Need for Educational Reform
A View from Europe/Norway

Terje Gjengedal, Senior Vice President/Professor
Exploiting the resources....
The EU Energy Policy..

20% reduction in emission of greenhouse gases

20% improvement in energy efficiency

by 2020

20% renewable energy
..IMPLIES HUGE INVESTMENTS IN RENEWABLE ELECTRICITY..

..where the main bill is split by a few nations

Renewable power in Europe (TWh)

Growth needed to 2020

~ 600

Estimated burden sharing new renewable power (TWh)

Source: OPTRES, EU Kommissjonen, Statkraft, ECON
600 TWh in new renewable power production towards 2020
How to transfer the power?
Necessary Grid Re-Enforcements by 2015
North Sea a common area for development

EU target 20% renewable by 2020

200 TWH from the North Sea?
Average Annual Growth in Electricity Demand & Generation Capacity *).

Norway 1960 - 2005

*) Increase in mean annual generation capacity
Implementing the next generation transmission has started.

After years with low investment in new capacity, a new era is underway.
Statnett in brief

- Established 1992
- Owns 10 000 km high voltage power lines and 140 transformer stations.
- Statnett owns approx. 90% but operate 100% of the Main Grid.
- Operates one national control centre and three regional control centers.
- Owns and operates interconnections to five countries including 4 HVDC subsea cables.
- 8 AC/DC converters in operations, supplier ABB
Statnett looking forward

Vision
Possible offshore grid 2020 - 2040
Possible North Sea modular development
Fantasy or reality??

From national to European thinking
Northern areas:
Possible offshore development based on floating offshore AC/DC installations

Cables connected to floaters from 800 – 1400 meter sea depth
Some new Interconnectors

- Skagerrak 4 – the 4th DC to Denmark
- Nord.Link – DC submarine to Germany
- NorNed 2 – 2nd DC submarine to Nederland
- DC submarine to England
Energy 21
The future energy system
Reporting to the Minister of Oil&Energy

Management group
Terje Gjengedal

- Transmission Onshore/Offshore
- RPM Regulatory Issues Policy Market
- Distribution
Some Challenges:

There will be an evolution in the grid: how do we plan and how do we operate?
After this- what will be a major challenge to us?

Three simple words:

Competence
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Competence profile

• Broadly educated engineers with basic understanding of fundamentals
• Specialists and ’deep diggers’

• We need competence to make the right decisions
  • The right long term planning and development
  • The right designs
  • Decide on the right equipment
  • At the right cost
  • Impact on operations
Competence needed:

- Power systems operation, control, design
- Power electronics, HVDC. Facts
- Transmission system design
- Consenting
- Environmental impacts
- DV cable technology
- Substation design
- O&M
- Economy, electricity markets
- Renewable technologies
- System integration
- Contracts and other legal aspects

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At Statnett:

- Focus on Continuing education
- Self learning
- Web based/ Online courses - need to develop

- Forming a Learning Environment
- Improve the relations with Universities and Colleges
- Establish a U&C program
Thank you for listening!