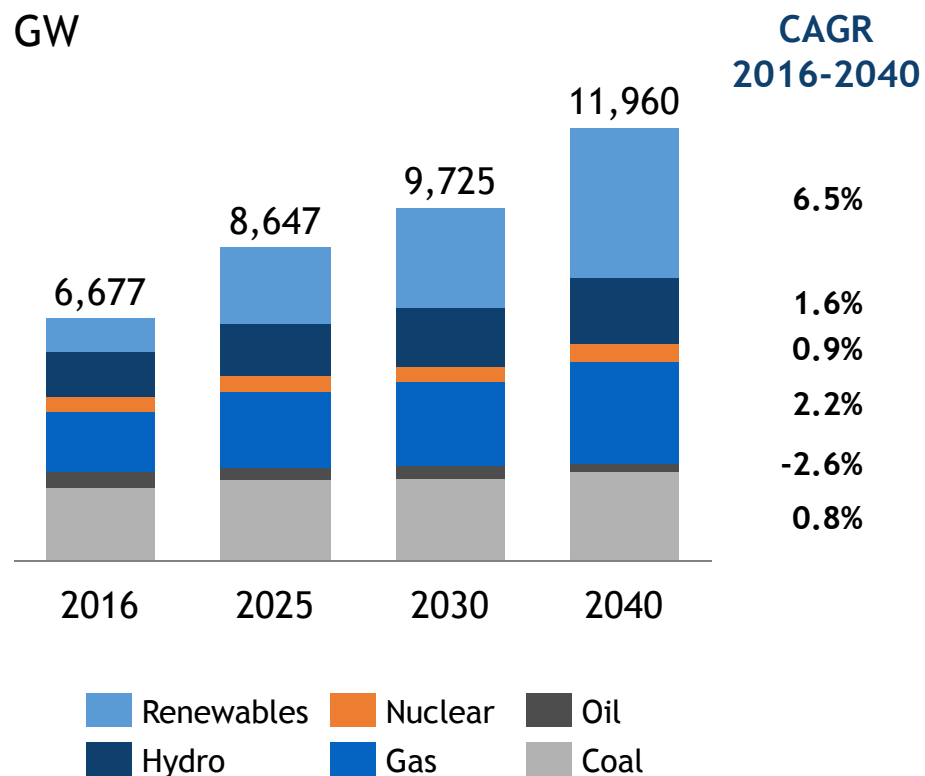
Note: Calculations for investment in digital infrastructure and software based on Markets and Markets (2016), Internet of Things in Utility Market; BNEF (2016), Digital Energy Market Outlook

Source: IEA

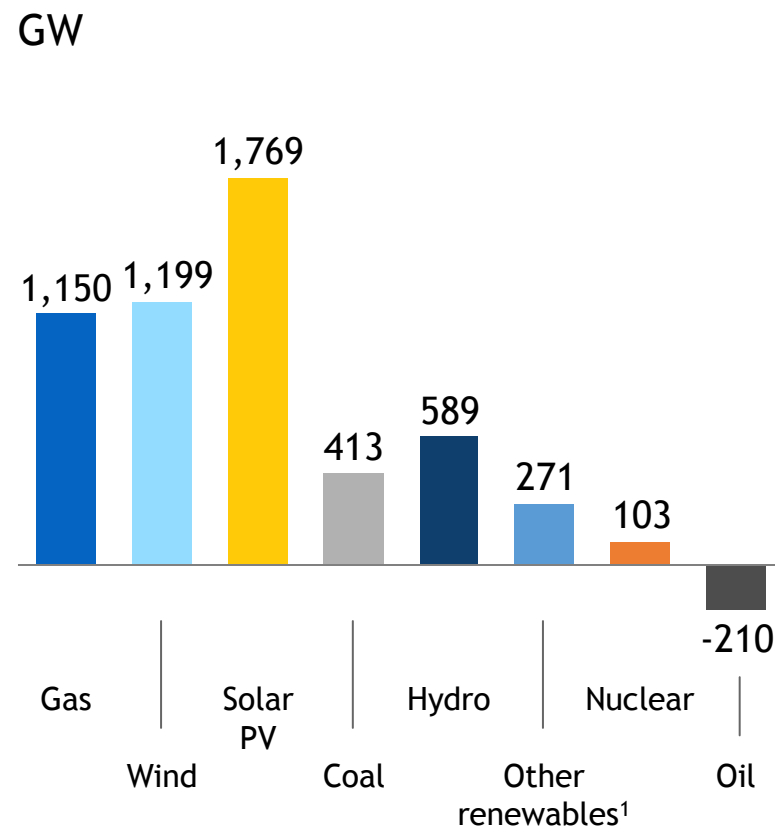
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Renewables expected to gradually replace conventional technologies in the future power generation mix

Worldwide installed power generation capacity 2016-2040



Net capacity additions 2016-2040



1. Bioenergy, Geothermal, CSP, Marine
Source: IEA (2017) World Energy Outlook (IEA New Policies Scenario), BCG analysis
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Even in the most 'green' scenario traditional technologies will still play an important role in the mix by 2040

BCG Green Revolution Scenario

Technology and regulation drive...

- Technology drives down costs of low-carbon technologies
- Regulatory push based on environmental concerns: clear push to limit CO2
- Government play a strong role

...Electrification, efficiency and renewables

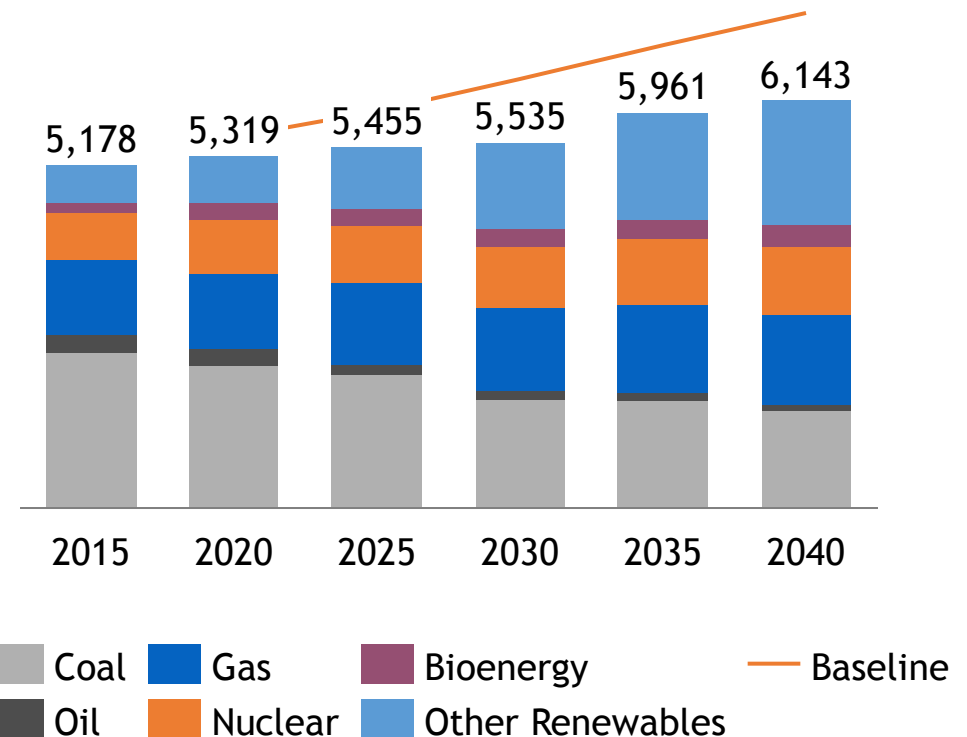
- Solar and wind fully competitive by 2025: Build-out rate ~300 GW/y
- Action on coal for power: active coal closure in OECD; China follows with 10y delay
- Investments in smart grids

Solid push for energy efficiency

- Central coordination of efficiency standards and investment in efficient lighting, cooking and appliances

BCG Energy Scenario Model

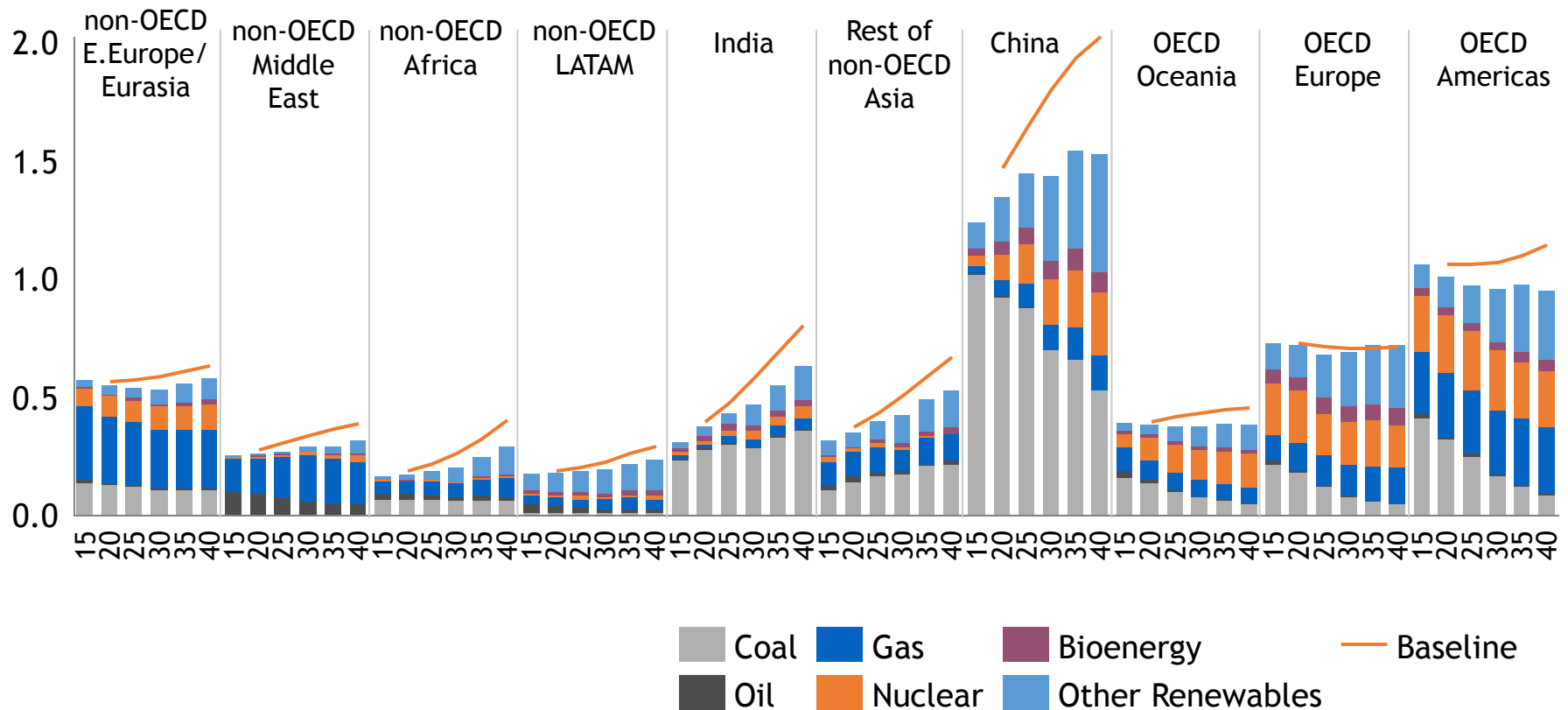
Total Primary Energy for Power Generation - mtoe (%)



Specially in developing economies: i.e., China and India

BCG Green Revolution Scenario: total Primary Energy for power generation 2015-2040

K mtoe



Coal and Gas could still be predominant in a scenario of abundant and cheap unconventional gas

BCG Blue Gas Economy Scenario

Abundant unconventional gas drives...

- The US leads the way
- Shale gas boom in China and Argentina

... A drop in gas prices...

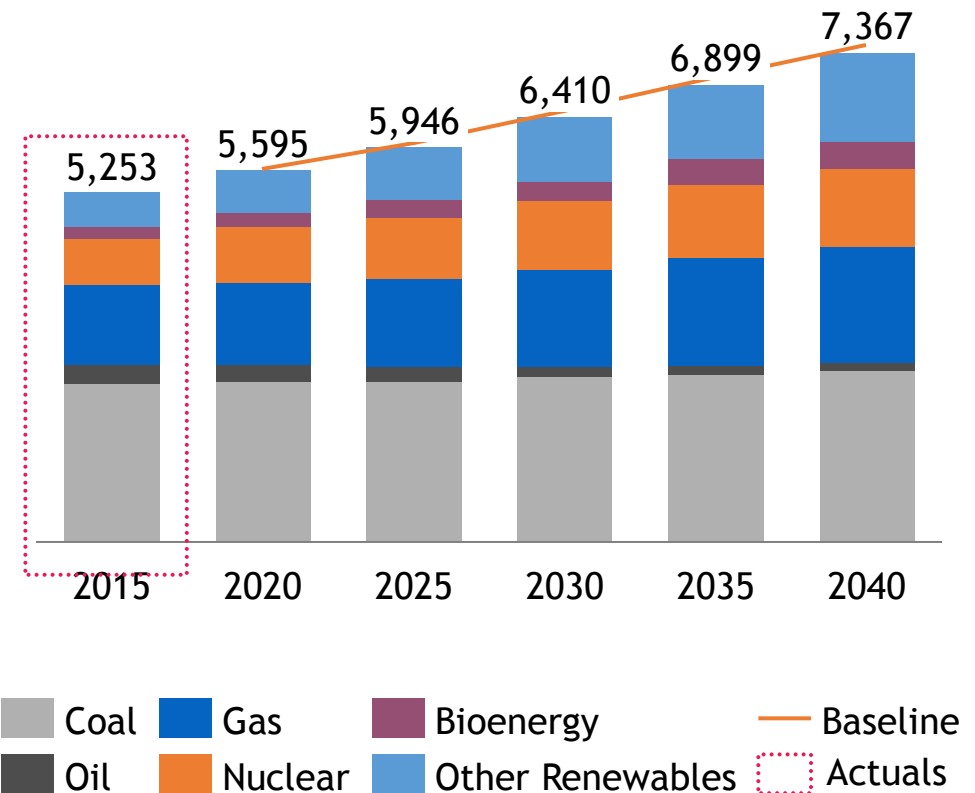
- Gas prices below 5\$/mmbtu in exporting countries
- Gas prices below 10\$/mmbtu in importing countries

... And a switch to gas

- Power, industry and buildings: switch in China and Argentina
- Decreased efficiency improvements in buildings: Slower deployment of building standards compared to Baseline

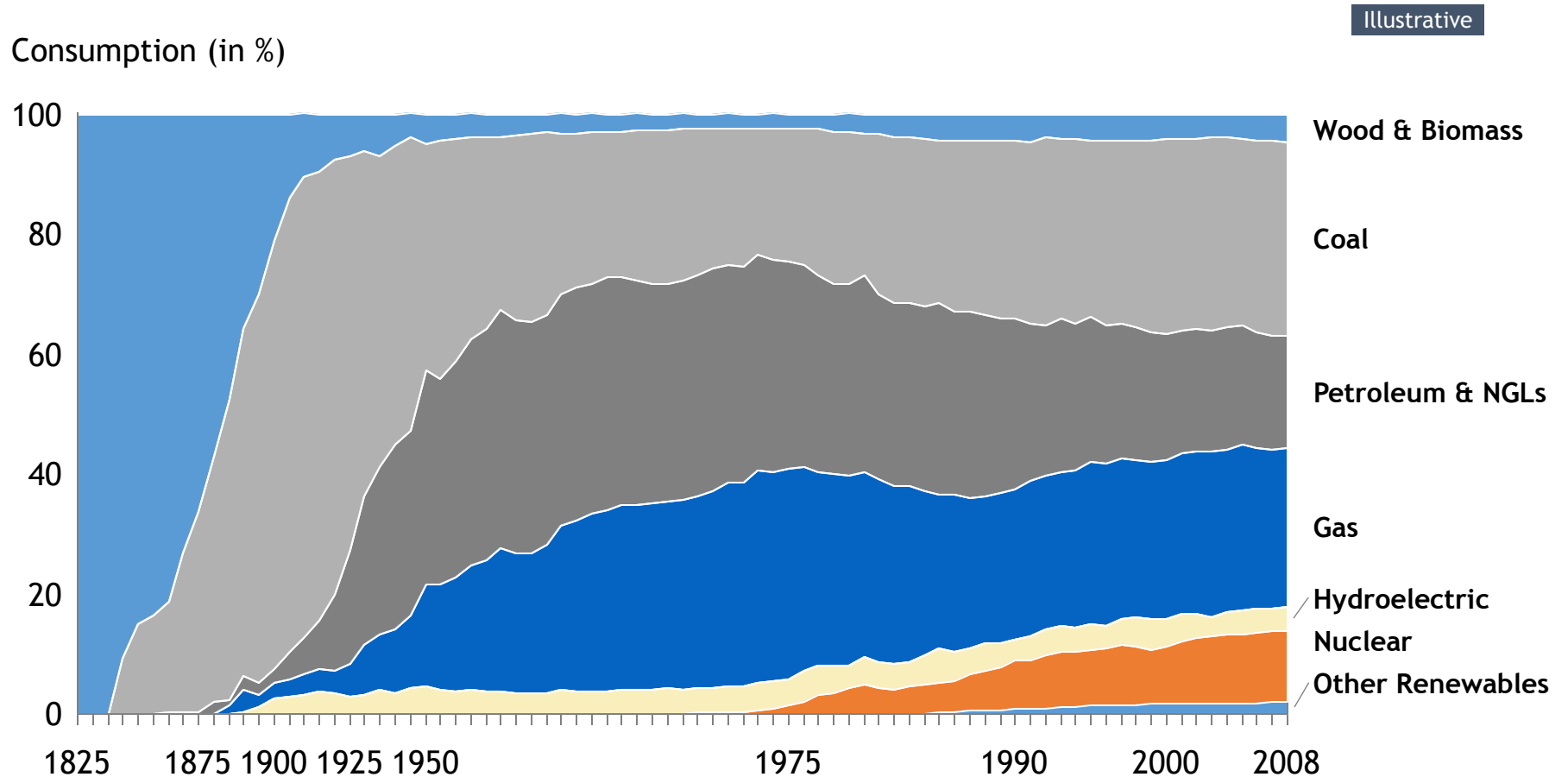
BCG Energy Scenario Model

Total Primary Energy for power generation - mtoe (%)



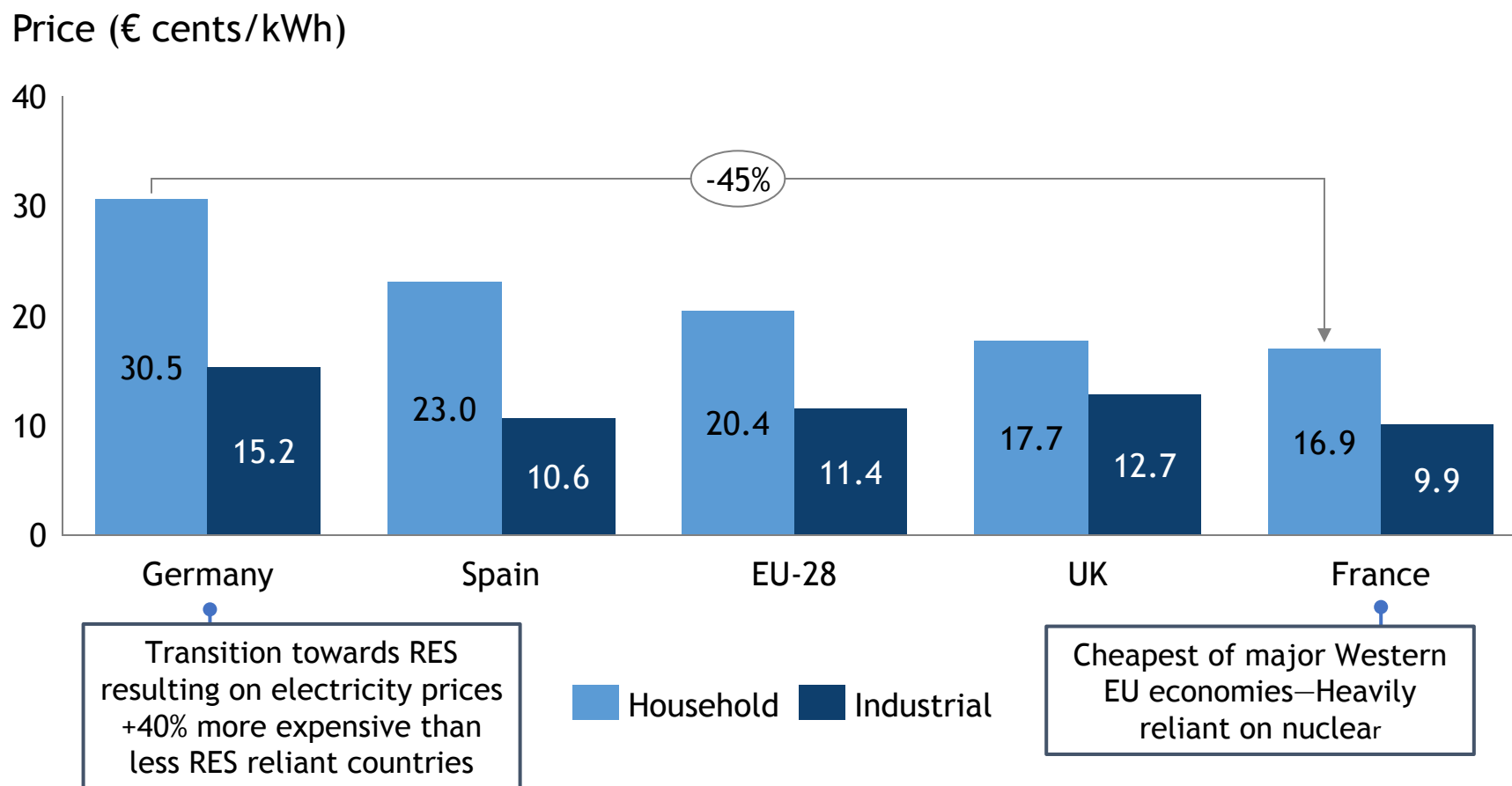
Replacement of fuel sources is not new and takes time

Major Sources in the US Energy Mix (1825-2008)



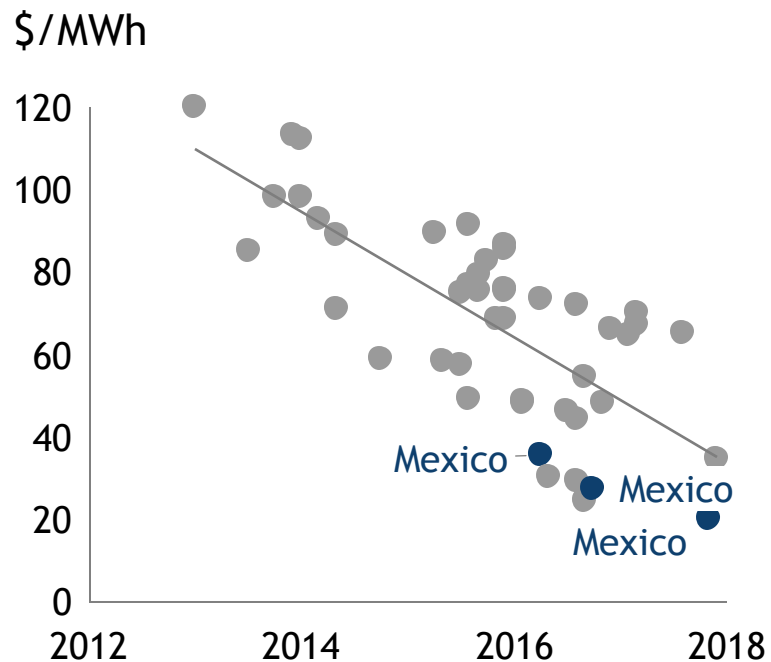
The different policy choices do have an impact on prices

Electricity prices in different countries

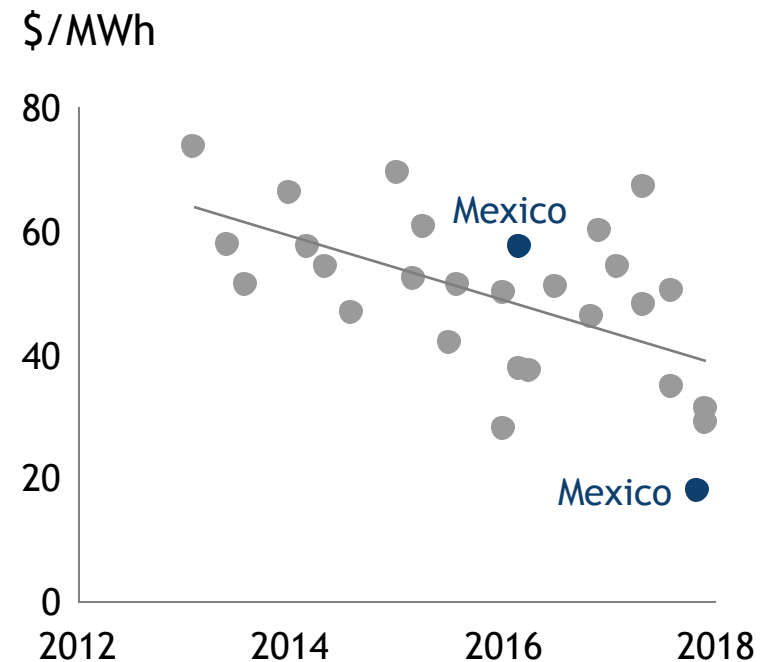


A 'wait and see' strategy can allow to benefit from a cheaper and more mature technology: e.g., Mexico

Solar PV: Auction prices

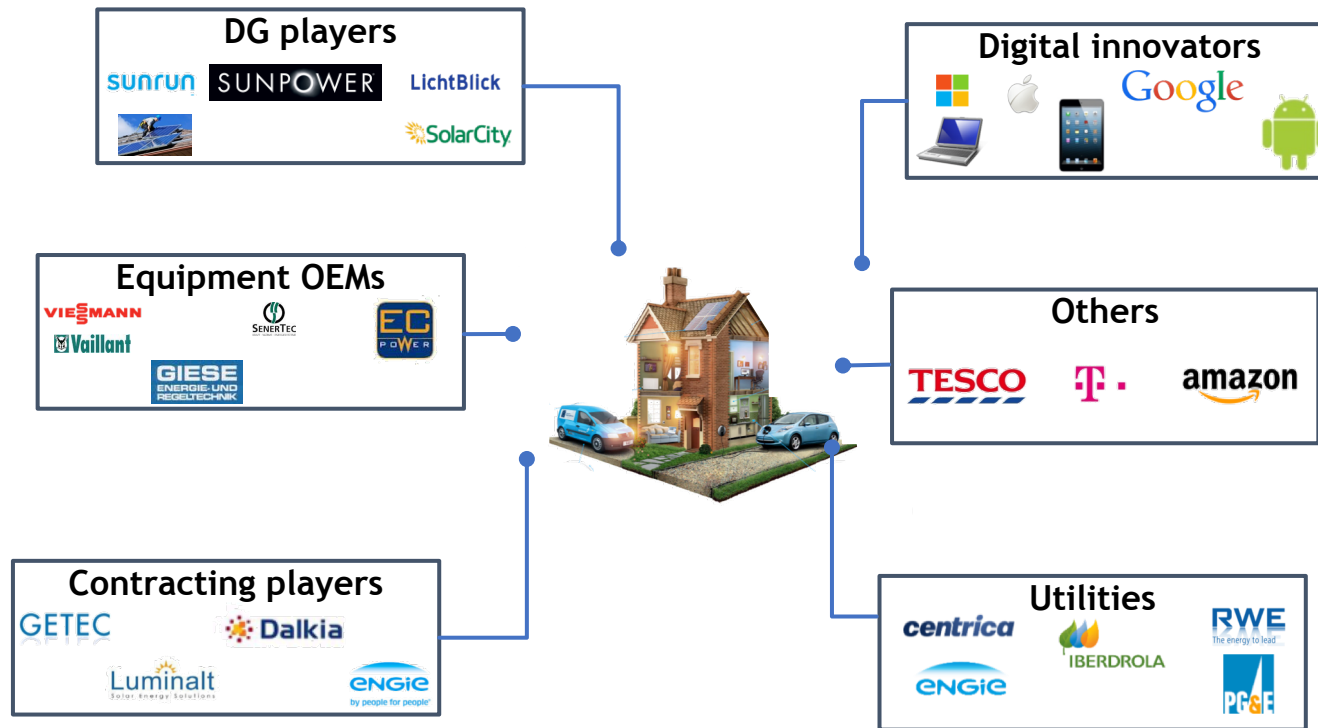


Wind onshore: Auction price



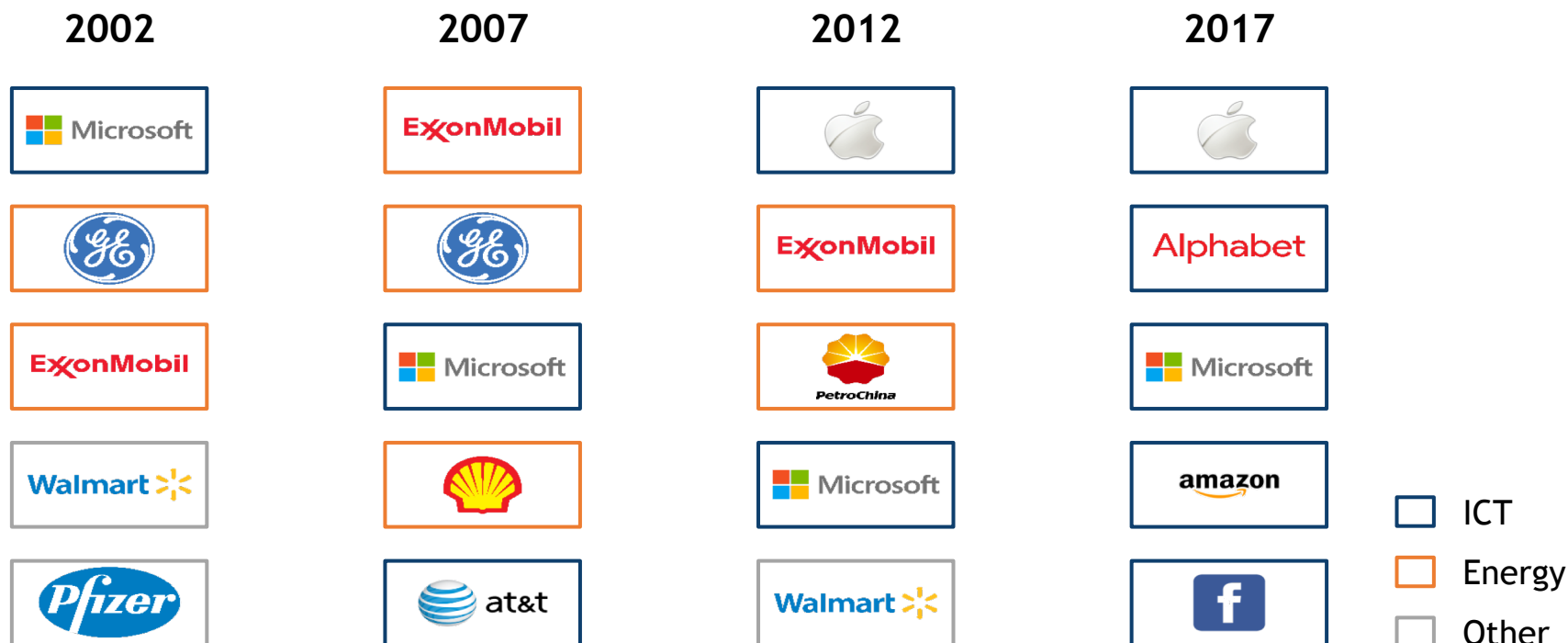
Mexico started later than other countries in Renewable development and is now achieving some of the cheapest prices around the world

A new landscape of players is emerging



"Utilities are crazy if they don't start offering customers innovative financing packages for solar and distributed generation ... because others will." – Honda Executive

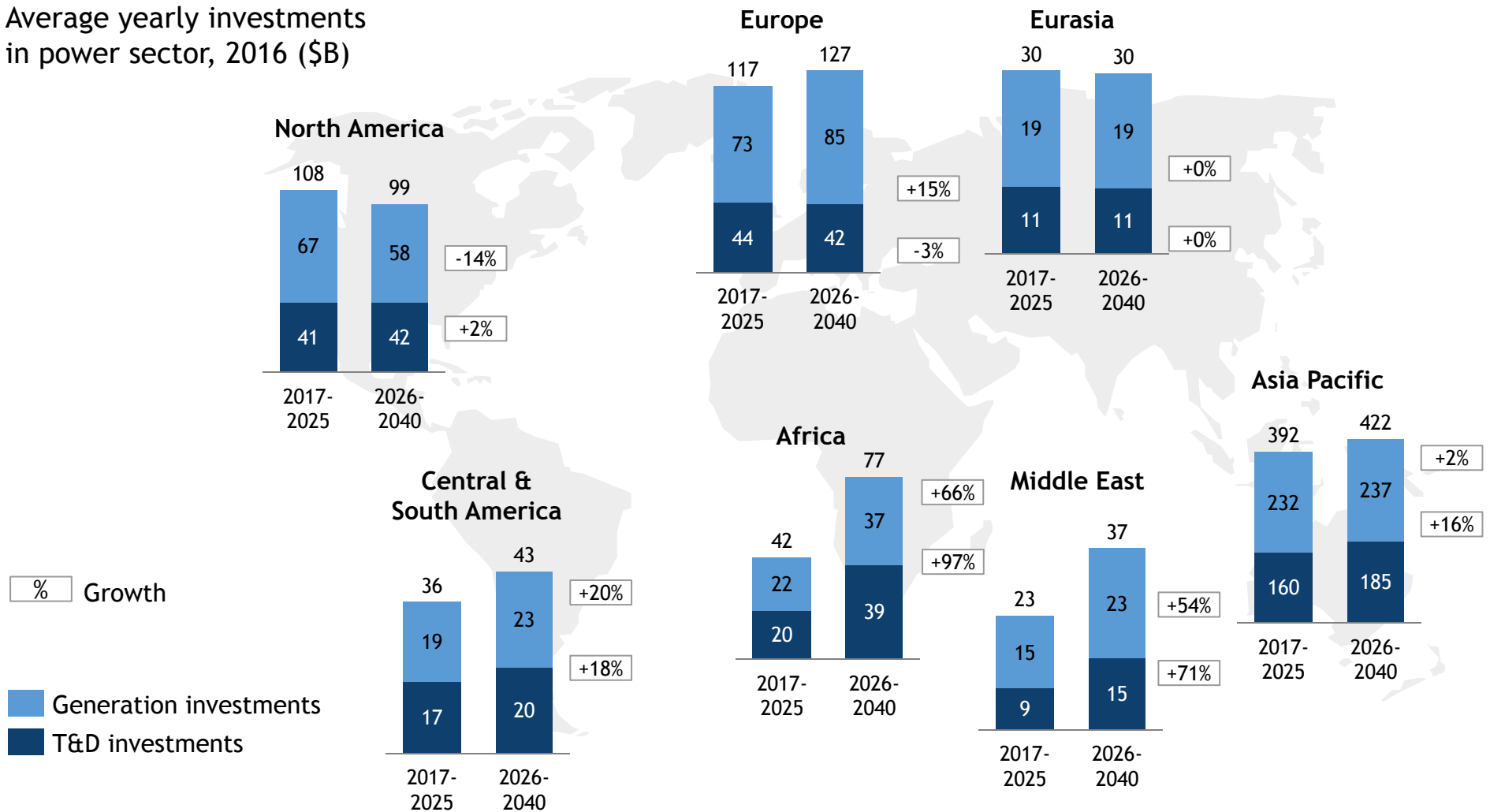
New environment impacting market capitalization of energy companies, limiting capacity to invest in large scale assets



Digital companies are now leaders by market capitalization

However, the energy industry still requires a significant amount of long term investment in the coming years

Average yearly investments in power sector, 2016 (\$B)



Key Questions

- 1 Should policy regulate/constrain technological progress?
- 2 Can technology in Energy be a source of competitive advantage for countries?
- 3 Is it possible to develop a leveled and sustainable regulatory framework to achieve the various goals and functionalities required (clean, cheap, access for all)?
- 4 Is there a mature technology that should be promoted?
- 5 How to foster innovation and competition without compromising long term investment required?
- 6 What to do with previous investments and potential stranded assets?

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