



Indlæg om optimering af samdriften af Hvide Sande Fjernvarme i energyTRADE

Brancheforeningen for Decentral Kraftvarmes temadag den 23-11-2021

Ved Jonathan Refsgaard (jr@emd.dk) og Anders N. Andersen (ana@emd.dk)
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Vores indlæg

- Væsentlige elmarkeder ved markedsoptimering
- Eksempler på faktorer der påvirker elpriserne i de enkelte elmarkeder
- Værkerne bliver mere komplekse
- Eksempel på energyTRADE's metoder til budprisberegninger
- Demonstration af energyTRADE's optimering af samdriften af Hvide Sande Fjernvarme

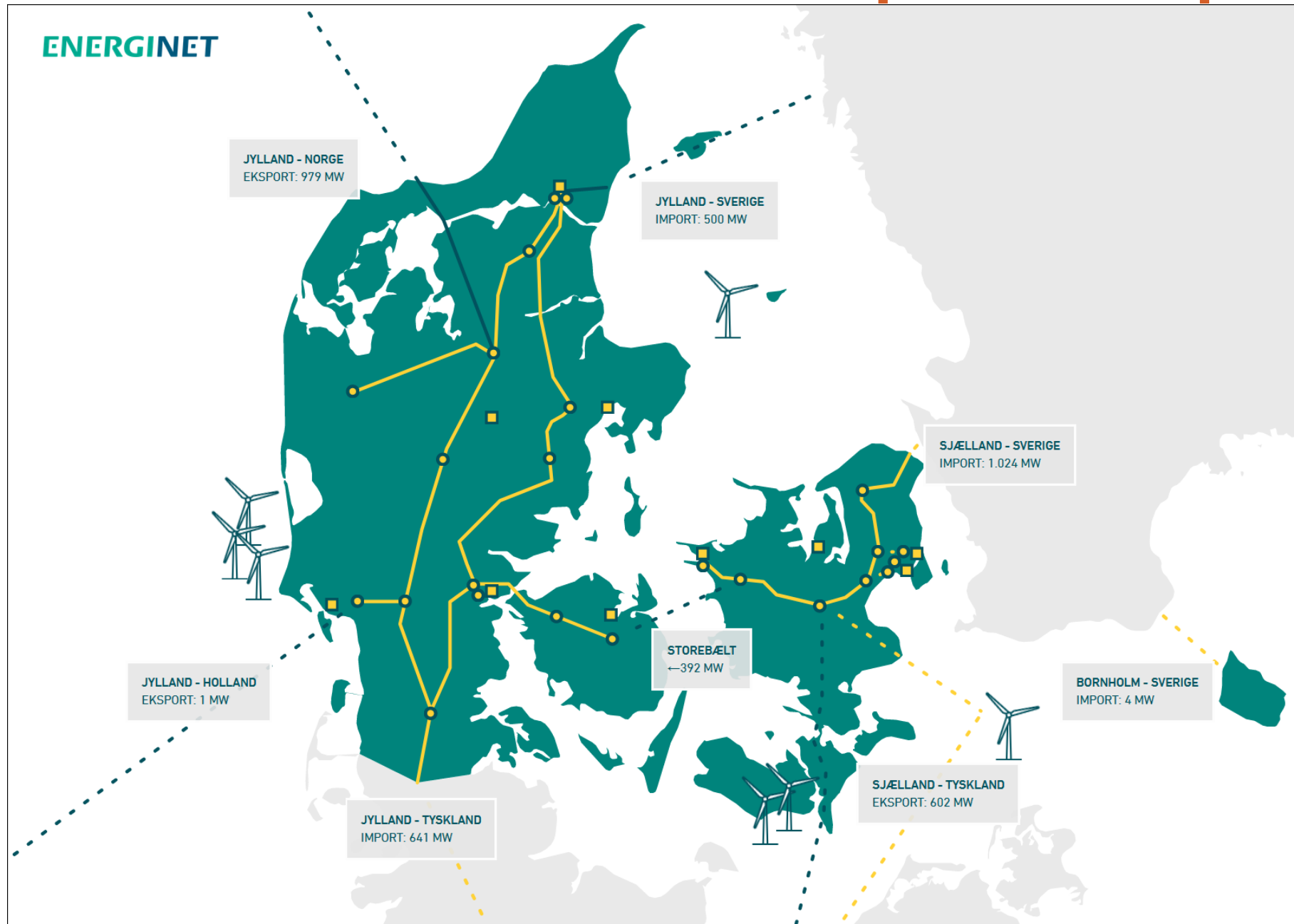
Væsentlige elmarkeder ved markedsoptimering

Danish electricity markets (that are becoming European standard)			
Marke	Gate closure	Organization	Price settlement
Frekvensregulering Frequency containment reserves (FCR)	8.00 the day before	Minimum 1 MW symmetric up/down Divided into four-hour blocks Bloc 1: Kl. 00.00 - 04.00 Bloc 2: Kl. 04.00 - 08.00 Bloc 3: Kl. 08.00 - 12.00 Bloc 4: Kl. 12.00 - 16.00 Bloc 5: Kl. 16.00 - 20.00 Bloc 6: Kl. 20.00 - 24.00	Marginal price
Rådighed i regulerkraftmarkedet Frequency restoration reserves (mFRR)	9.00 the day before	Bids for each of the 24 hours tomorrow. Asymmetric bids.	Marginal price
Spotmarkedet Day ahead wholesale market	12.00 the day before	Bids for each of the 24 hours tomorrow. Asymmetric bids. Price independent, price dependent or bloc bids.	Marginal price
Aktivering i regulerkraftmarkedet og specialregulering Replacement Reserves (RR)	45 minutes before the operating hour	Bid for the next hour. Asymmetric bids.	Marginal price/ PayAsBid
Elbas Intraday wholesale market (ID)	45 minutes before the operating hour	Bid for the next hour. Asymmetric bids.	PayAsBid

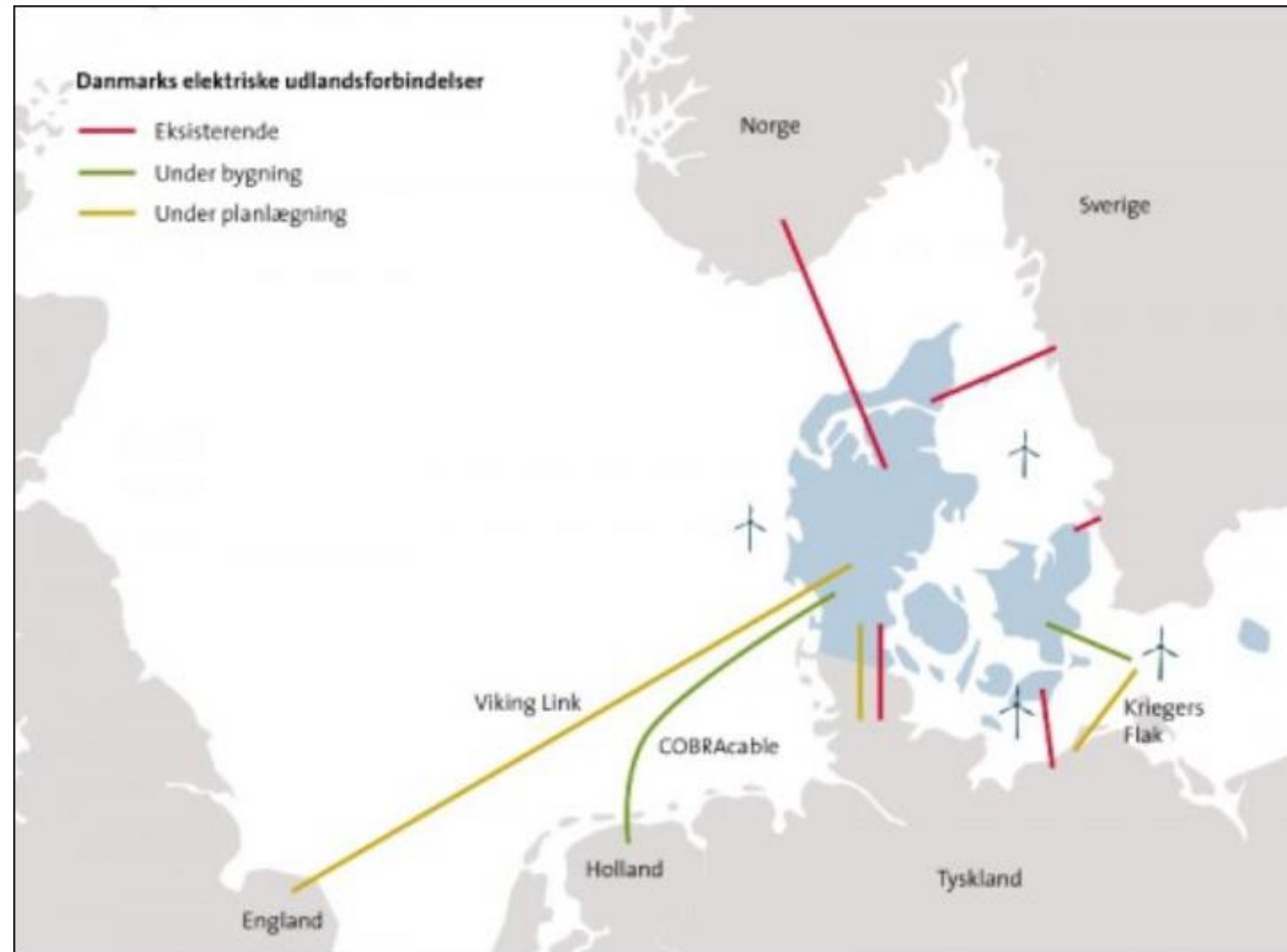
Eksempler på faktorer der påvirker elpriserne i de enkelte elmarkeder

- De eksisterende udlandsforbindelser påvirker elpriserne
- Der udbygges med flere udlandsforbindelser
- Varighedskurverne for elpriser ændrer sig i de kommende år
- Specialregulering flyttes til Intra-Day

De eksisterende udlandsforbindelser påvirker elpriserne

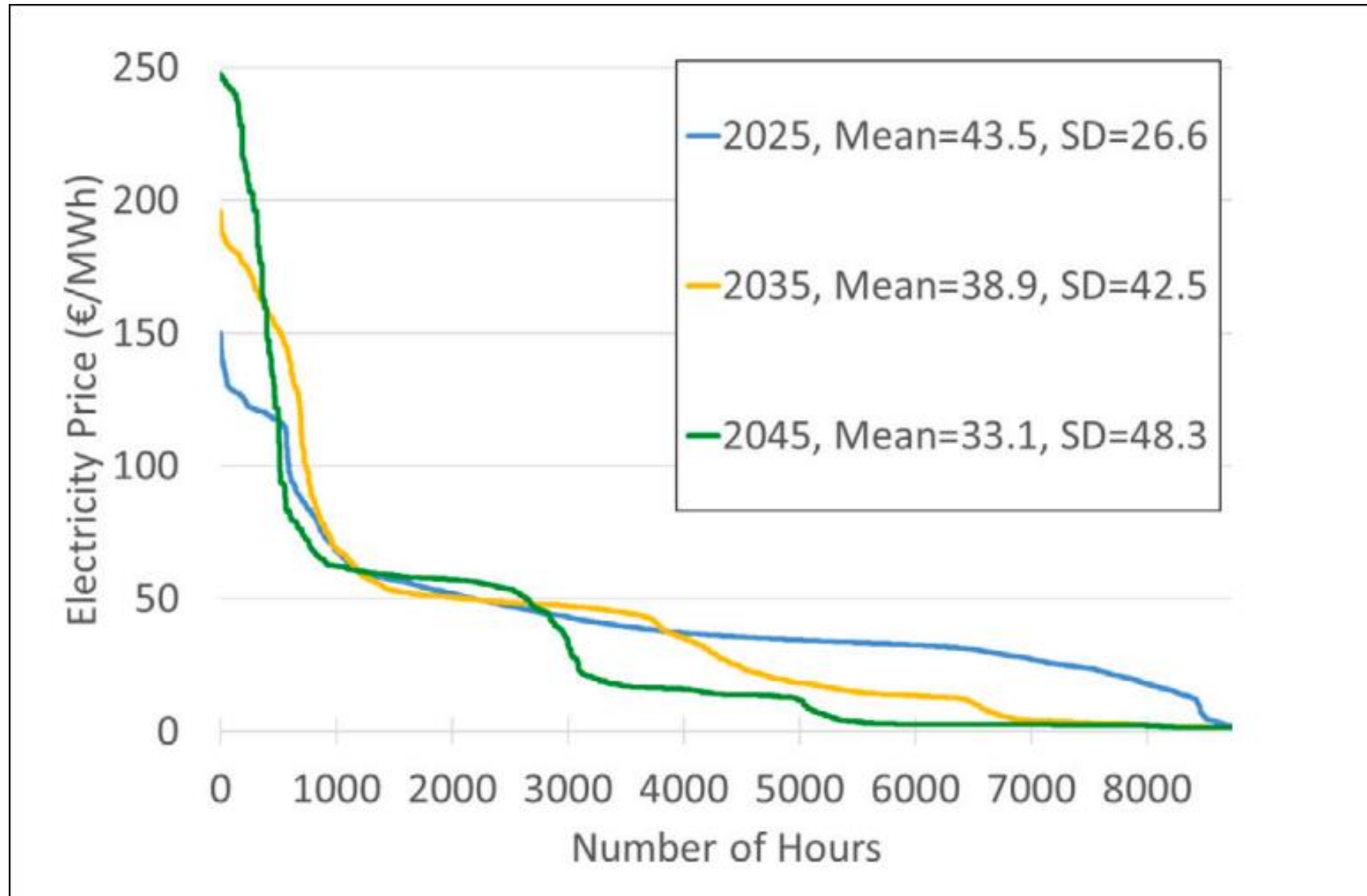


Der udbygges med flere udlandsforbindelser (Viking Link idriftsættes 2023)



Varighedskurverne for elpriser ændrer sig i de kommende år

<https://www.sciencedirect.com/science/article/pii/S0306261921013337>



Specialregulering flyttes til Intra-Day

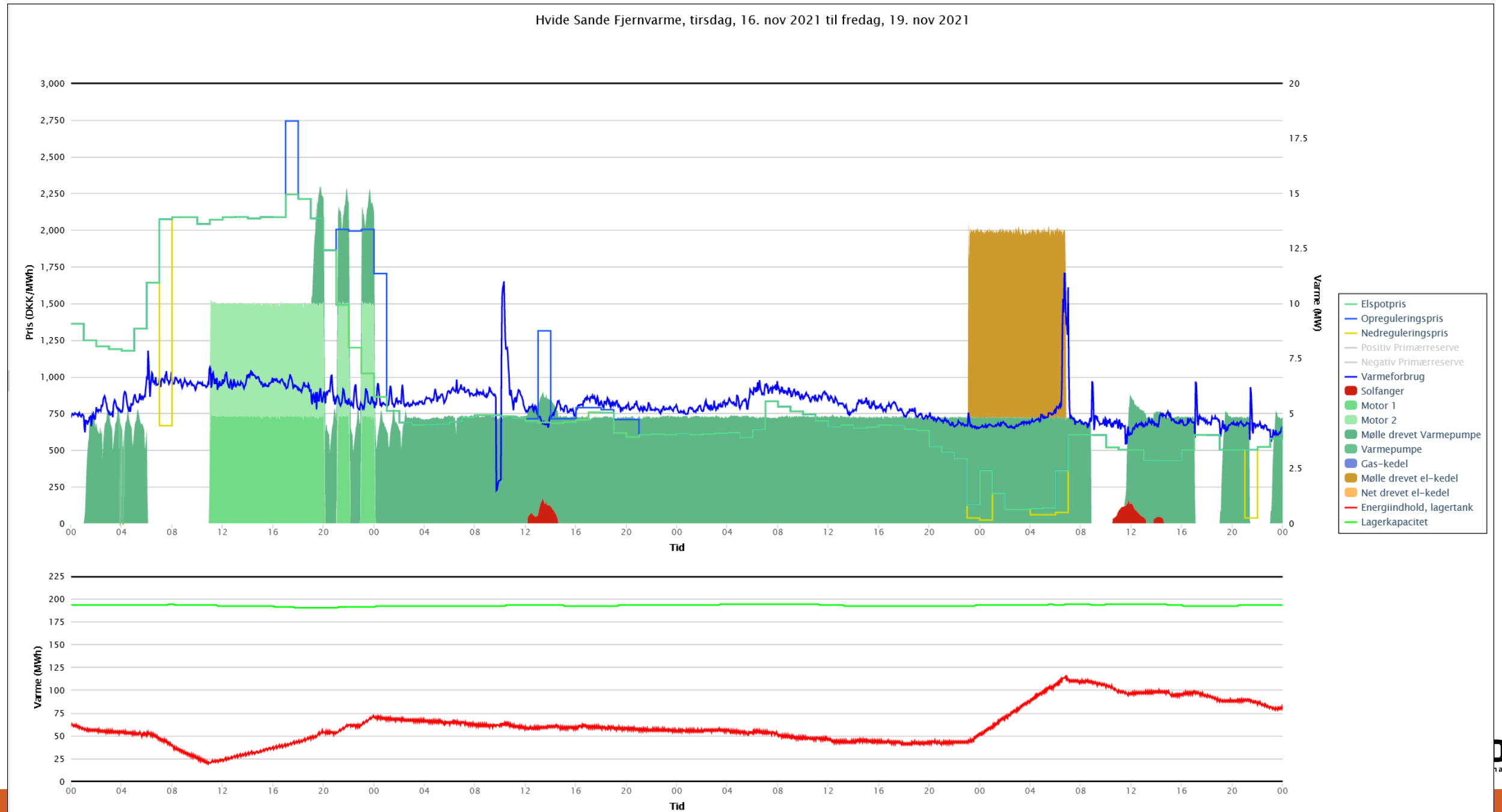
Senest i november næste år flyttes Specialregulering i DK1 fra Regulerkraftmarkedet til Intra-Day

In 2020, countertrade in the special regulation model resulted in:

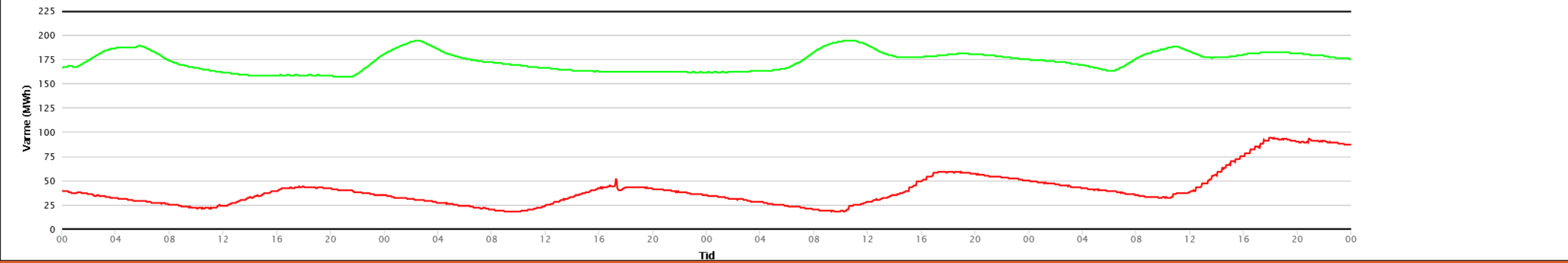
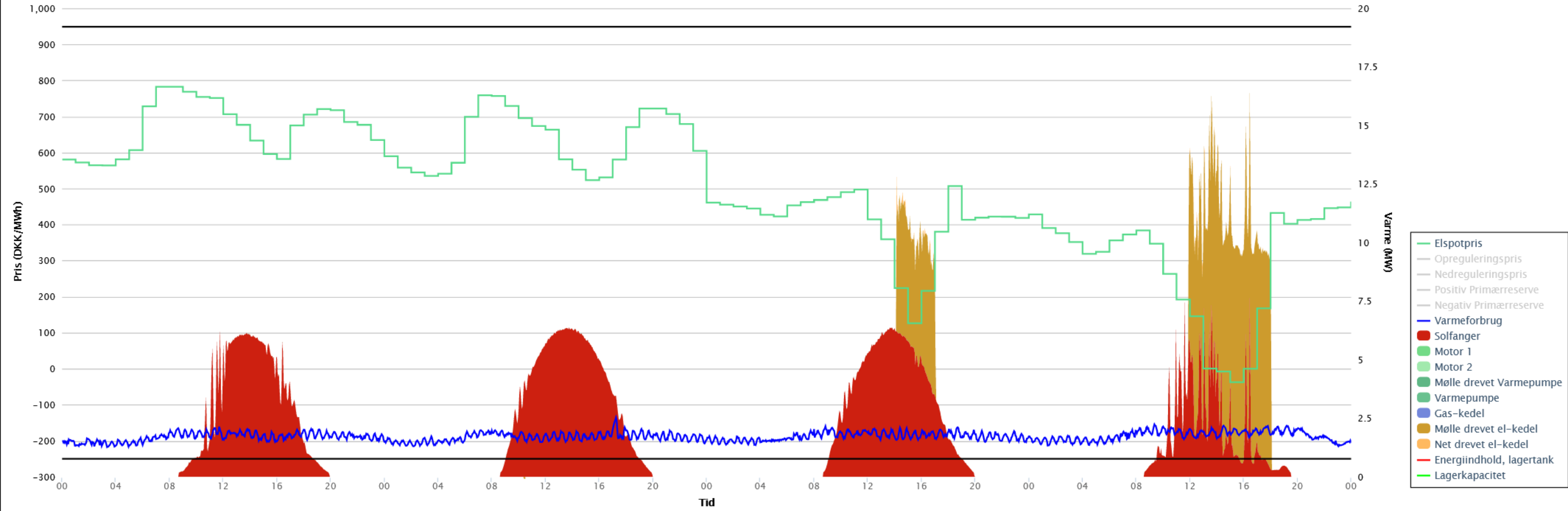
- 1,461 GWh downward regulation of Danish wind turbines
- 517 GWh downward regulation of Danish electric boilers
- 1,065 GWh downward regulation of Danish thermal power stations

Den gennemsnitlige PayAsBid-pris var i -23 EUR/MWh i 2020, det vil sige, at både vindmøller og fjernvarmeværker i Vestdanmark hvert år taber 250 mio. DKK.

Værkerne bliver mere komplekse, se www.emd-international.com/livedata/

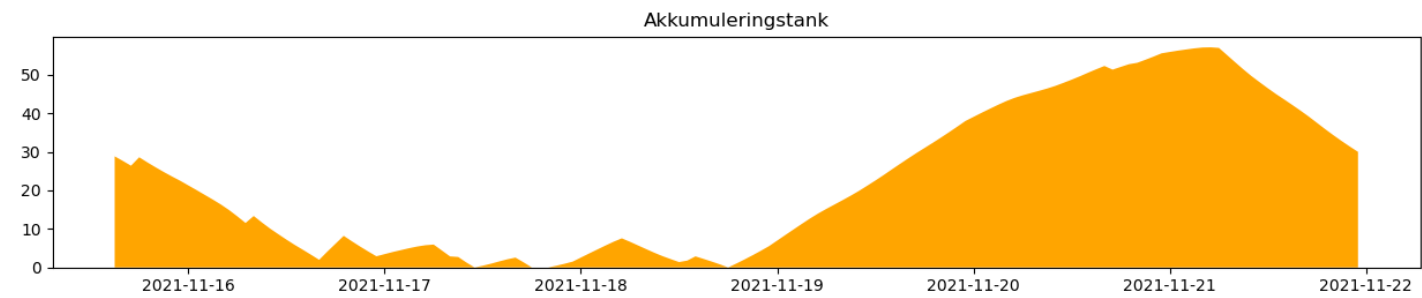
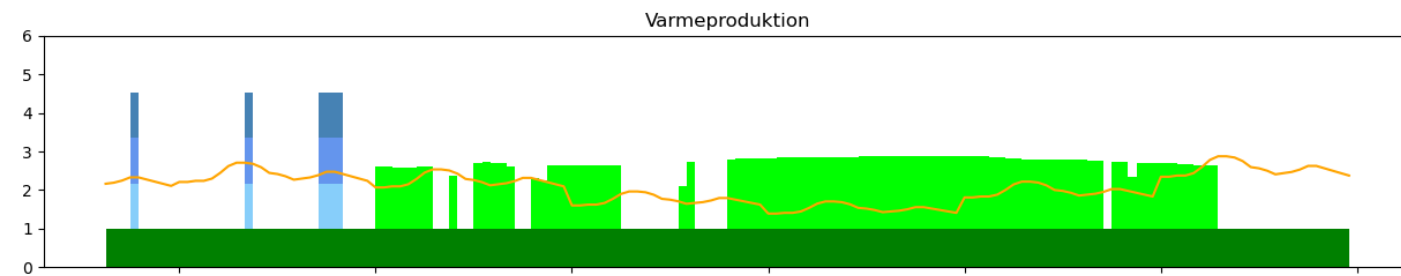
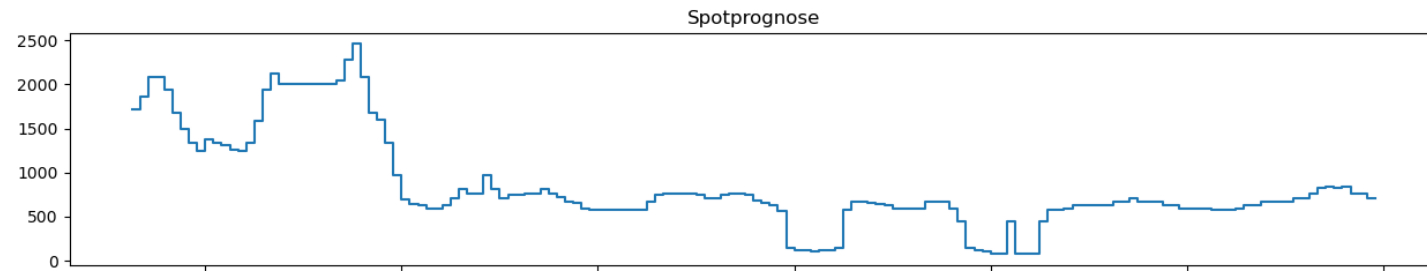


Hvide Sande Fjernvarme, torsdag, 15. jul 2021 til søndag, 18. jul 2021



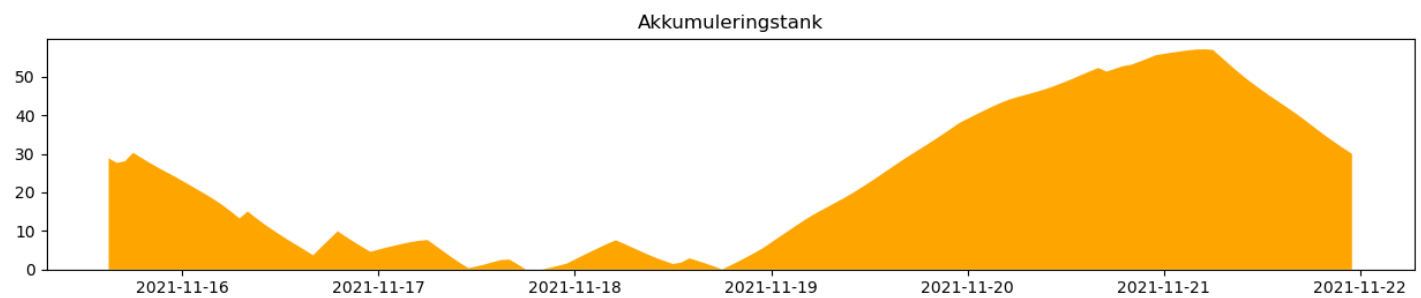
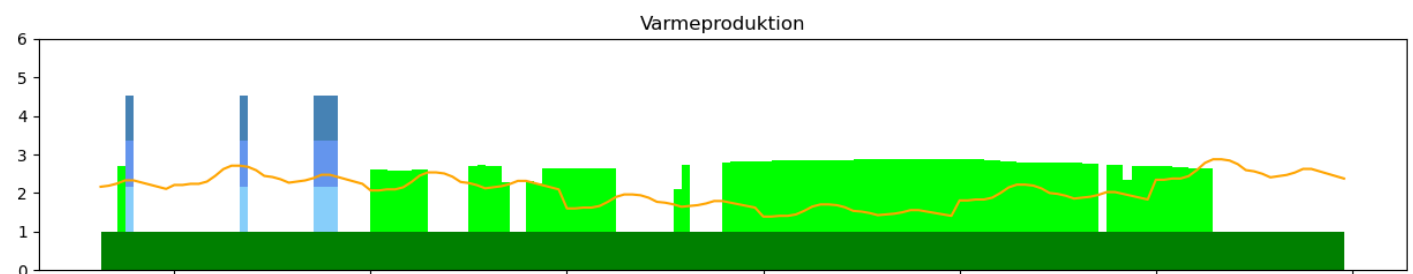
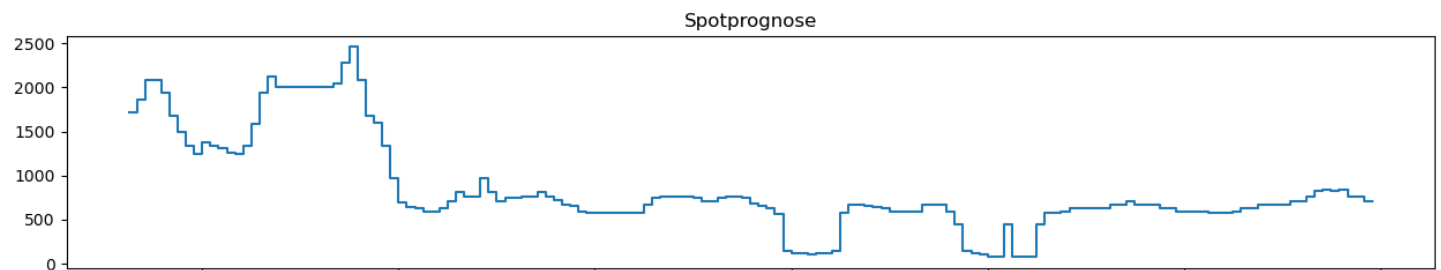
**Som eksempel på energyTRADE´s metoder til budprisberegninger:
Aktiveringsbudpris i regulerkraft – beregnes ved ændret handel i spotmarkedet, hvis en aktivering er vundet.**

Reference
77.224 DKK



Reference
77.224 DKK

Varmepumpe nedregulering
 $(77.224 - 76.839) / 0,50 = 770$



Reference

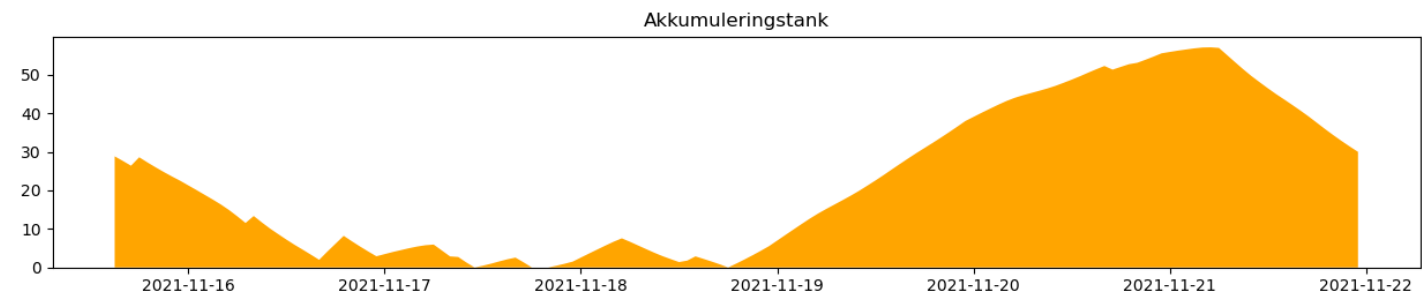
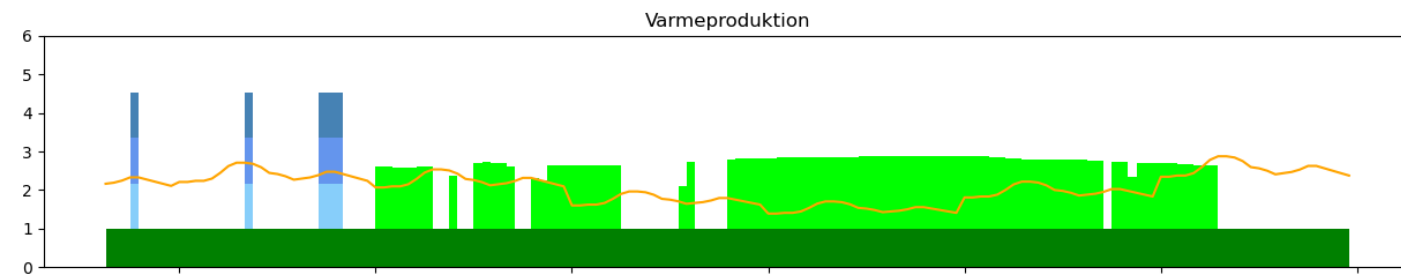
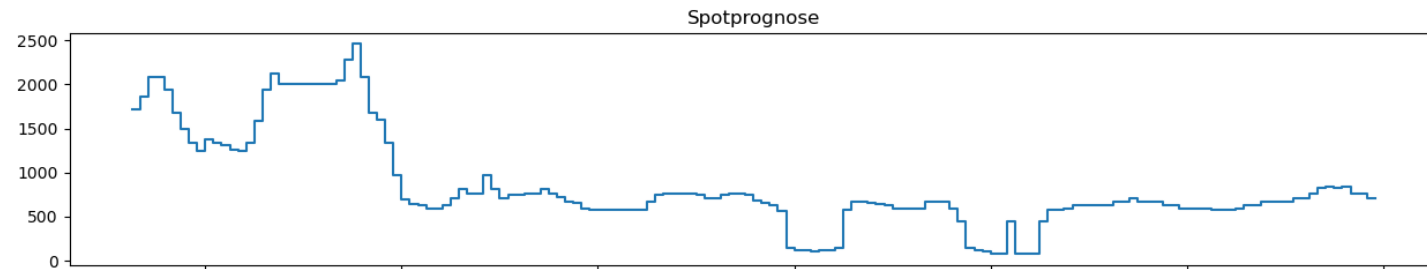
77.224 DKK

Varmepumpe nedregulering

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77.224 DKK

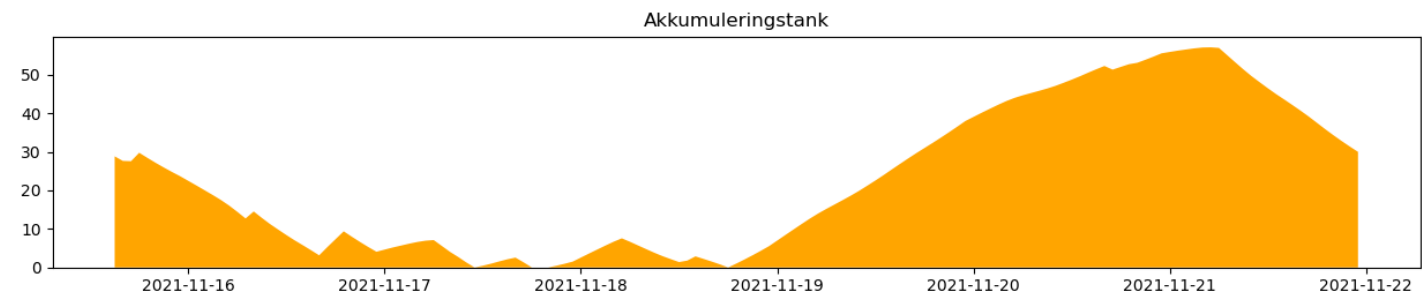
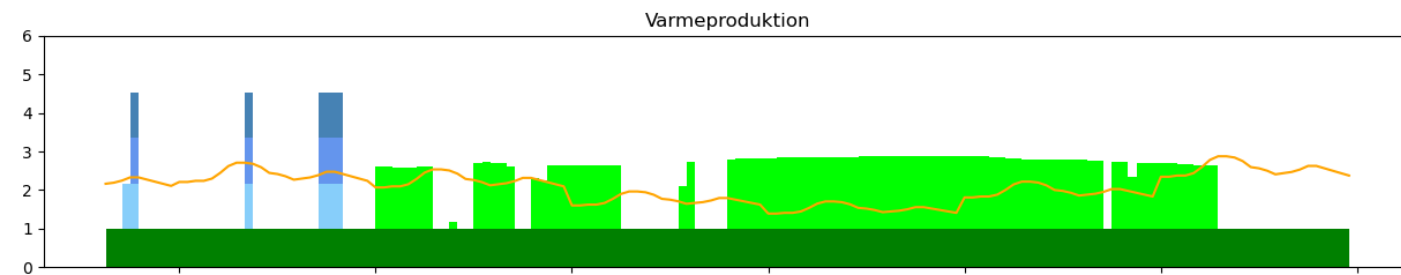
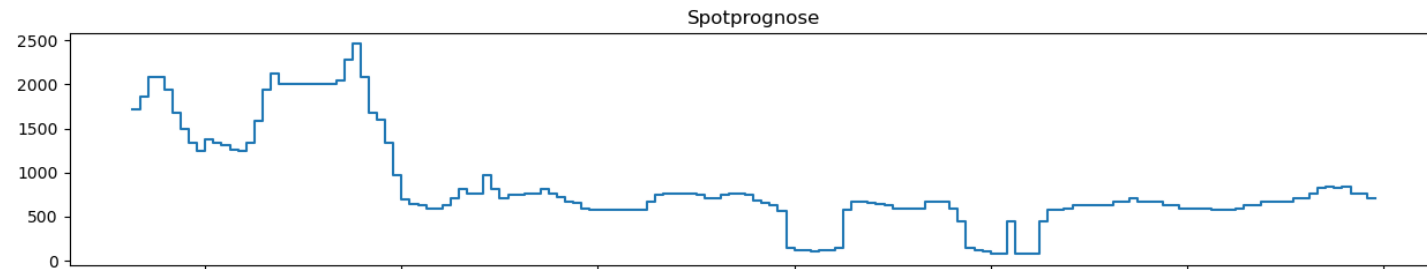


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Motor 1 opregulering
 $(78.658 - 77.224) / 0,70 = 2047$



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77.224 DKK

Varmepumpe nedregulering

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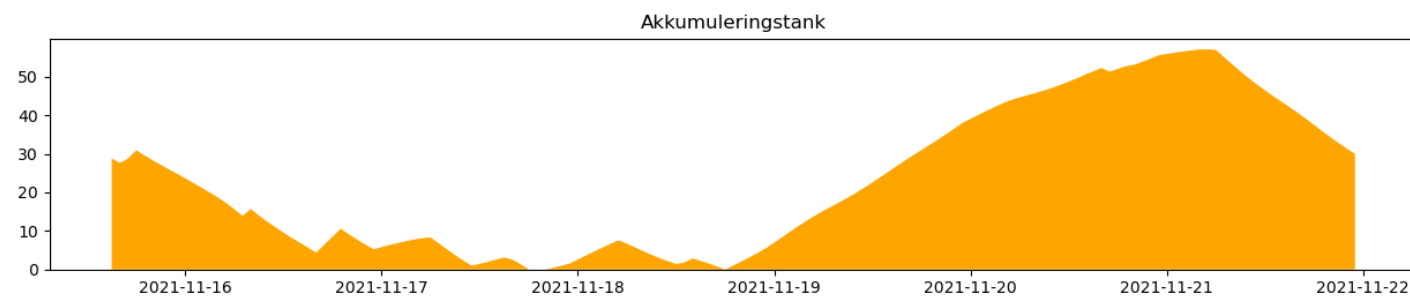
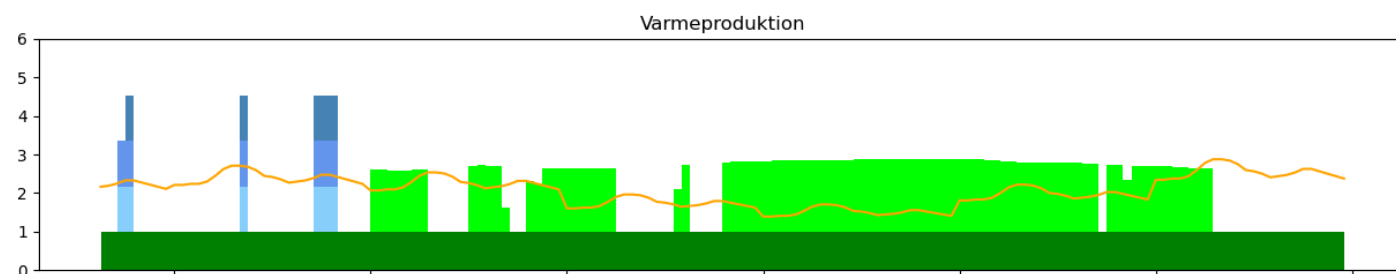
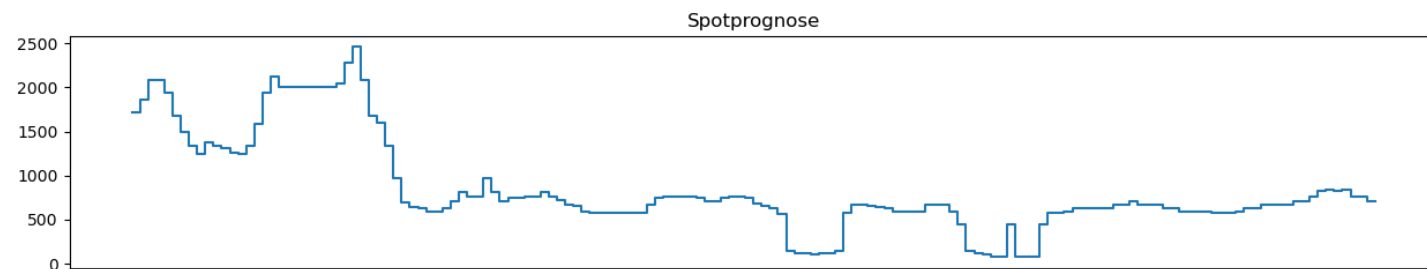
77.224 DKK

Motor 1 opregulering

$(78.658 - 77.224) / 0,70 = 2047$

Motor 2 opregulering

$(80.096 - 78.658) / 0,70 = 2053$



Reference

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Varmepumpe nedregulering

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Motor 1 opregulering

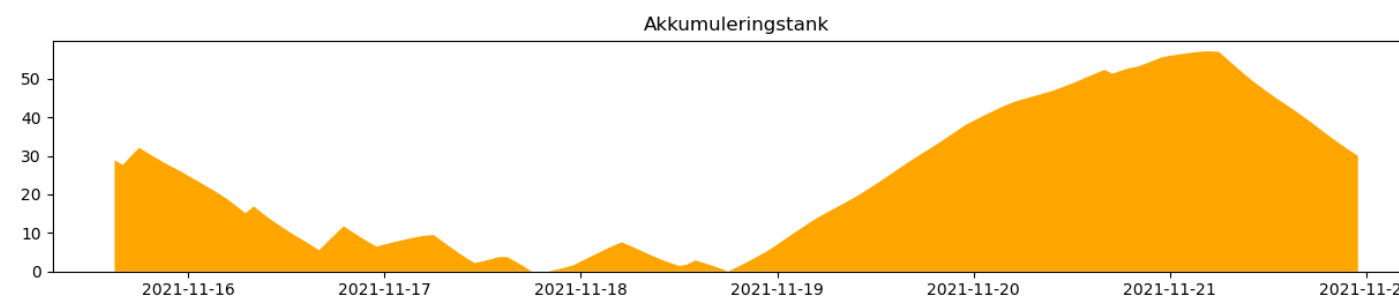
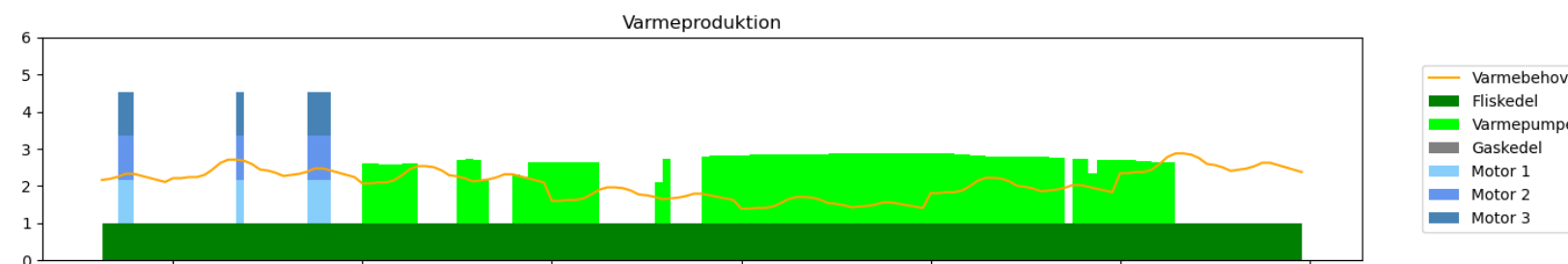
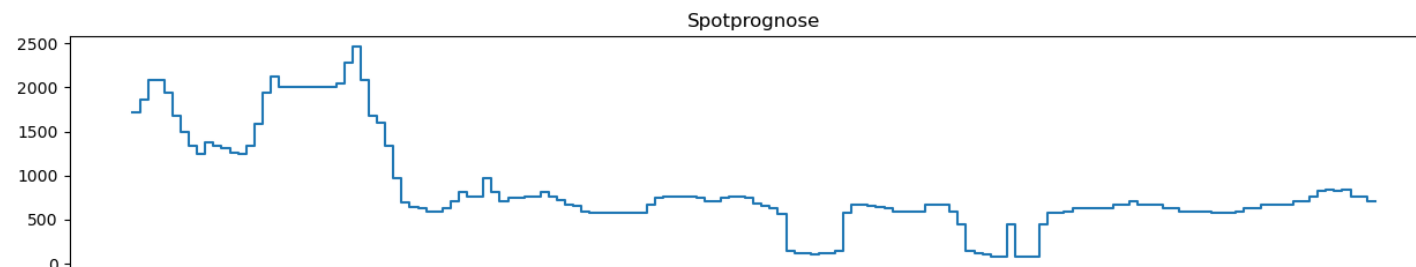
$(78.658 - 77.224) / 0,70 = 2047$

Motor 2 opregulering

$(80.096 - 78.658) / 0,70 = 2053$

Motor 3 opregulering

$(81.535 - 80.096) / 0,70 = 2056$



**energyTRADE´s optimering af samdriften af Hvide Sande Fjernvarme
vises online, <https://www.emd-international.com/energytrade/>**