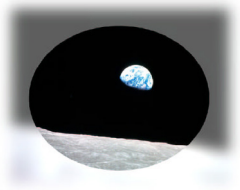


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# Transition to 100 % renewable electricity in Germany- the role of Norwegian hydro storage

University of Flensburg  
Gesine Bökenkamp

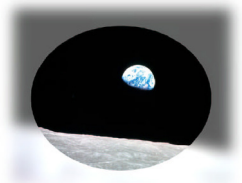
11.09.2012



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# Approach

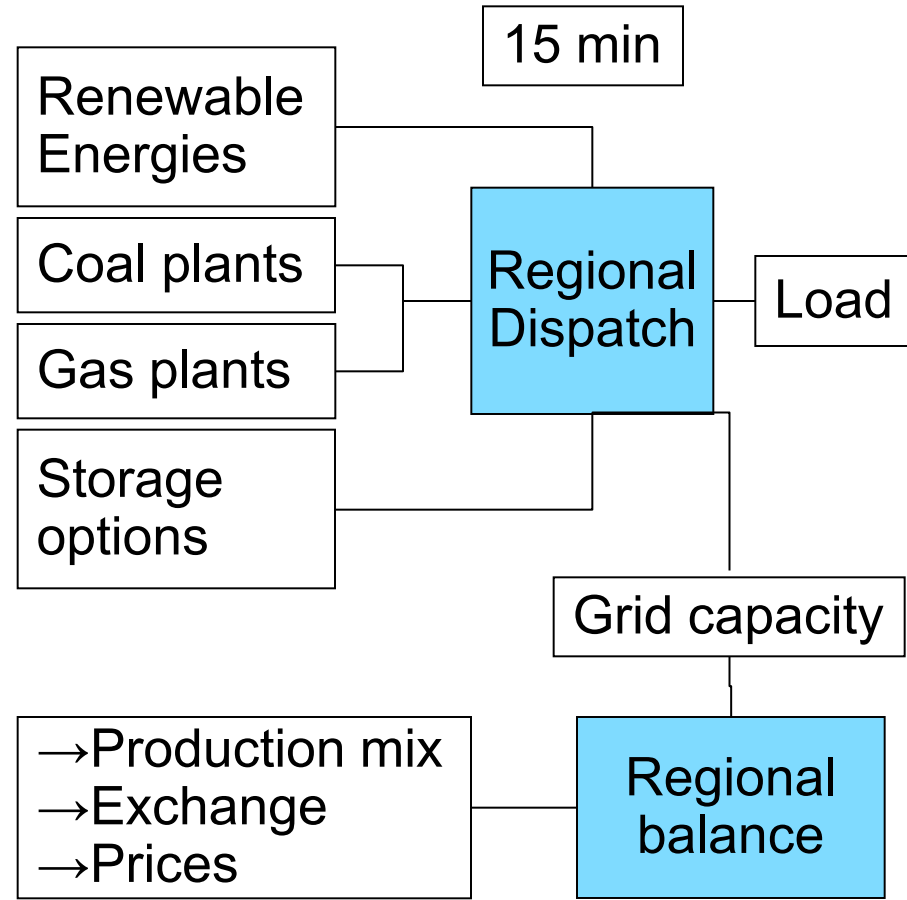
- Aim: 100% renewable electricity supply
  - Climate change
  - End of fossil resources
  - Nuclear risk
- Planning based on long-term aims
  - Avoid sunk costs and lock-ins
  - Reduce costs
  - Increase acceptance
- European solution



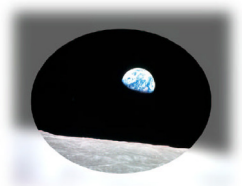
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# Model renpass

- Germany, Norway, Baltic rim
- Up to 21 regions within Germany
- 1/4h or 1h resolution
- Many parameters variable
- Open source data and software



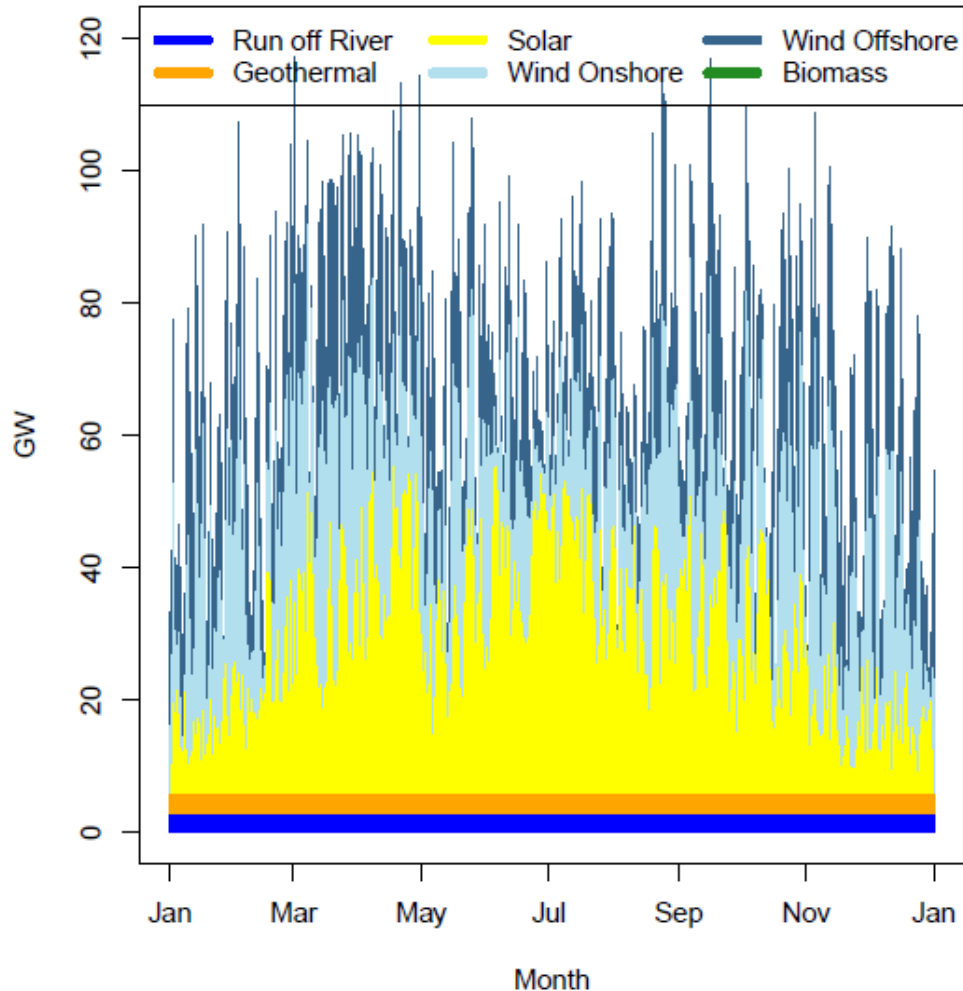
→ Model driven by renewable expansion



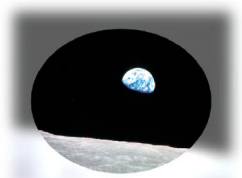
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# Residual load

**Renewable electricity production 2050**  
(own calculations based on: Leitstudie 2011)

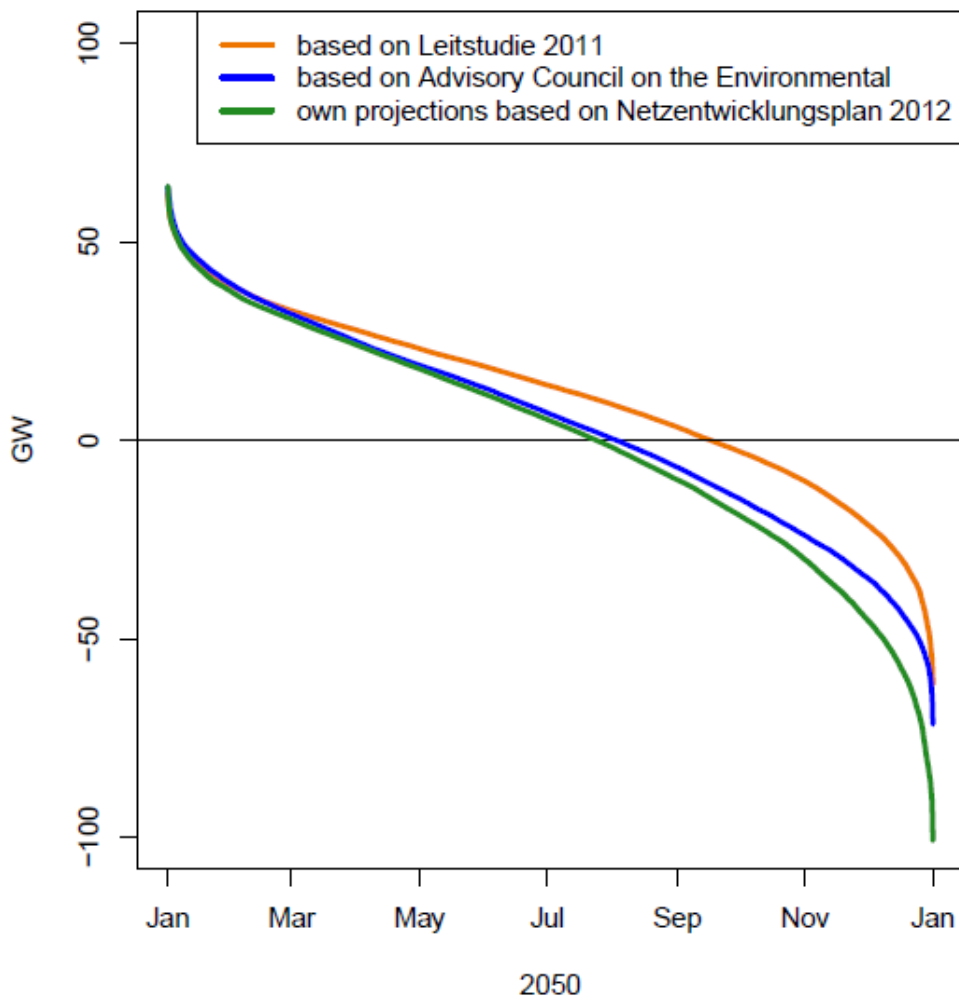


- Residual load concept
- Use of biomass
- Gaps and overproduction

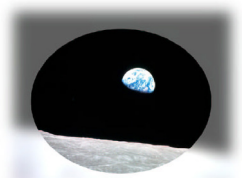


# Different scenarios

Residual Load Duration Curve



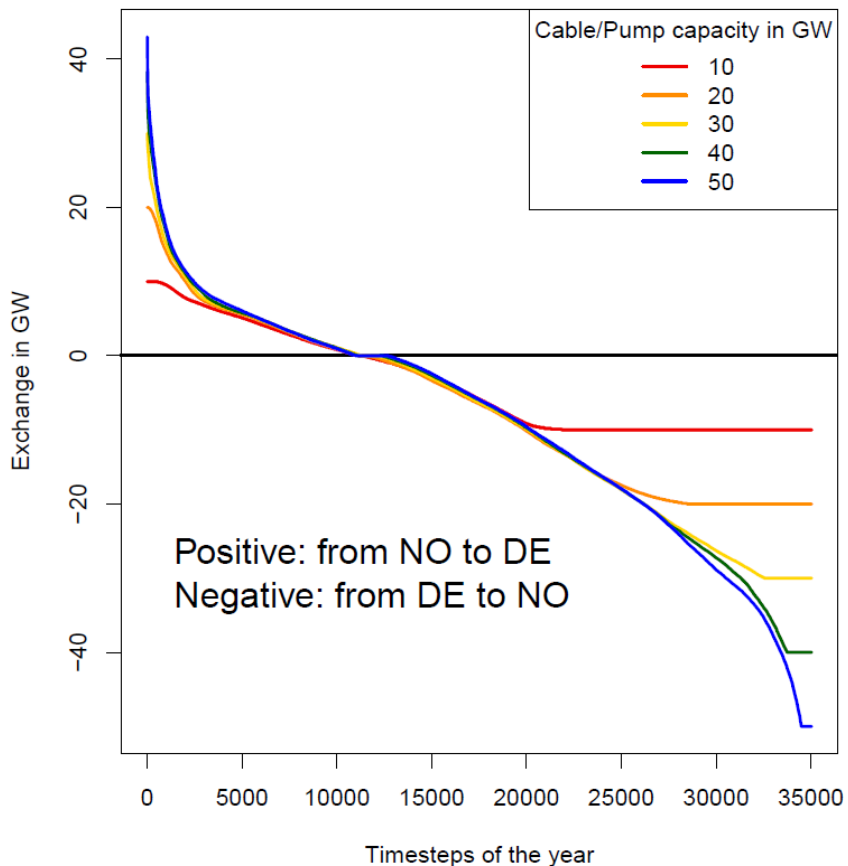
- Leitstudie:
  - Total 186.8 GW
  - Medium mix
- Council report:
  - Total 162.9 GW
  - High offshore, low solar
- Own projection:
  - Total 255 GW
  - High share of solar and onshore



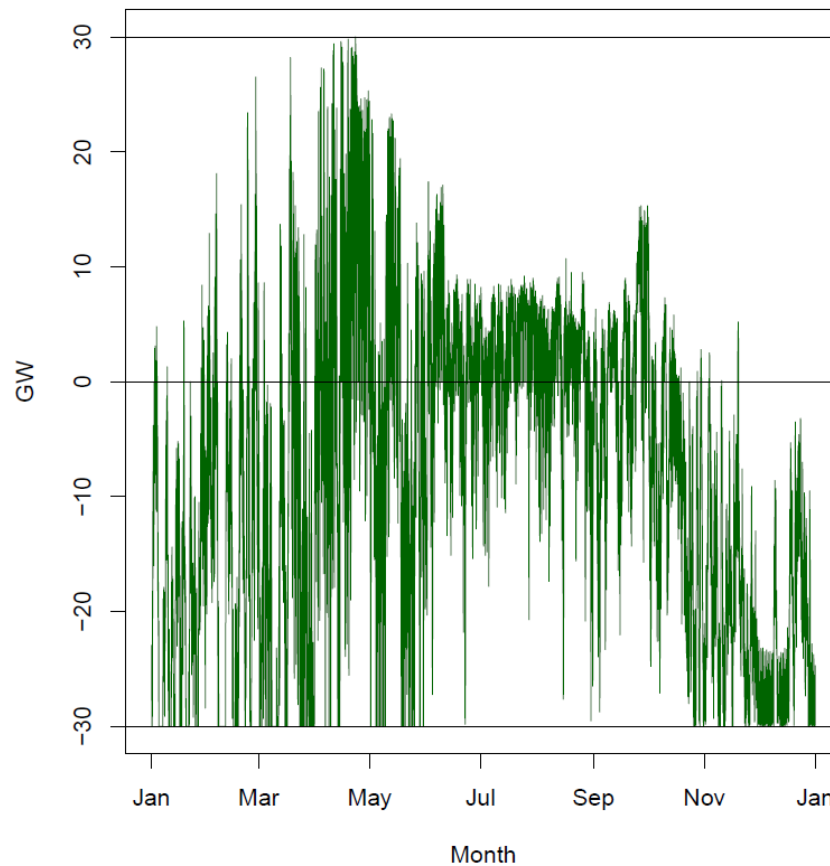
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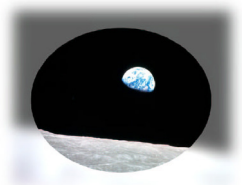
# Power Exchange

### Duration of exchange between Germany and Norway 2050



### Exchange between Norway and Germany 2050

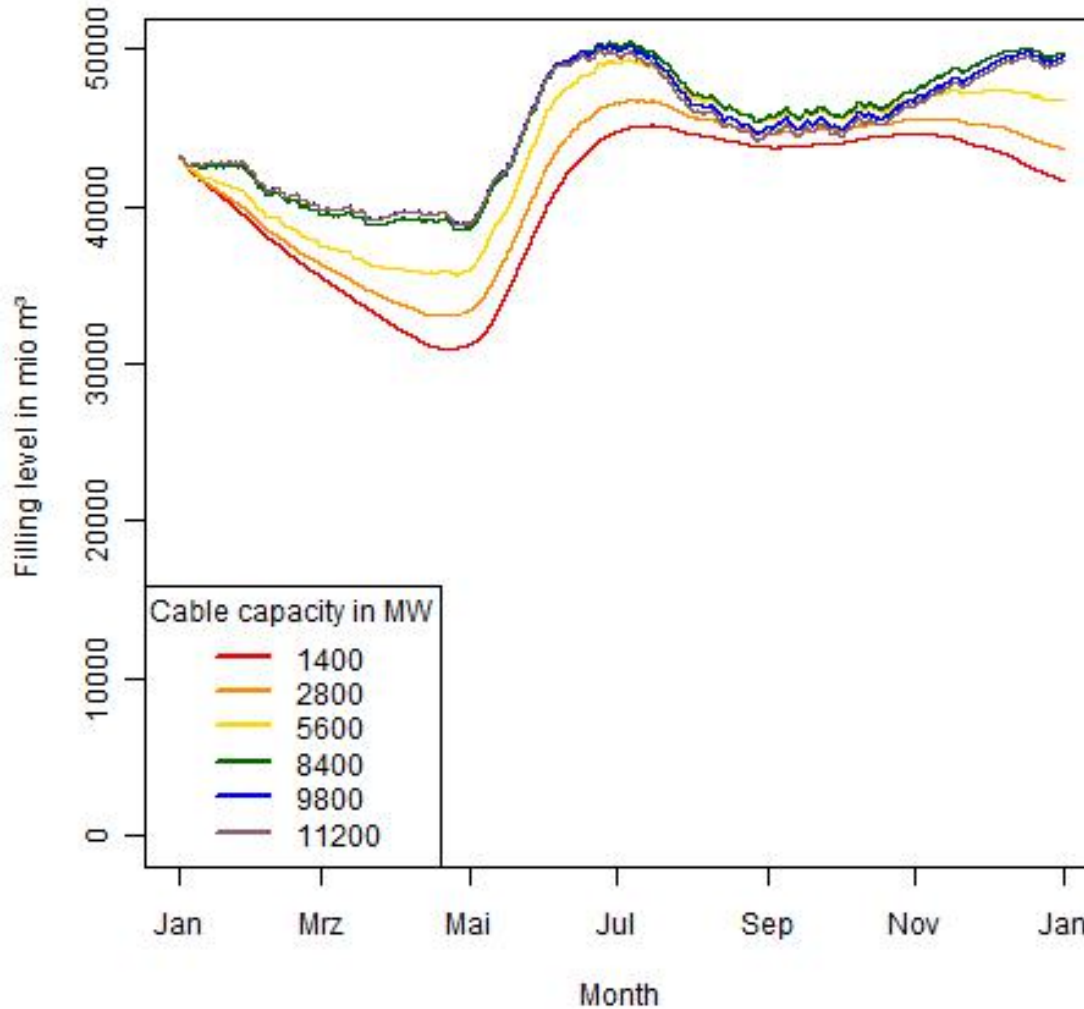


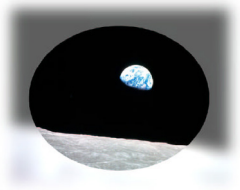


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# Filling level

### Filling level in Norway, Focus Offshore 2022





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# Questions

- What are sound pathways?
- What are the sensitivities?
- What are the other storage options?
- Financing -> Markets