

Price volatility in the future EU market: insights from HydroBalance/WP3, and from FLEXNET project

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1.1 Introduction

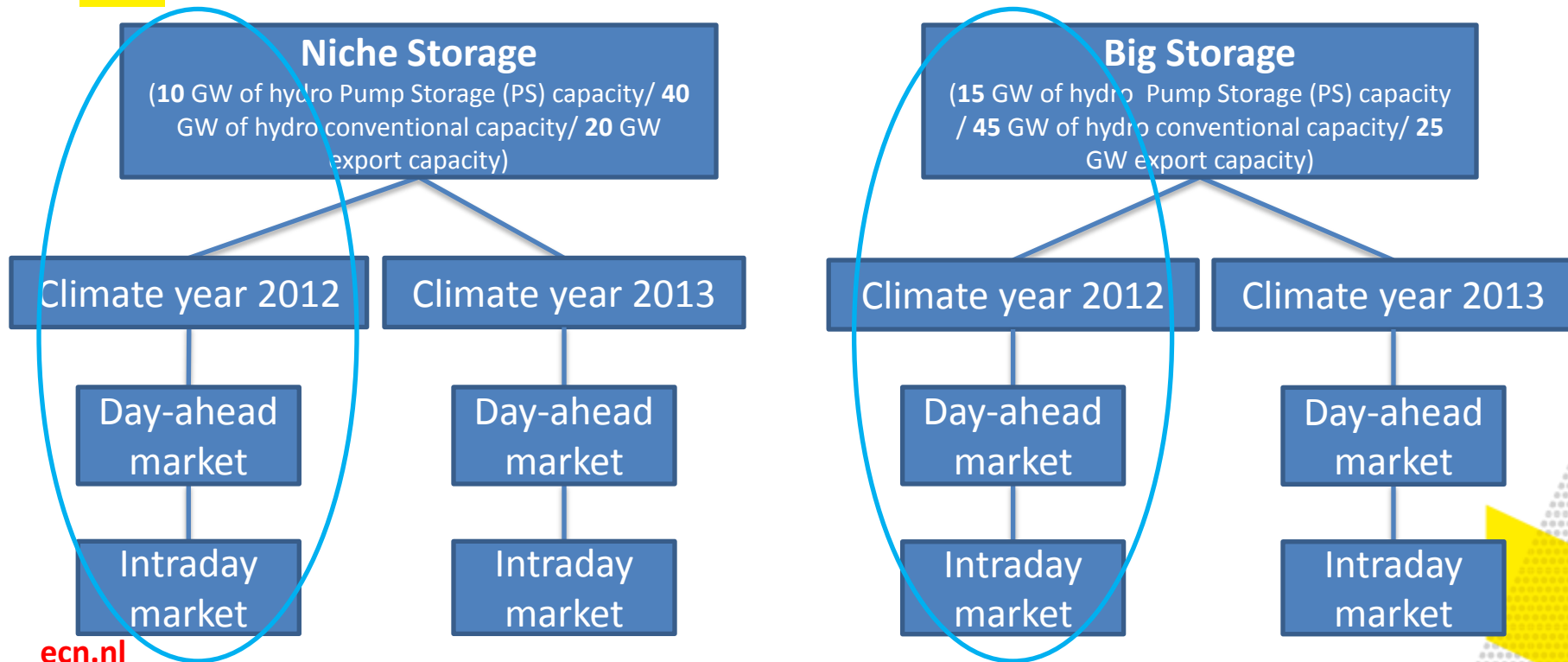
- Within Hydrobalance project, ECN contributed by utilizing the EU electricity market model COMPETES to:
 - Analyze impact of hydro power capacity, transmission capacity and different levels of market coordination on prices, flows and production
- During last User Meeting general results were presented, in this presentation focus is on **price volatility** in EU markets (NL/DE)
 - Hydro PS units require certain volatility in electricity prices
- FLEXNET Project, focussing on demand/supply of flexibility in NL, also provides insights that are valuable for Hydrobalancing project



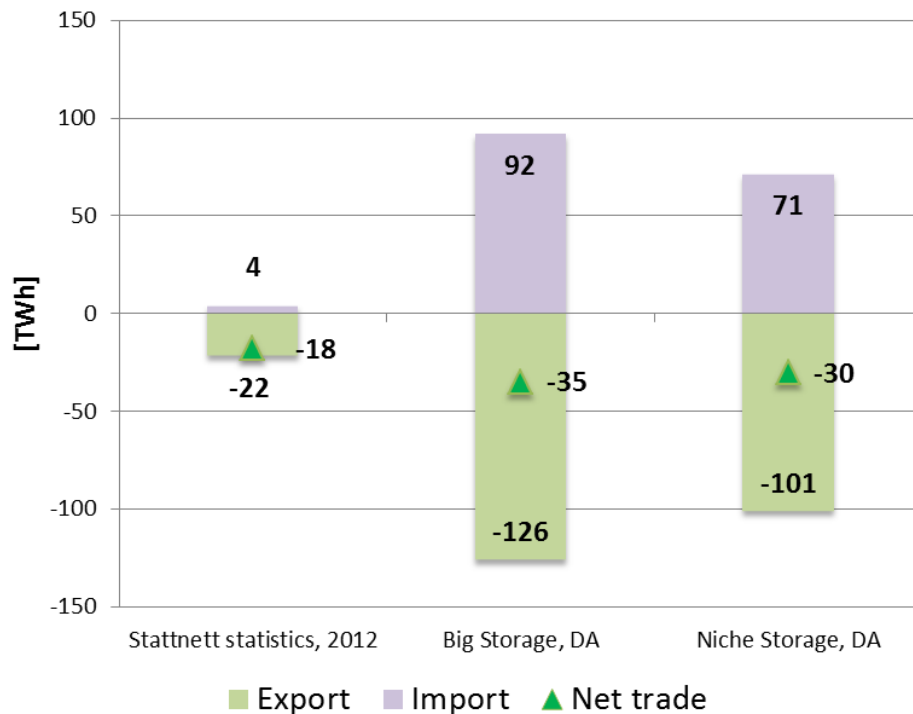
Part I: Insights on price volatility from HydroBalance project



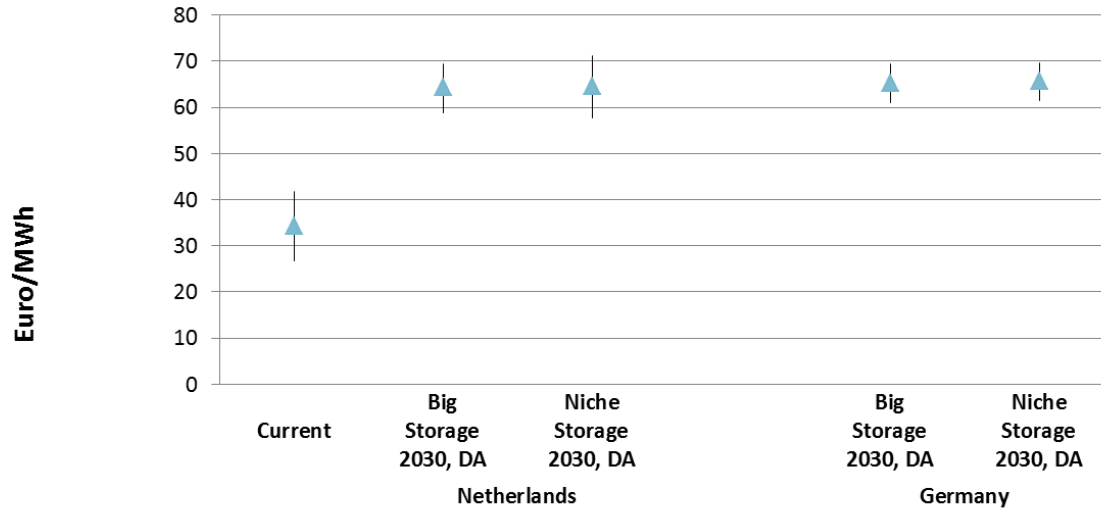
Overview of scenarios for the year 2030



E-trade on NO borders (DA market result, climate year 2012)



Price volatility DA market (climate year 2012)



Delta Price volatility up-down

15

11

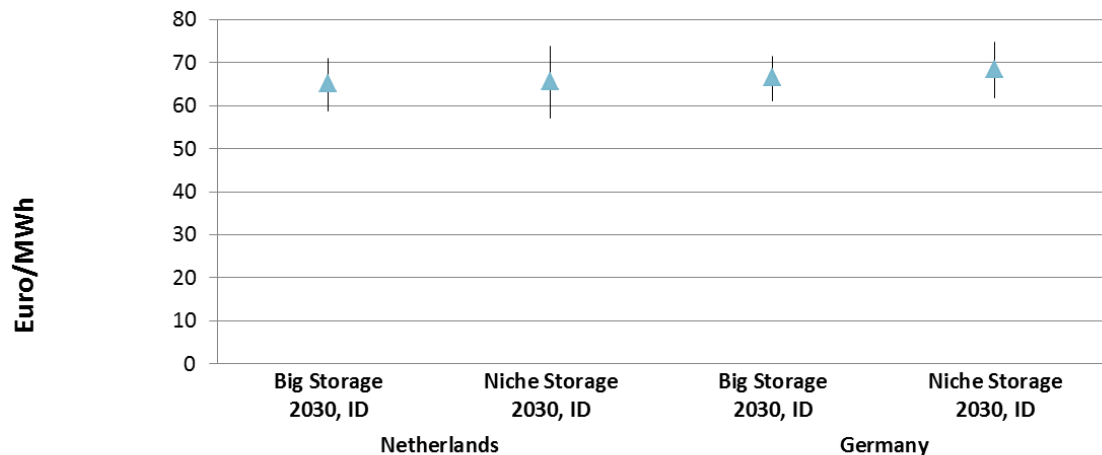
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8

8

- Even though there are significant investments in I-RES, price volatility reduces slightly w.r.t. today's situation due to assumption of **strong EU network**
- In NL Niche Storage we see higher price volatility due to reduced imports from NO from lower transmission capacity
- In DE, prices do not differ much between Niche Storage and Big Storage due to higher Hydro PS capacity in DE

Intraday market: increased price volatility under limited market coordination (climate year 2020)



Delta Price volatility up-down

12

17

10

13

- In Big Storage, price volatility is slightly higher due to increased scarcity in supply (e.g. in NL from 11 €/MWh to 12 €/MWh) > transmission capacity can accommodate fluctuations in supply and demand to a significant extent since all EU markets are fully coordinated in Big Storage
- In Niche Storage, due to limited coordination, there is a more significant increase in price volatility (e.g. in NL from 13 €/MWh to 17 €/MWh)

Part II: Insights on price volatility from FLEXNET project

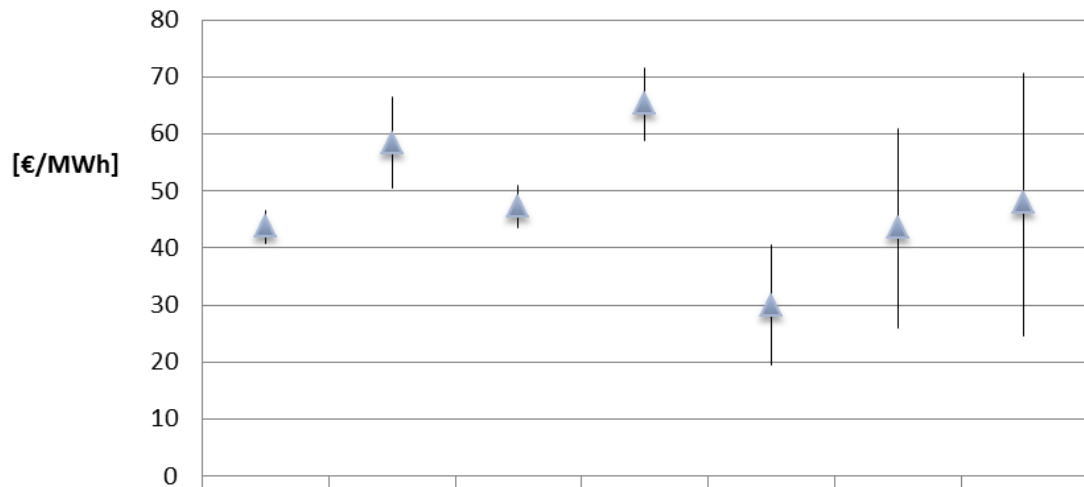


2.1 Introduction to Flexnet project (report forthcoming)

- Objective of FLEXNET project is to analyse demand and supply of flexibility of the power system in NL up to 2050 at both the *national* and *regional* level.
- **7 future scenario's** that differ with regard to demand/supply of flexibility:
 - Scenario **R2023** and **R2030** represent business-as-usual situation for 2023 and 2030
 - Scenario **A2023**, **A2030** and **A2050** represent alternative situation assuming significant increase in RES and demand due to electrification (e.g. from EV's, heat pumps)
 - R2023/A2023 and R2030/A2030 do not differ significantly w.r.t. RES capacities, but mainly with regard to additional demand from electrification. A2050 can be considered an extreme scenario
 - For **A2030** and **A2050** transmission investments included (HVDC Overlay)
 - Since **A2050** can be considered an extreme scenario with significant e-demand and I-RES, the transmission investments were high (2 sensitivity analyses: **B2050** and **C2050** assuming **50%** and **0%** of additional transmission investments in A2050, respectively)



Price volatility in Netherlands in 7 future scenario's (FLEXNET)



	R2023	R2030	A2023	A2030	A2050	B2050	C2050
Price volatility up	47	66	51	72	41	61	71
Price volatility down	41	50	44	59	19	26	25
▲ weighted average	44	58	47	65	30	44	48

- Low price volatility in **R2023/A2023** due to relatively limited I-RES
- Lower average prices, but higher price volatility in **R2030** compared to **A2030** due to more hours where there is surplus of I-RES due to lower demand
- **A/B/C2050**: price volatility in NL increases with less interconnection, which increases the potential for pumped-hydro but on the other hand limits the access for NO Hydro PS

Overview of lessons learned from HydroBalance/Flexnet

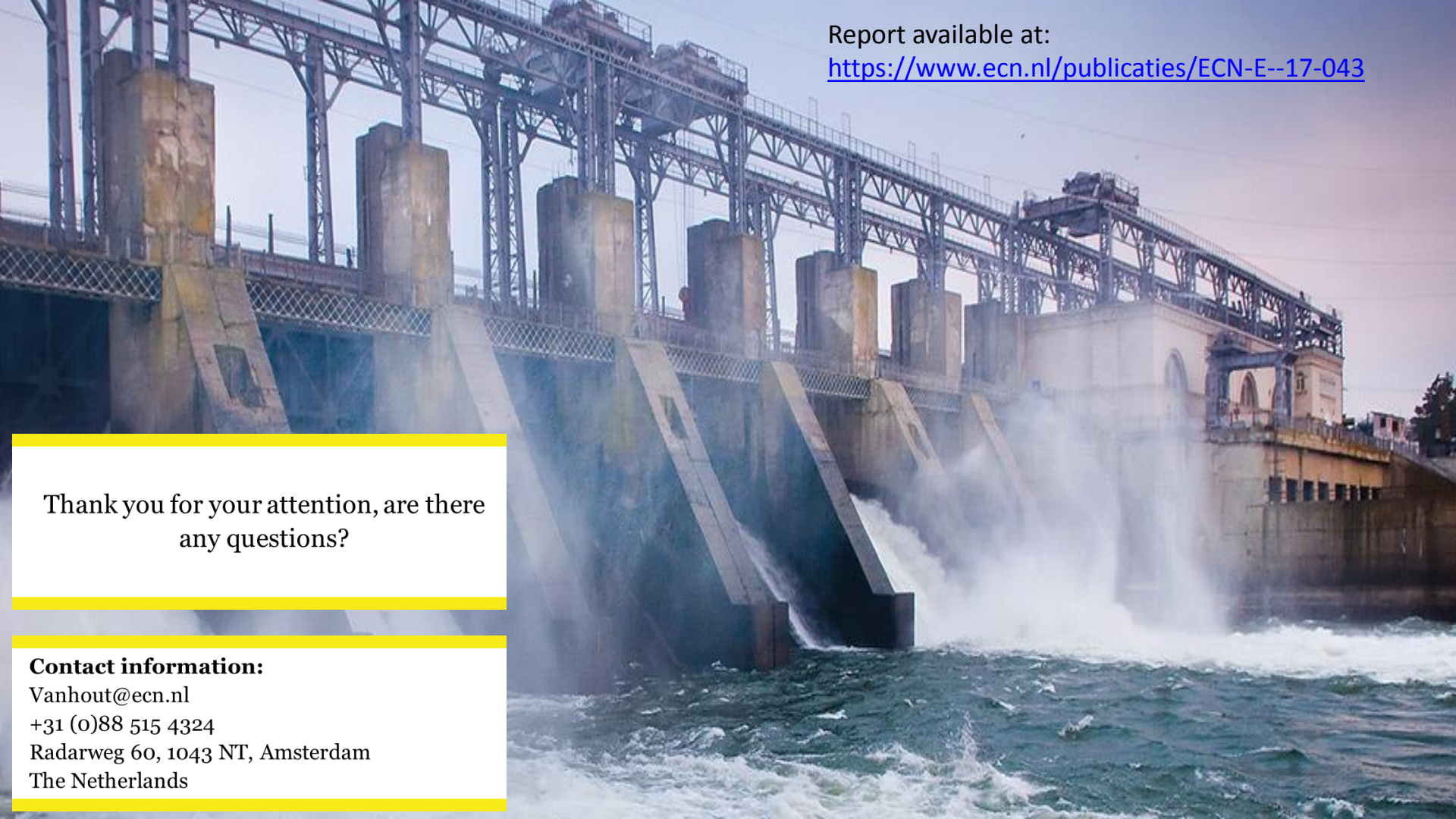
Price volatility is expected to *ceteris paribus*..:

- **..Increase** due to higher I-RES capacity in the future EU w.r.t. today's situation
- **..Increase** if coordination between EU intraday markets is limited (as in Niche Storage, ID)
- **..Increase** if additional demand from electrification (e.g. EV's/heat pumps) is a non-smart profile and adds to peaks
- **..Decrease** in countries on EU mainland with increasing grid capacity which further accommodates fluctuations in demand and supply
- **..Decrease** with increasing shares of Hydro PS or other energy storage technologies (e.g. P2G) → every additional MW takes some of the potential, as determined by the level of price volatility in order to be operational
- **..Decrease** if additional demand from electrification (e.g. EV's/heat pumps) is a smart profile and cuts the peaks and adds to hours with surplus of RES

Various developments can thus have a simultaneous impact on price volatility in EU: **net effect is of importance**

- Developments in price volatility on EU mainland are essential to developments in level of price volatility in Norway, and thus on Hydro PS in particular, especially with increased grid capacity on Norwegian borders





Report available at:

<https://www.ecn.nl/publicaties/ECN-E--17-043>

Thank you for your attention, are there any questions?

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Appendix



COMPETES unit commitment (UC) model

- COMPETES is a network constrained model of the European electricity market
- Countries are represented by 'nodes'
- Hourly resolution to model hourly demand and I-RES generation (wind/solar)
- Model objective is to minimize total var. costs + min. load costs + start up costs + load shedding costs
- Constraints accounted for:
 - Electricity balance constraints
 - Generation capacity constraints
 - Cross-border transmission constraints
 - Ramping up / down constraints
 - Minimum load constraints
 - Minimum up / down time constraints
 - (Non) spinning reserve constraints

Geographical coverage in COMPETES and representation of cross-border infrastructure

COMPETES Future network
Existing ———
New ———

