Distributed Energy Systems – intelligente und dezentrale Energieversorgung

Marco Lippuner, Siemens AG, Energy Management, Leitung Infrastructure & Industry Sales
Rising to the challenges

The energy system is changing due to global megatrends.
More than ever, our daily life depends on electricity
Distributed energy systems make up the largest part of new capacity until 2030

Market drivers for distributed energy systems
- Shift to renewable sources & small units
- Regulatory incentives
- Rising energy costs

Energy consumer requests
- Autonomy
- Green image
- Cost reduction

Global generation capacity in GW

<table>
<thead>
<tr>
<th>Global generation capacity in GW</th>
<th>Installed 2013</th>
<th>Retirements</th>
<th>New Capacity</th>
<th>Installed 2030</th>
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</thead>
<tbody>
<tr>
<td>Engines</td>
<td>6300</td>
<td>2100</td>
<td>5900</td>
<td>10.100</td>
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<tr>
<td>Geoth./Biomass</td>
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<td>Solar</td>
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<td>Wind</td>
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<td>Hydro</td>
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<td>Nuclear</td>
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<td>Coal</td>
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<td>Gas</td>
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+2.8% p.a.
Challenges and opportunities in the decentral energy world

Decentral optimization

Peak avoidance

Resilience

Business models

CO₂ and cost avoidance

Loss prevention

Balancing

Customer focus

Balancing

Peak avoidance

Resilience

Business models

CO₂ and cost avoidance

Loss prevention

Balancing

Customer focus
Weekly and seasonal volatility of renewable energy supply and electricity consumption pose a major challenge

80% of power consumption is fed by renewable energy sources
(Net power generation in GW and consumption)

Maximum load at only 10% infeed from renewable energy sources
(Net power consumption in GW and consumption)

Source: Agora Energiewende, 07.01.2015

~ 1270 GWh
Sunday, May 11th 2014

~ 1680 GWh
Wednesday, November 12th 2014
Setting the pace

Siemens keeps leading the field in addressing the energy challenge.
Growing share of renewables and distributed generation calls for end-to-end energy management

- Further development of electrification levels in emerging economies
- Grid modernization required in many regions

- Increasing level of renewable and distributed generation
- Grid stability challenges
Siemens Energy Management lives up to future challenges with the most comprehensive portfolio

Software/IT
Grid control – big data analytics – grid application

Communication, automation, protection, and field devices

Electrification solutions
High-voltage direct current (HVDC) transmission – grid access – FACTS – air-insulated/gas-insulated substations – power systems solutions – microgrids / nanogrids

Products and systems
High-voltage switchgear and systems – power transformers – medium-voltage switchgears – distribution transformers – low-voltage switchboards and circuit breakers

1 Transmission system operators  2 Distribution system operators
Siemens solutions for distributed energy systems

Energy Automation and Mgmt. Software and Controls

Electrification Equipment and Power Electronics

Solutions for Distributed Energy Systems

Distributed Generation Sources

Storage Systems
Siemens portfolio well positioned for distributed energy systems, partnering to complement the offering

### Distributed Energy Systems

Focus on electrical power and cogeneration (CHP) that typically contain

- **Distributed generation** sources
- **Storage** systems
- Energy automation & mgmt. **software and controls**
- **Electrification** equipment and **power electronics**

### Combination of reliable and proven portfolio (incl. partnering)

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<thead>
<tr>
<th>Automation</th>
<th>Grid automation</th>
<th>VPP</th>
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<td>Smart grid</td>
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<td>Microgrid</td>
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<td>Power management</td>
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<th>Storage solutions</th>
<th>Battery storage</th>
<th>Substation</th>
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<td>Electrolyzer</td>
<td>Substation</td>
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<th>Fossil / Biomass generation</th>
<th>Small GT</th>
<th>Substation</th>
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<tbody>
<tr>
<td></td>
<td>Small ST</td>
<td>Engines</td>
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<th>Wind Onshore</th>
<th>Onshore WP</th>
<th>Substation</th>
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<tr>
<td></td>
<td>Wind equipment</td>
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<td></td>
<td>Co-location storage</td>
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<tr>
<th>PV electrical equipment</th>
<th>PV elect. equipment</th>
<th>Substation</th>
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Lake-City Wien Aspern, AT: „Living Lab“
Developing integration of distributed energy systems

JV: City of Wien / Wien Energie / Wiener Netze / Siemens

- Private wind & solar
- Smart Building & thermal storage
- Heating, chiller, heat station
- Microgrid Controller
- Storage solution
- Building e.g. Data Center
- Nanogrid
Storage as enabling technology to ensure distributed energy systems operability:
Smart energy management with SIESTORAGE for Enel Distribuzione, Italy

- Easy to re-use installation of the SIESTORAGE power storage system in a standard container
- Main purpose: grid stabilization
- Capacity of 1 MVA/500 kWh
  For Enel’s pilot project
- In operation since late February 2012
Answering the new challenges for distributed energy systems – Multiplying strength through partnerships

Siemens observes new challenges in regard to distributed power generation for players in the power generation market as well as for network operators.

Siemens is committed to provide new business models and solutions in this changing environment – together with reliable partners.

to provide a powerful and broad solution portfolio for customers & partners (e.g. power generation, energy management, building technologies)
Distributed energy market needs integrated solutions with comprehensive support

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<th>Description</th>
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<tr>
<td>1</td>
<td>Perfectly aligned technology from components to even the most complex grid connections</td>
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<td>2</td>
<td>Competent partner for all complex generation from planning through commissioning to services and support</td>
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<td>3</td>
<td>Deep experience in regulatory and application framework with fast, professional response</td>
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<td>4</td>
<td>Top level engineering support helping you solve all the complex engineering tasks associated with connecting to the grid</td>
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<tr>
<td>5</td>
<td>Promoting new businesses through venture capital funding, and technology to business co-operations</td>
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Energy Management – your partner for distributed energy systems
Vielen Dank für Ihre Aufmerksamkeit

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