Power Outlook for Skåne

Webbinarium om Stödtjänster
30/11-2021

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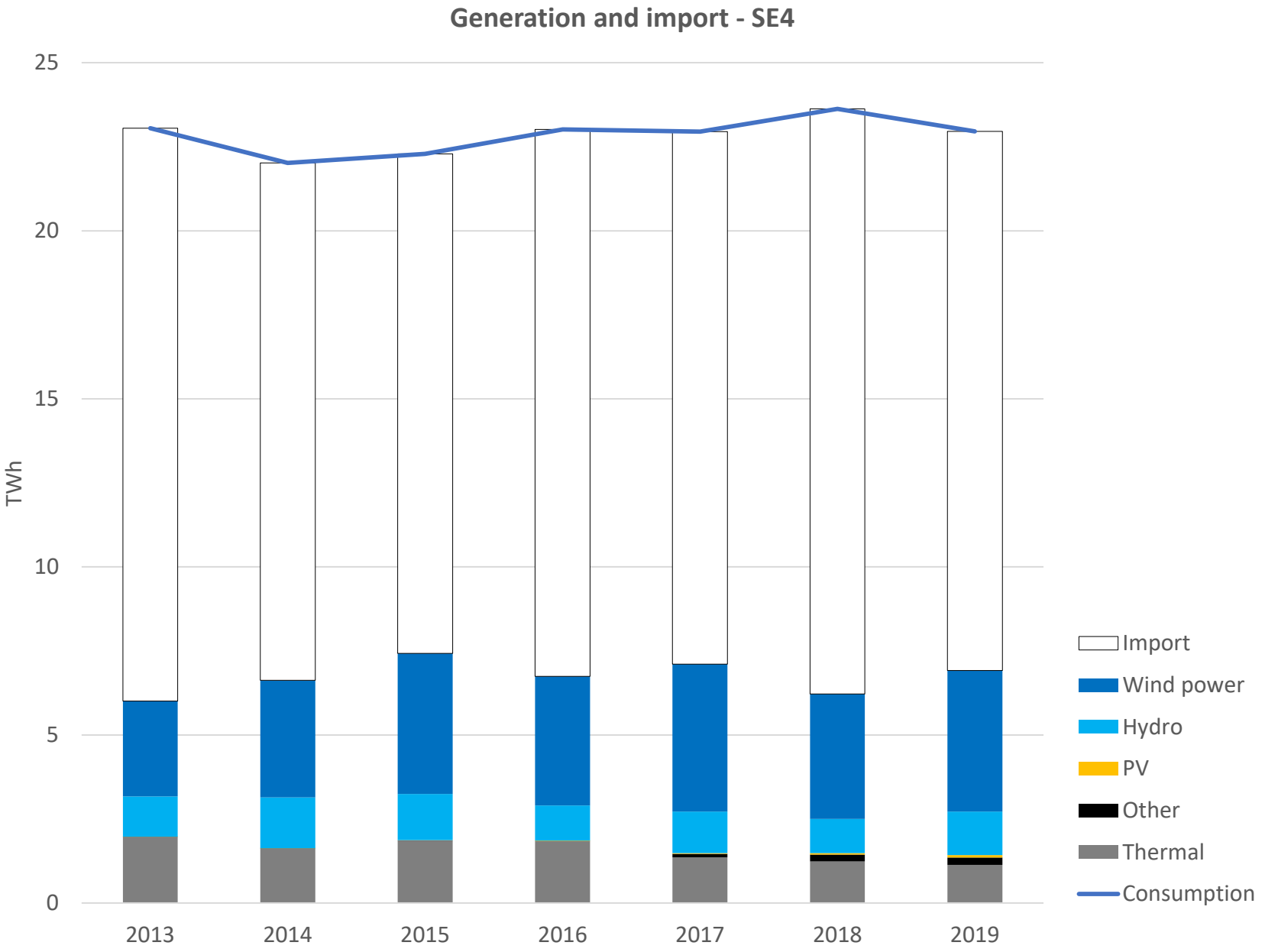

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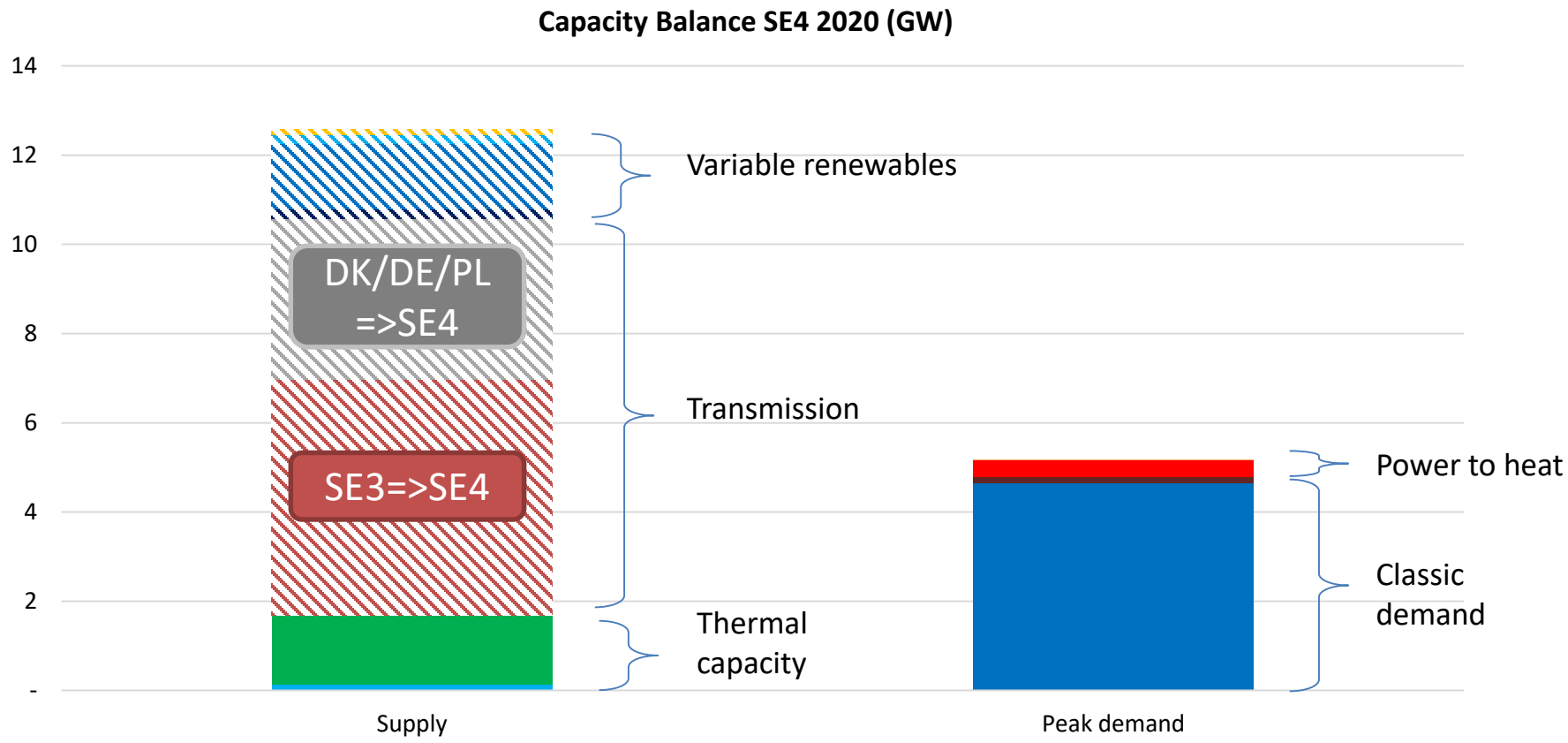

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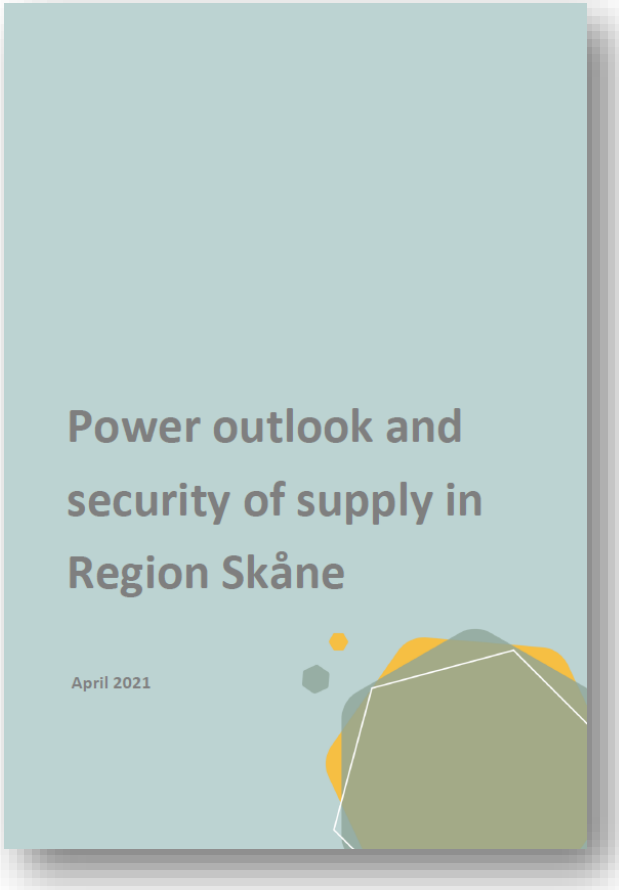
Objective of the project

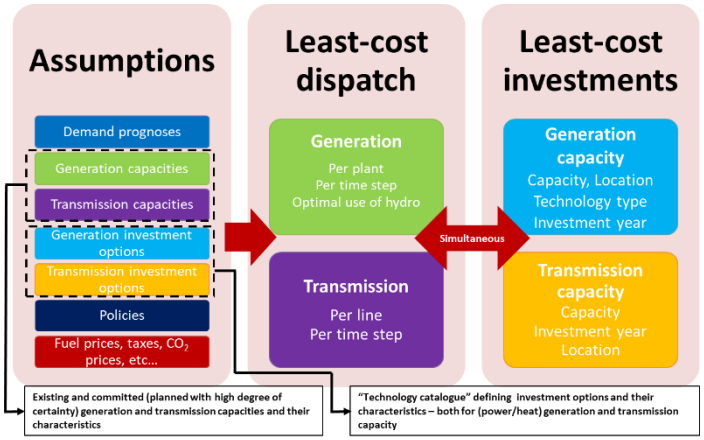
The purpose of the project has been to shed light on the economic conditions for power generators in Southern Sweden and the related challenges for the security of electricity supply.



Analytical approach

- Analysis of the energy sector with focus on power and district heating
  (+ P2X demand and production)
- Optimization of dispatch and investments in new capacity, co-optimization of generation and transmission
- Open-source model coded in GAMS

- **Outputs**: optimal generation mix, hourly dispatch and power prices, optimal transmission expansion, etc.



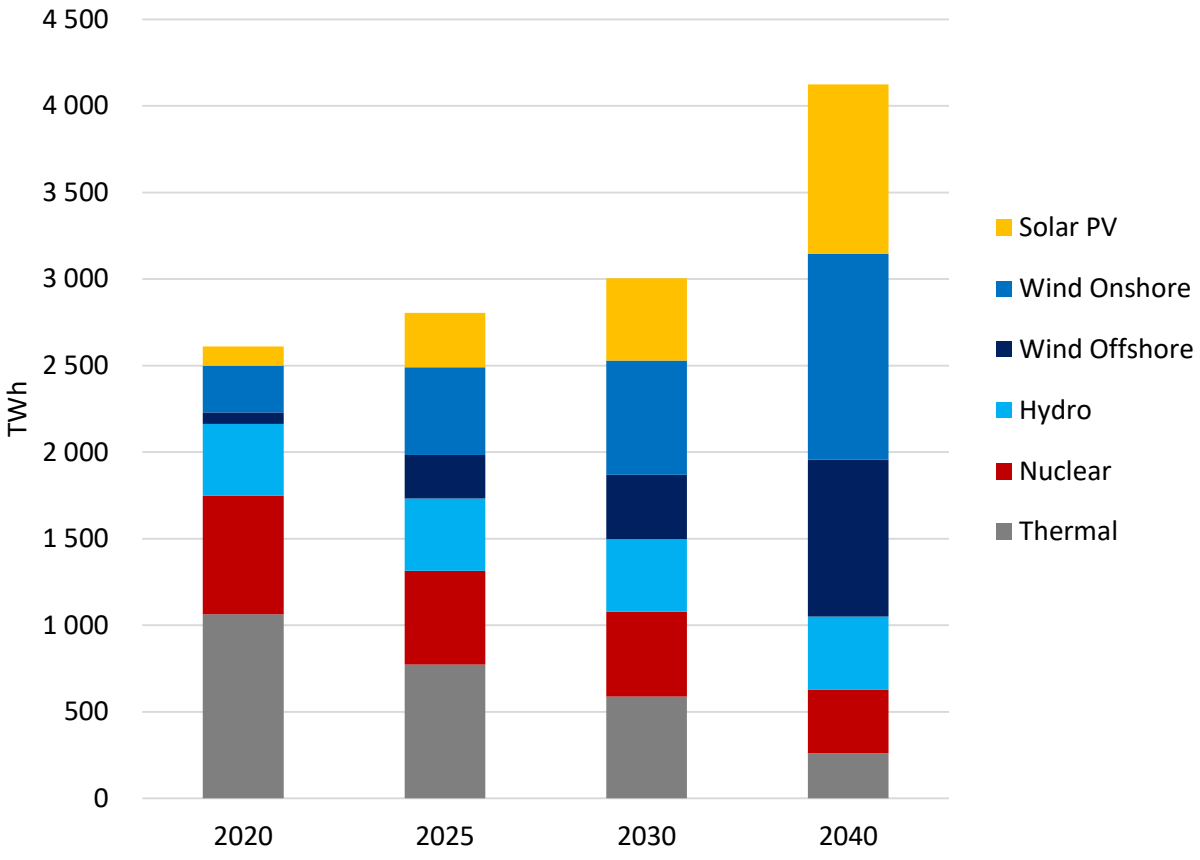
Electricity generation in the modelled area (Central/Northern Europe)

European countries act on their climate targets

Increasing electricity demand due to direct and indirect electrification (PtX)

Cost of CO2-allowances

2030: 44 €/ton
2040: 83 €/ton



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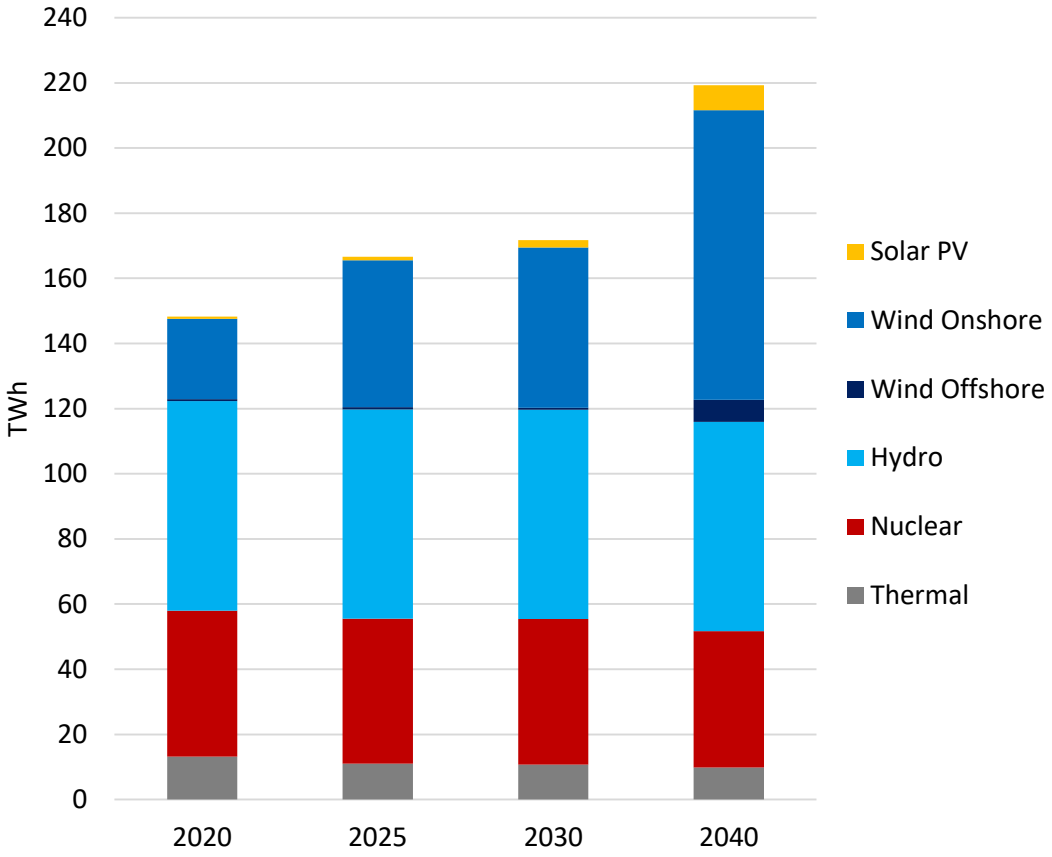
Electricity generation in Sweden

6.8 GW nuclear capacity (Forsmark 1-3, Oskarshamn 3, and Ringhals 3-4)

Karlshamnsverket in Blekinge and Heleneholmsverket in Malmö are decommissioned by 2025 reducing thermal capacity in SE4 by 750 MW

Increase in power demand is strongest in Northern Sweden (industry/PtX)



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Power capacity in SE4

No new investments in thermal capacity.

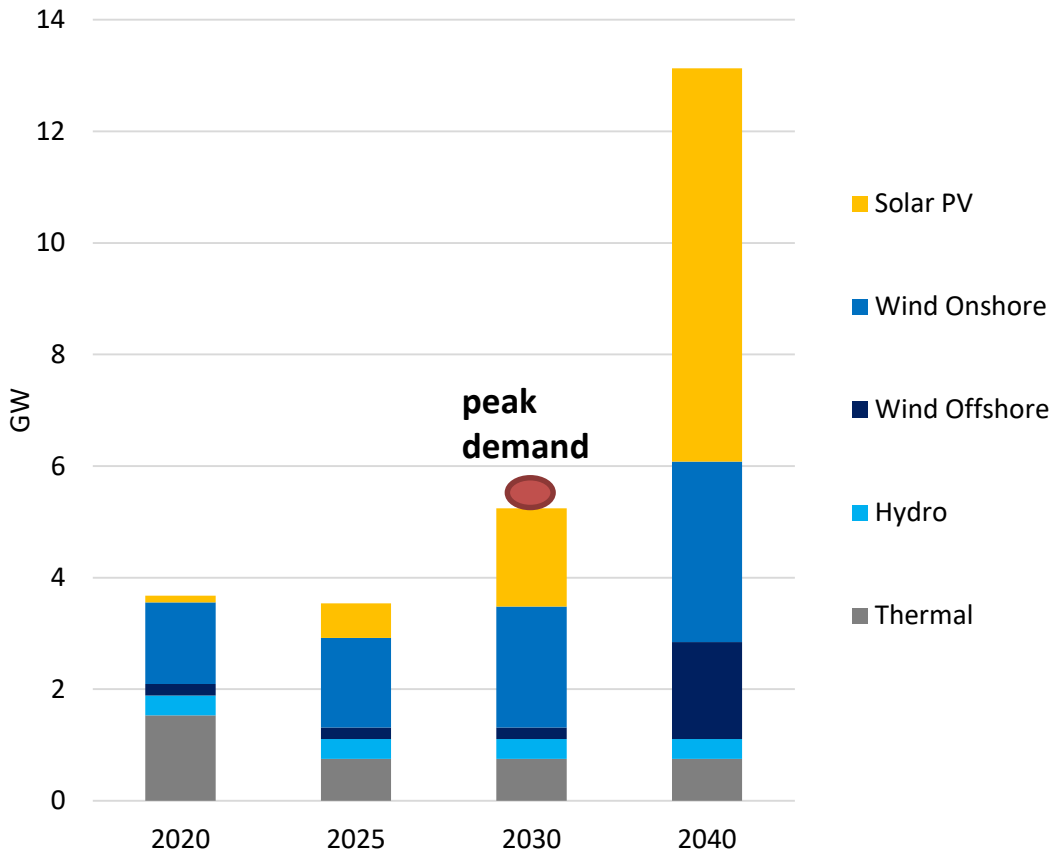
Increasing wind and solar deployment.

Onshore wind potential is capped by the model.

Market based offshore investments by 2040.

New interconnectors to Poland and Germany appear attractive

Gap between peak demand and firm capacity increases.



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Focus on thermal power capacity in SE4

The Balmorel model contains a requirement of 1,960 MW of strategic and manual reserves for Sweden to be supplied by generations units. This requirement is defined on a country level.

Plant	Fuel	MWe	2020 operation	2030 operation	2040 operation
Alloverket 1	bio	14	Spot market	Spot market	Spot market
Vasthamnsverket 1	bio	69	Spot market	Spot market	Spot market
Minor biomass plants	bio	47	Spot market	Spot market	Spot market
Vasthamnsverket GT	gas	54	Spot market	Spot market	Reserve
Öresundsverket GT G24	gas	128	Spot market	Spot market	Reserve
Karlshamnsværket	gas	35	Spot market	Spot market	Reserve
Karlshamnsværket	oil	670	Reserve	Decommissioned	Decommissioned
Heleneholmsverket	oil	126	Reserve	Decommissioned	Decommissioned
Minor fuel oil plants	oil	357	Reserve	Reserve	Reserve

Sensitivity analysis

If existing major power plants in SE4 need major refurbishments thermal power plant capacity could drop to 0.2 GW by 2040

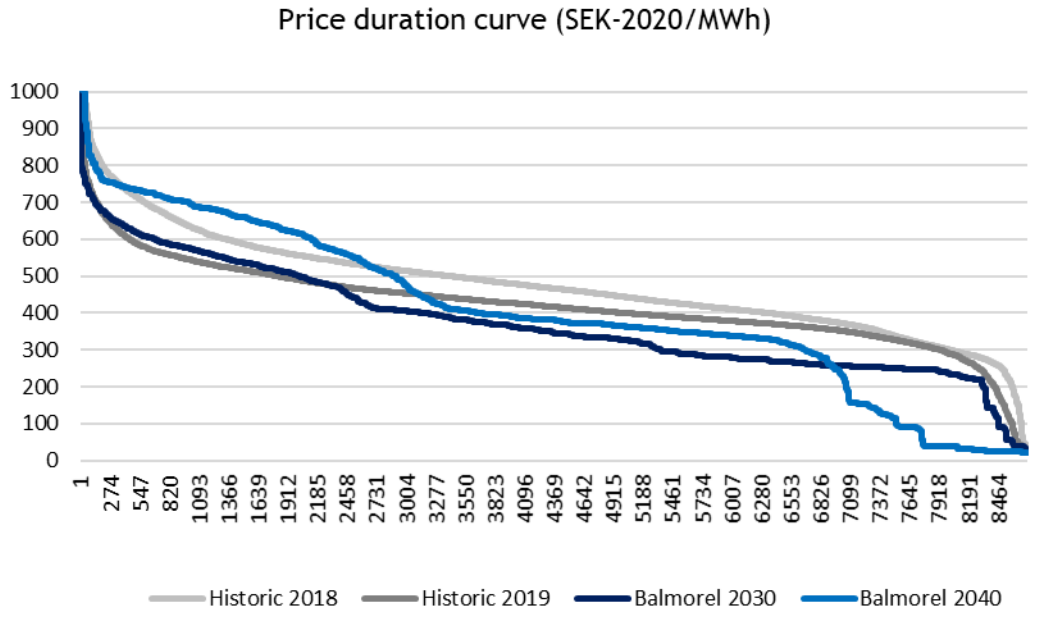
Power prices in SE4

Average prices in 2030 and 2040 of 431 and 444 SEK/MWh respectively.

This is slightly higher than the 2019 average.

There are approx. 20-30 hours where the power price reaches the price ceiling in the market in 2030 and 2040.

In these hours there is not sufficient generation capacity in the spot market to cover demand.



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Thermal Generator Economy in SE4

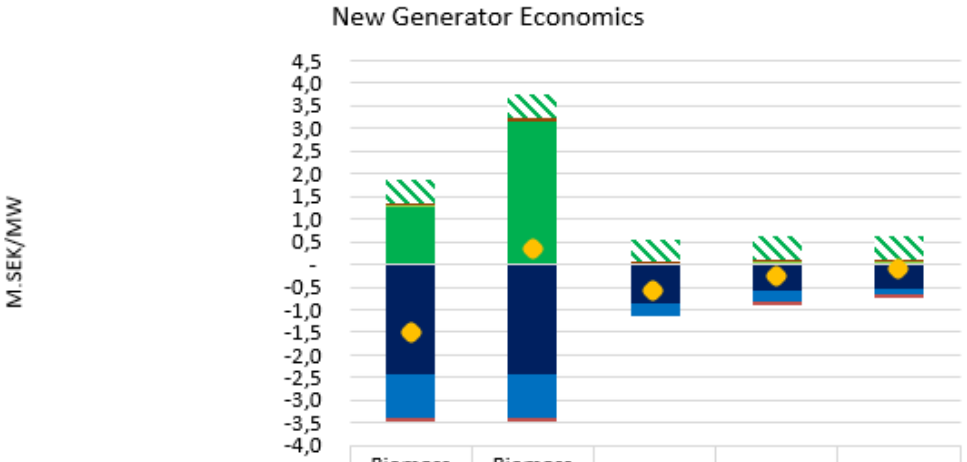
Side-analysis considering revenues in spot and regulating power markets
(not reserve payments and non-frequency related ancillary services)

Revenues in regulating power market is limited – and/but associated with high uncertainty
Variations in regulating prices are assumed to follow spot market variations.

New biomass CHP only profitable with low biomass price.

Gas units are not suited for CHP due to high carbon taxes

New peak unit economy is very sensitive to "scarcity pricing".



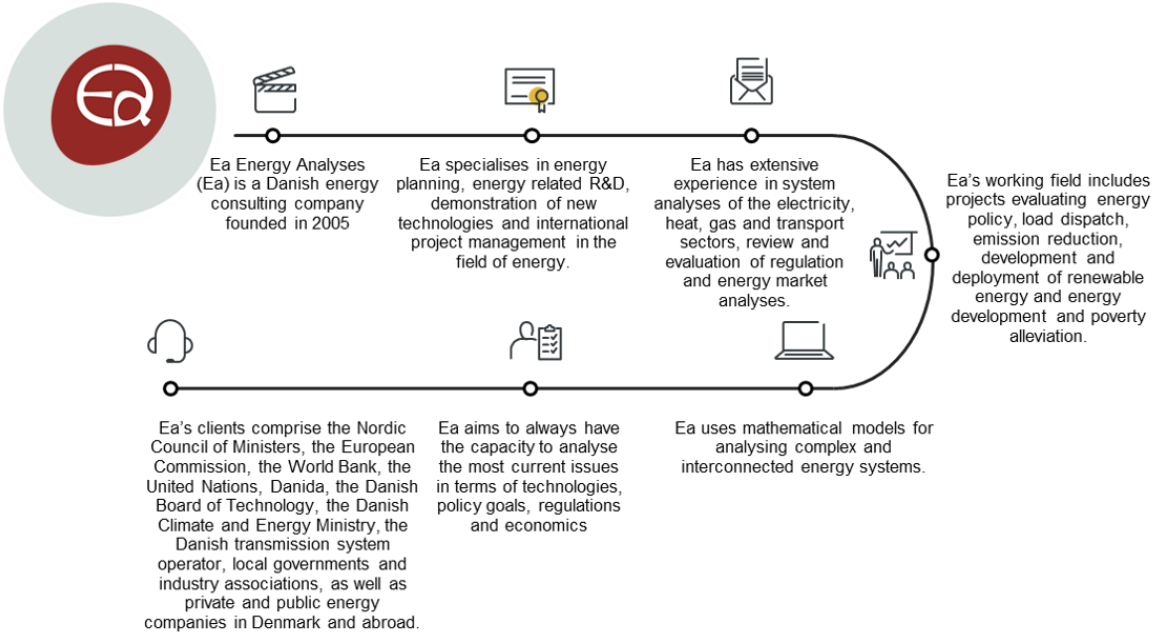
	Biomass CHP (Fuel price = 70 SEK/GJ)	Biomass CHP (Fuel price = 50 SEK/GJ)	CCGT (backpressure)	CCGT (condensing)	OCGT - (condensing)
Contribution margin from scarcity prices	0,51	0,51	0,51	0,51	0,51
Contribution margin from up-regulation	0,04	0,09	0,01	0,05	0,05
Contribution margin from down-regulation	0,03	0,00	0,00	0,01	0,01
Contribution margin from spot market	1,28	3,16	0,02	0,04	0,04
Start up costs	-0,01	0,00	0,01	-0,03	-0,01
Annual fixed O&M	-0,98	-0,98	-0,28	-0,26	-0,13
Annualized investment	-2,42	-2,42	-0,87	-0,57	-0,54
Annual profit	-1,54	0,36	-0,60	-0,25	-0,07

Conclusions

- Gap between peak demand and firm capacity increases from about 3.5 GW in 2020 to 4.75 GW in 2030.
  - Karlshamnsverket and Heleneholmsverket are assumed to close down
- Electricity prices are expected to increasy only slightly compared to 2019
  - But price variations will increase
- Investments in gas capacity dependent on scarcity pricing
  - Sweden less attractive location due to high carbon taxes on heat generation
- Investments in new biomass capacity dependent on heat market AND low biomass price

- Investments in solar and onshore wind capacity appear attractive
- Investments in offshore wind are sensitivity to constraints on onshore deployment (NIMBY etc.)
- New interconnectors to Germany and Poland appear attractive
  - Opportunity for integration with offshore grid in Baltic Sea
  - Offshore wind and new interconnectors would improve security of supply

- Modelling is based on a standard year's conditions
- Further analyses are recommended to shed light on security of supply, in situations with abnormal weather conditions and limitations on interconnector capacity



THANK YOU

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