

The European Engine Power Plants Forum 2017

Microgrid Solutions – Integration of Engine Power Plants

Cologne, June 28th 2017
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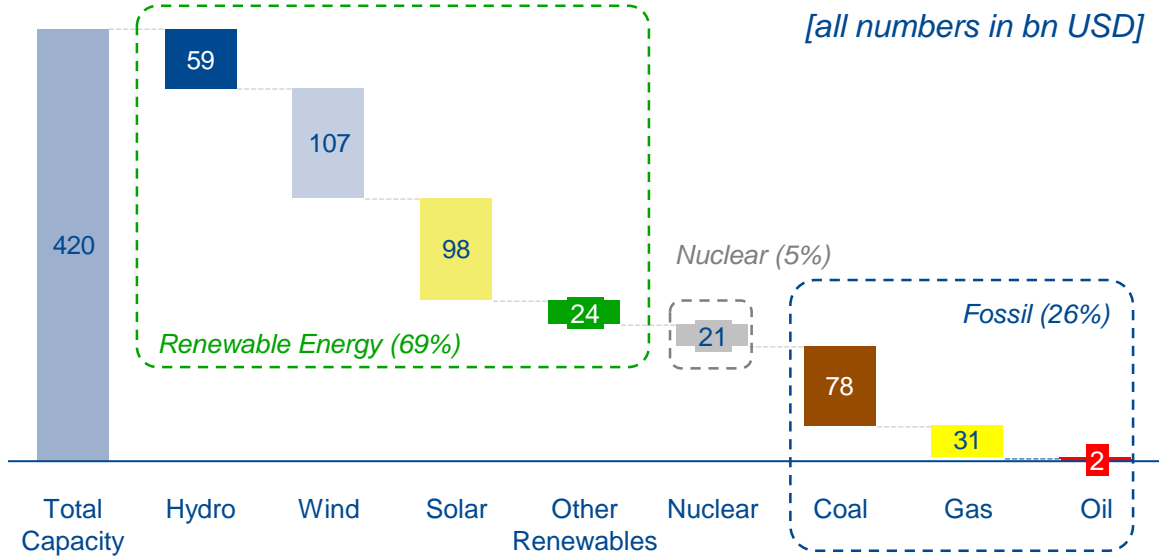
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Rationale | Global Power Generation Investments 2016



- 420 bn USD global power generation investments in 2016
- Already 69% are renewable energy sources, mainly wind and solar
- Only a share of 26% is generated by fossil sources, mainly coal fired capacity in India and China

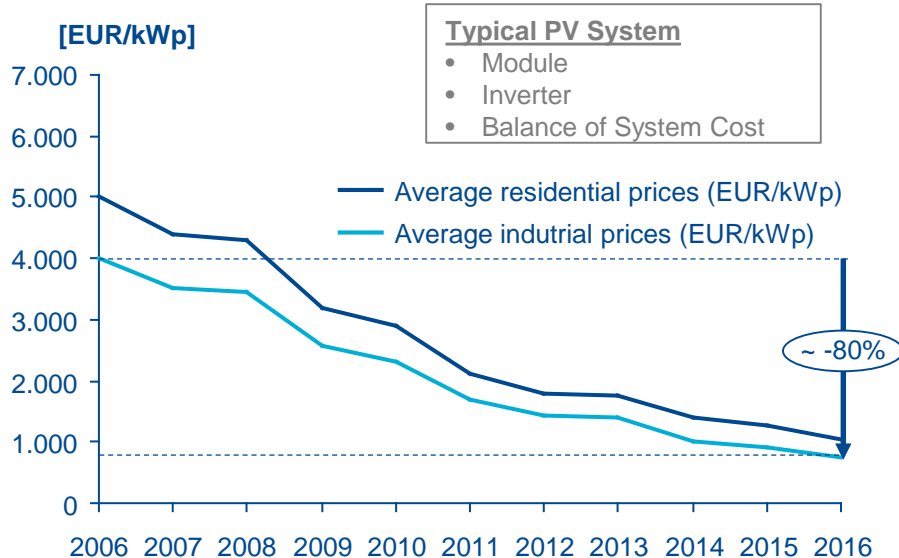
Source: IEA Energy Investment Report 2016



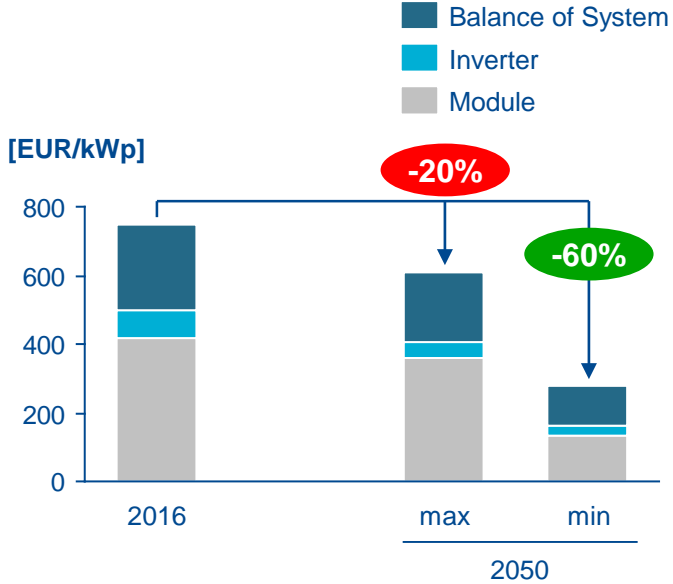
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Rationale | Historic Cost Development of Solar PV

Historical Investment Costs for Solar PV



Invest Cost Outlook for Solar PV

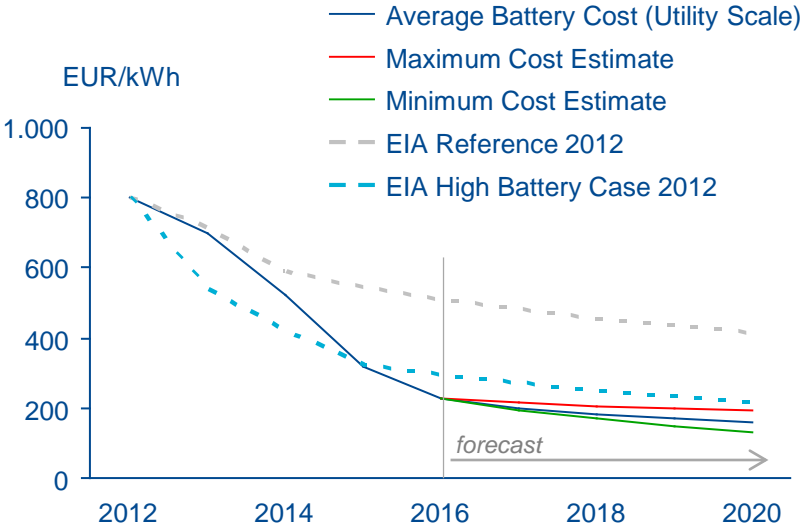


Source: Agora Energiewende 2015, various public available data, RRPS Analysis

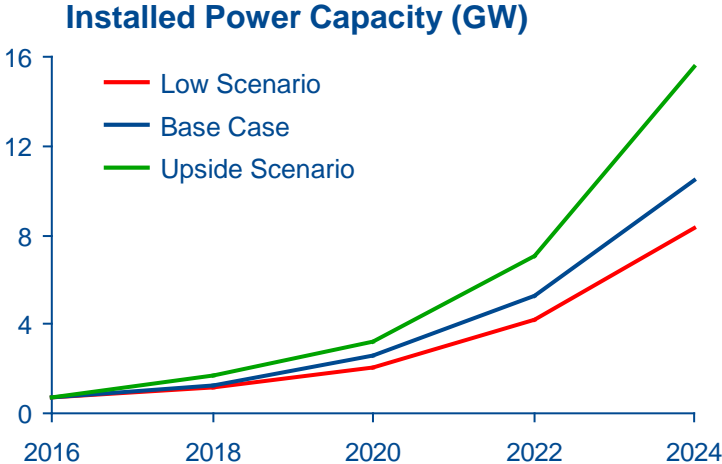
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Development of Battery Costs and Installed Capacity

Development of Battery Cell Cost



Global Utility-Scale Battery Storage Outlook



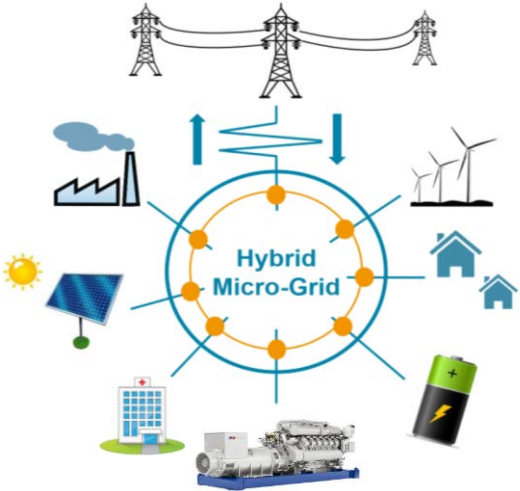
Source: Navigant Research, EES Europe, RRPS Analysis



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Definition and Typical Features

Typical Set-up of a Microgrid



Source: VSCM Analysis, Delta EE

Definition of a Microgrid

A Microgrid

- ...combines **multiple power generation sources** including **renewables, energy storage** and **fossil generation** with local loads
- ...can **operate connected** to the centralized electricity grid or in **island mode** in remote areas
- ...can **run disconnected and autonomously** as physical or economic conditions dictate

Example Applications



Remote Areas



Utilities/ IPPs



Big Industry



Rural Electrification



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Growth Drivers

Increasing focus on renewable power generation and integration of decentralized energy

Significant cost reduction for renewable energy sources and battery storage technologies

Unreliable power supply quality and power shortages

Rural and island electrification

Governmental support and policies



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Reference Case

- Gamesa is currently testing such an hybrid power plant near Zaragoza, Spain
- Launched in May, 2016
- Equipped with wind turbines, solar PV systems, batteries and three MTU diesel systems series 1600
- This combination guarantees green but also reliable energy supply

