A decentralised electricity system: implication for transmission grids
The job of transmission system operators
Working on it
Challenges of distributed generation

Variable generation

Thousands of small units

Huge flows all over Europe

Challenges

Secure system operation – it’s getting harder

- High Penetration of Wind & Solar Generation
- Voltage & Reactive Power Management
- Remote Generation and Market-Driven Power Flows
- Delays in Grid Reinforcements
- Increasing Frequency Sensitivity due to less Inertia (Non-Synchronous Generation)
- Priority Treatment of Renewable Generation
Working on solutions

41 TSOs from 34 countries

595 million citizens served

828 GW generation managed

305 Thousand Km of transmission lines

Ten-Year Network Development Plans
Adequacy forecasts
R&D plans
Tools for Market Integration
Network Codes
Building a fit for purpose grid
Efficient, fair, transparent (much more complex) market design
Efficient, fair, transparent market design

Re-imagine system operations
Impact of renewables on the transmission grid

20 March 2015, 9.30 a.m

A natural stress test for the transmission grid
A successful TSO collaboration

90% + 100% Up to 90%

Graph showing the impact of a solar eclipse on power generation.

- Without eclipse: 26 GW
- Solar eclipse: 12 GW
- Total difference: 14 GW
Thank you for your attention!

Check out also [http://networkcodes.entsoe.eu/](http://networkcodes.entsoe.eu/)