

CEDREN: HydroBalance kick-off seminar and workshop

Scenarios for the 2050 European Energy mix and large scale modelling of grid development and storage needs.

Ingeborg Graabak

SINTEF Energi

Ingeborg.graabak@sintef.no



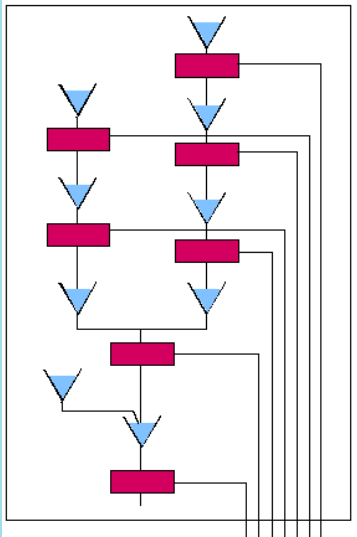
Brief overview of EMPS modelling concept



norden

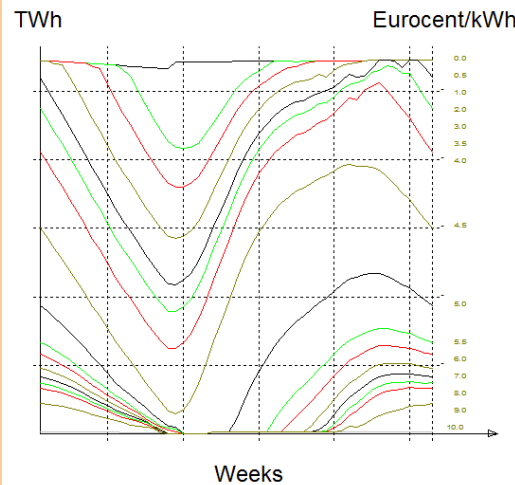
Nordic Energy Research

Details for hydropower



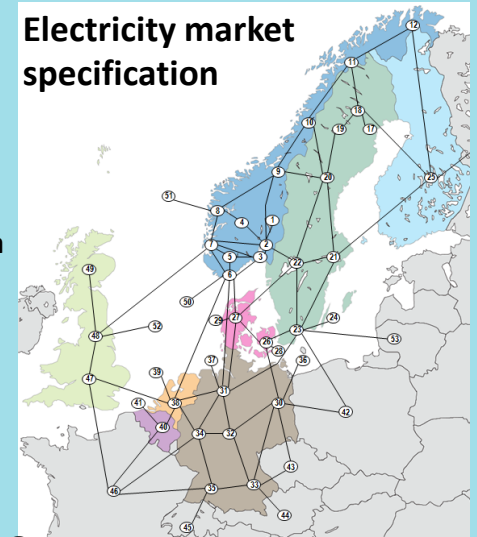
Aggregation

Strategy calculation (SDP)



Water values

Electricity market specification



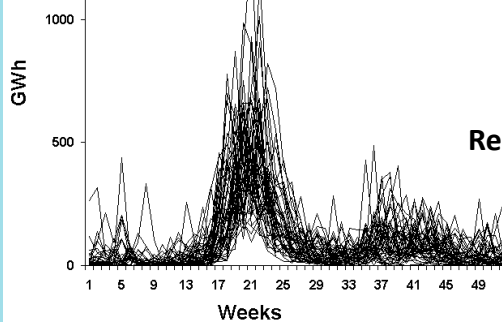
Market data Allocation

Detailed simulation
Probabilities

Market data

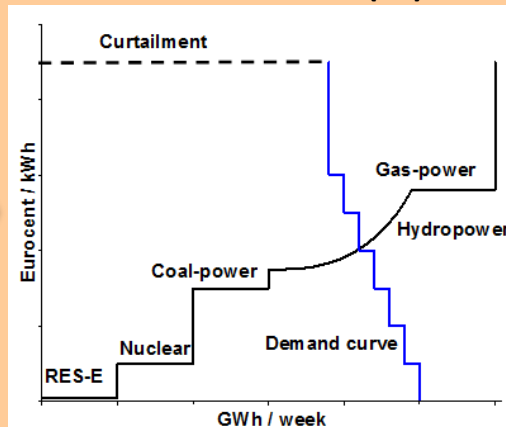
Calibration

Stochastic weather



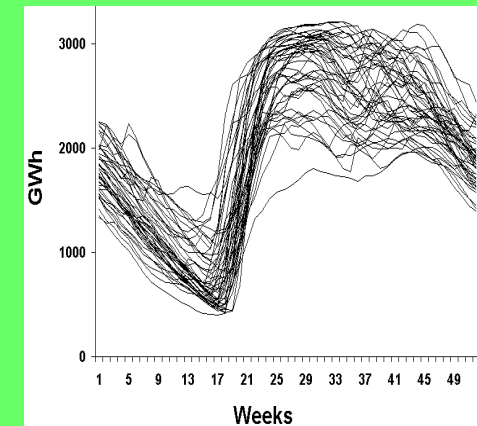
Realization

Market simulation (LP)

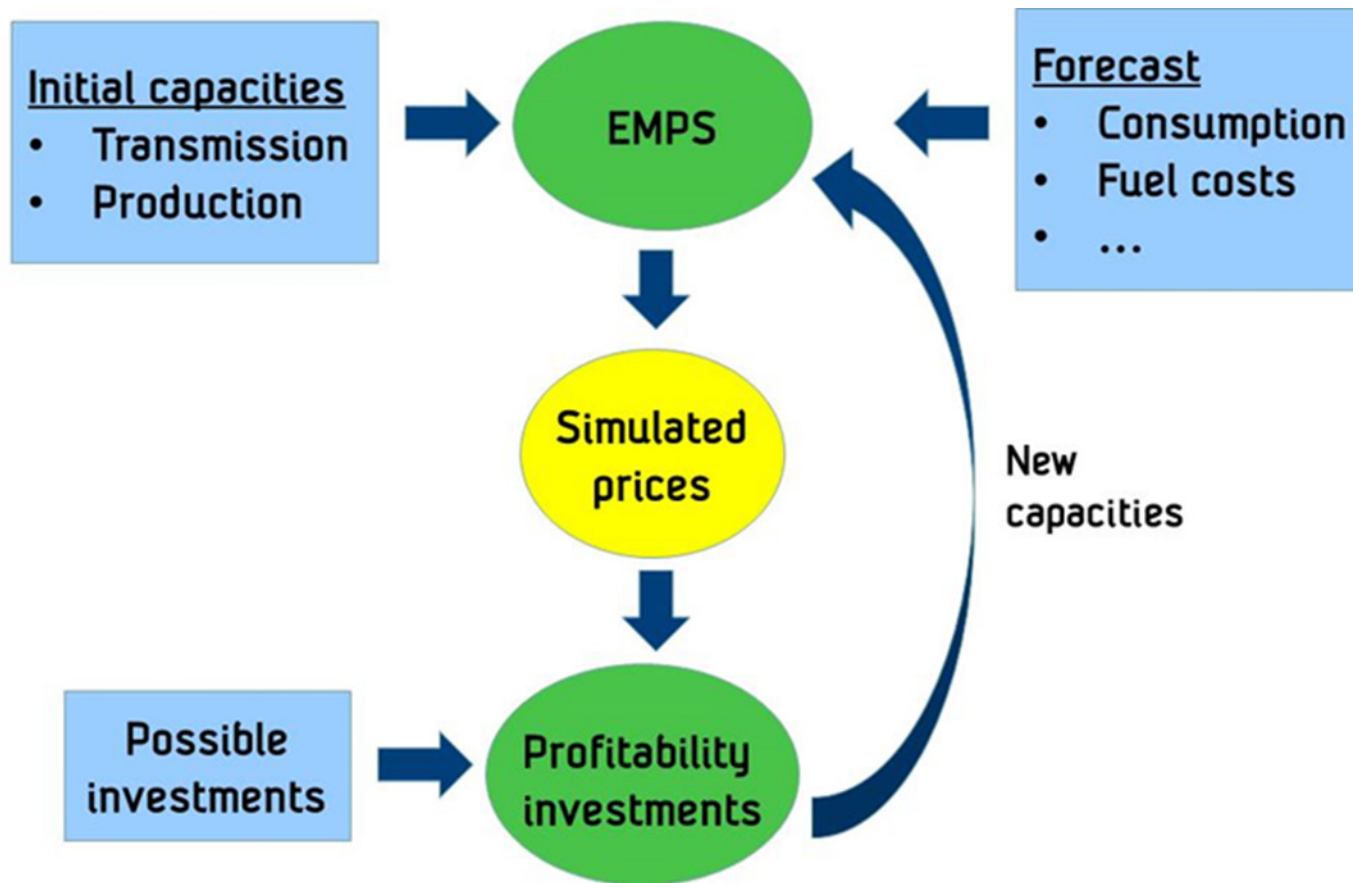


Solutions

Simulation results



Investment algorithm (for analysis of profitable increases in transmission capacities)

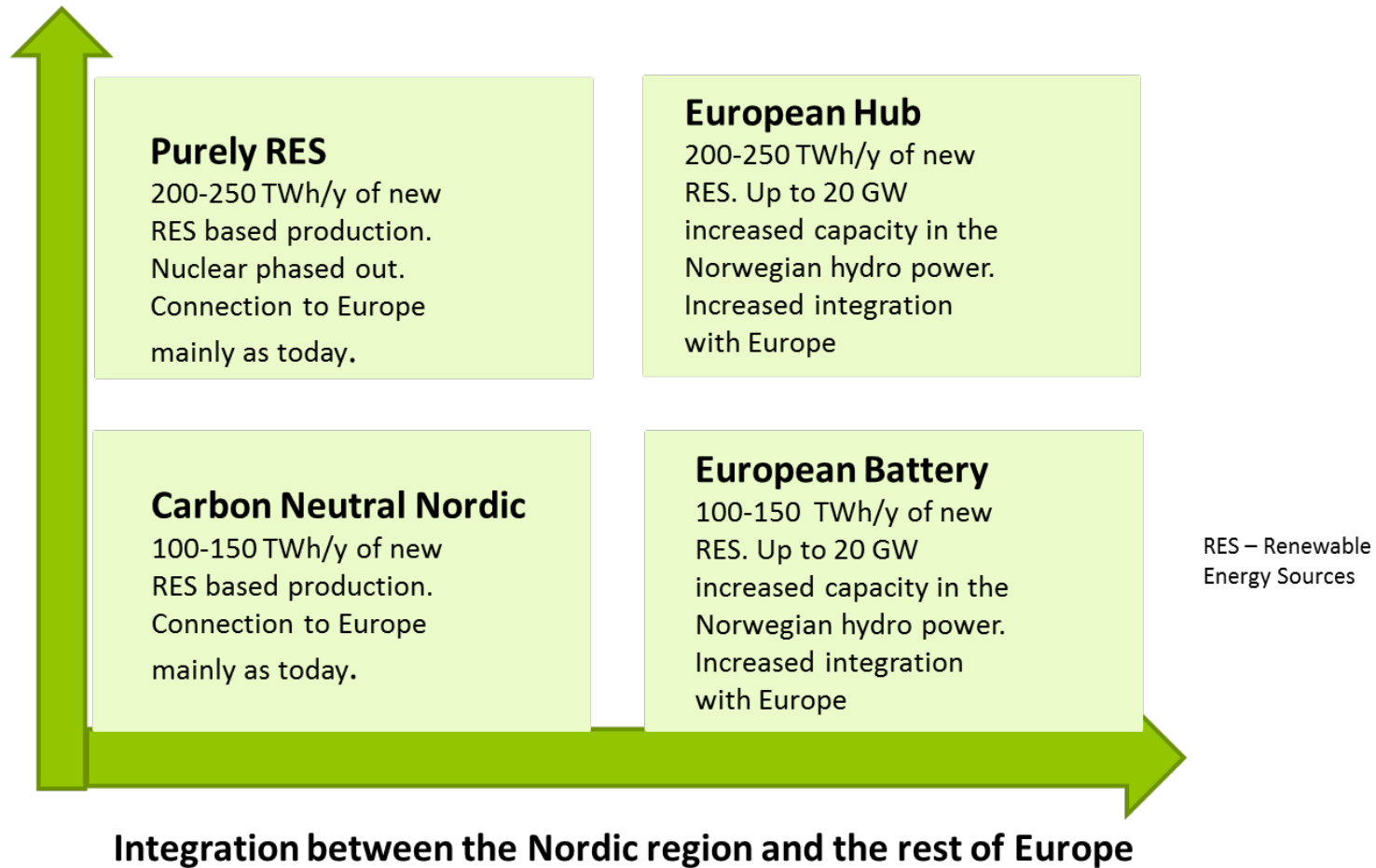


NORSTRAT objectives

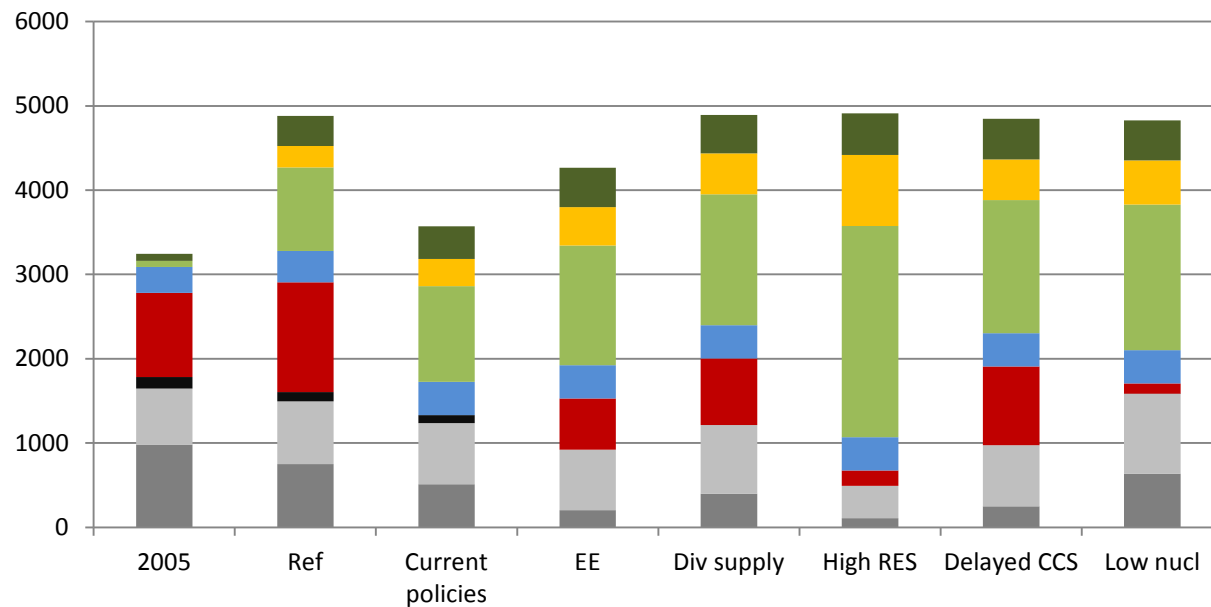
- **Objectives:** To build knowledge about possible carbon neutral futures for an integrated Nordic power system in a time perspective up to 2050 based on quantitative scenario analysis of impacts on the electricity, the transport and partly the heating system combined with the necessary governance aspects to enable the transformation.
- **Partners:** SINTEF Energi, Stockholm Environment Institute (SEI), Technical University Denmark (DTU)
- **Related Baltic project:** Similar project for the Baltic region. Partners: Riga Technical University and Stockholm Environment Institute Tallinn.
- **Reference group:** Vattenfall, Fortum, Dong Energy, Svenska Kraftnät, Statnett, Fingrid, Energinet.dk, Danish Energy Association, Energy Norway, Enova, Vestas

NORSTRAT scenarios

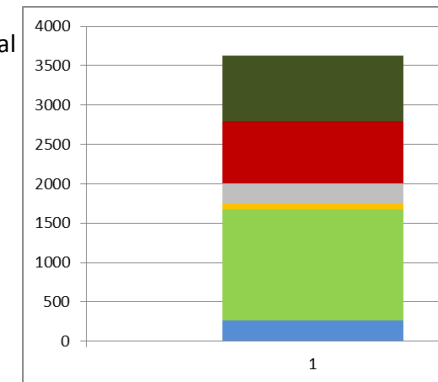
Volume of new RES in
the Nordic region



Production portfolio Europe



EU Energy Road Map Scenario 2050 (EU 27)

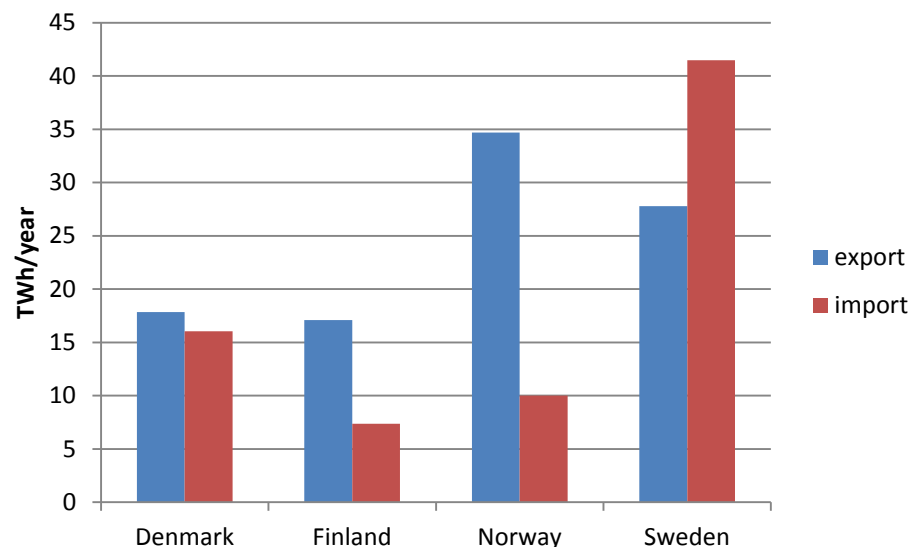
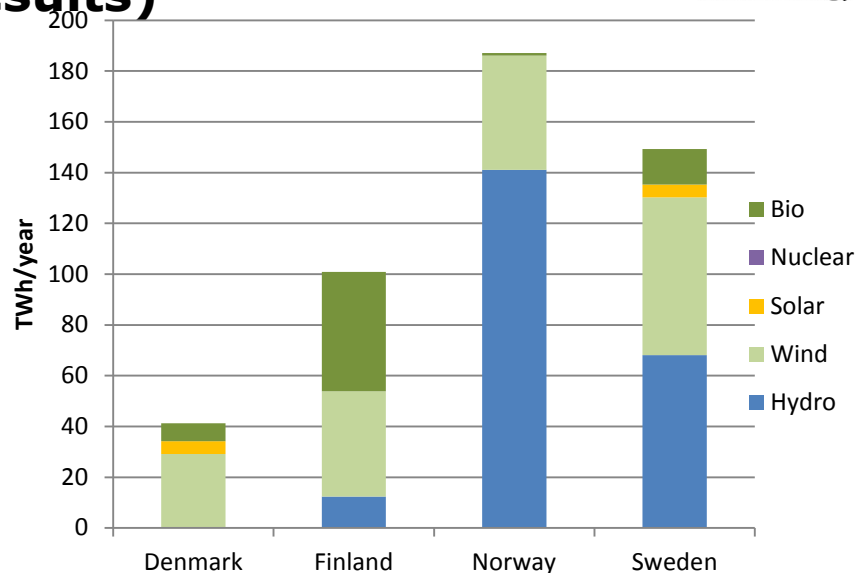


NORSTRAT
Europe minus
Nordic region



Purely RES 2050 (preliminary results)

FINNMARK	TROMS	150
FINNMARK	FIN-NORD	350
TROMS	SVER-SNO1	650
HELGELAND	SVER-SNO2	1200
MORE	NORDVEST	500
MORE	NORGEOST	1200
VESTSYD	JYLL-NORD	150
TELEMARK	NORGEOST	1400
NORGEOST	SVER-SNO3	50
SVER-SNO1	SVER-SNO2	650
SVER-SNO1	FIN-NORD	150
SVER-SNO2	SVER-SNO3	4250
SVER-SNO3	SVER-SNO4	800
SVER-SNO4	DANM-OST	400
FIN-NORD	FIN-SYD	50
HALLINGDAL-	SVER-SNO3	1350
SVER-SNO3	FIN-SYD	550
SVER-SNO3	JYLL-NORD	150
Total	EW	14000



Purely RES 2050 Increases in transmission capacities (preliminary results)

Yellow line: max increase 2000 MW
Red line are 10 times a yellow line
Blue line: existing, no increase



Profitable investments in transmission grids

NORSTRAT scenarios (preliminary results)

