Challenges in transmission grid expansion and required innovative solutions

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The business environment is in transition – Need for efficient bulk power transmission as challenge

**Grids in transition**

- Energy autonomy
- Cross border interconnectors
- Integration of municipalities (electricity/gas/heat/water)
- Demand response vs. demand management
- Improving supply of power-critical consumers
- Unbundling and privatization
- Support-policies for renewable energy
- Investment risk for new technologies
- Declining revenues
- Investing in automation vs. improving hardware
- Huge installed (aging) assets
- Energy efficiency directives/demands
- Involving “prosumers” through Smart Metering
- Underground bulk power lines investment
- Affordability of grid automation
- New power lines and capacity expansion
- Energy autonomy
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Growth engines

- Connecting grids
- Totally Integrated Power
- Agility in energy
Dramatic changes in energy system landscape – prosumer as new key player in distributed energy

Key trends in energy system:
- Capacity increases and change in generation mix
- Energy system increasingly distributed and driven by prosumer
- New competitors and business models emerging

Digital grid

Transmission
- HVDC
- HVAC

Distribution
- Primary distribution
- Secondary distribution

Prosumer
- Critical power
- Distributed energy systems
- Building & construction electrification

Source: EM 2030 Team
Challenges in industry

**Political intentions**

- Renewable energies (EEG 2016): The power generation will become more unsteady ("Wind blows not all the time"): Fluctuations could have impacts on the stability of the grids
- Base load coverage needs to be warranted

**Grid extension**

- High influences by public nature conservation organizations as well as private stakeholders (NIMBY)

**Public acceptance**

- Innovations are being confronted with:
  - Securing of reliable high voltage solutions
  - Less market acceptance (less sponsorship)
  - Unexpected costs and risks
- Open innovation is required to increase market acceptance and the reliability:
  - No standards
  - Increased complexity (causes higher R&D costs)
A compact solution for high power transmission

Gas-insulated lines for AC-transmission
Flexible grid connections – optimum grid integration

Outstanding in safety operation
Environmental compatibility
Service life >50 years
Perfect grid integration

Easy planning with less space required
Flexibility in routing
Innovations will drive future business for GIL

**DC CTL**
DC compact transmission lines for high power DC transmission (upto 5 GW)

**Mobile Factory**
Mobile factory for faster installation at higher quality standards

**ECO GIL**
ECO GIL for environmental friendly gas insulation without SF6
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siemens.com/gas-insulated-transmission-lines