

Zero Terrain / Energiasalv

An aerial architectural rendering of a coastal development project. The scene shows a lush green landscape with a dense forest of trees. A winding road or path cuts through the forest. In the foreground, a large body of water, likely a bay or harbor, is visible. A long pier extends into the water, with several small boats docked. A large, modern building with a flat roof is situated on the shore. To the right, a large, dark, rocky cliff face rises from the water. On the cliff, a complex of white, cylindrical structures, possibly part of a power plant or industrial facility, is visible. The overall scene is a blend of natural beauty and modern infrastructure.

Oktoober 2025

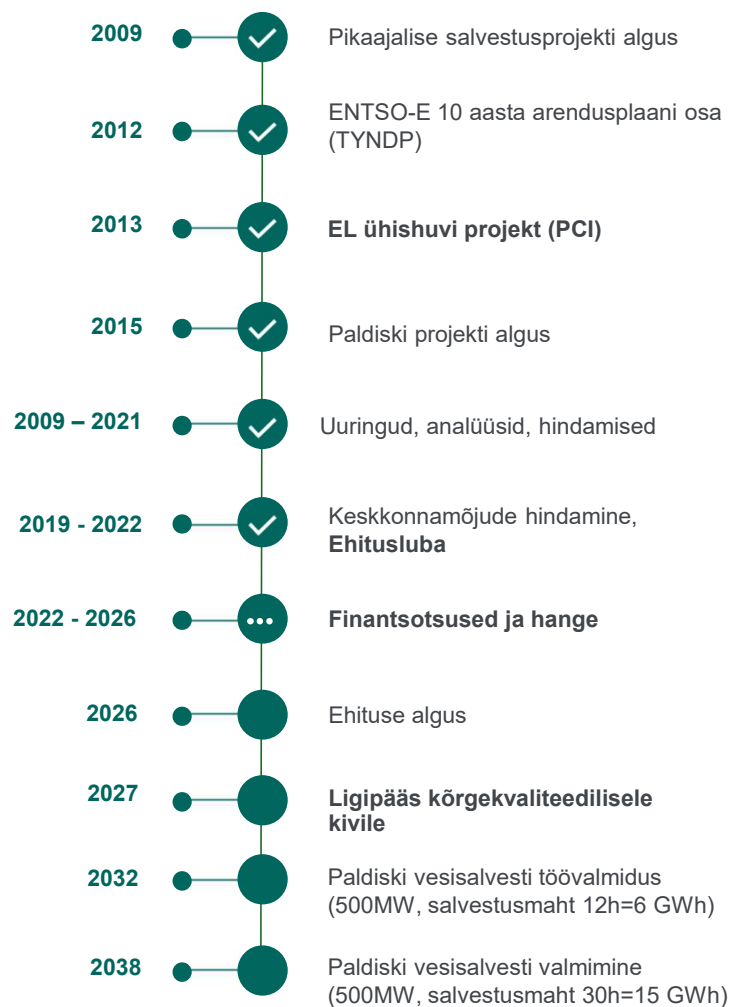
Mario Vee

ÜHISHUVI PROJEKT ALATES 2013

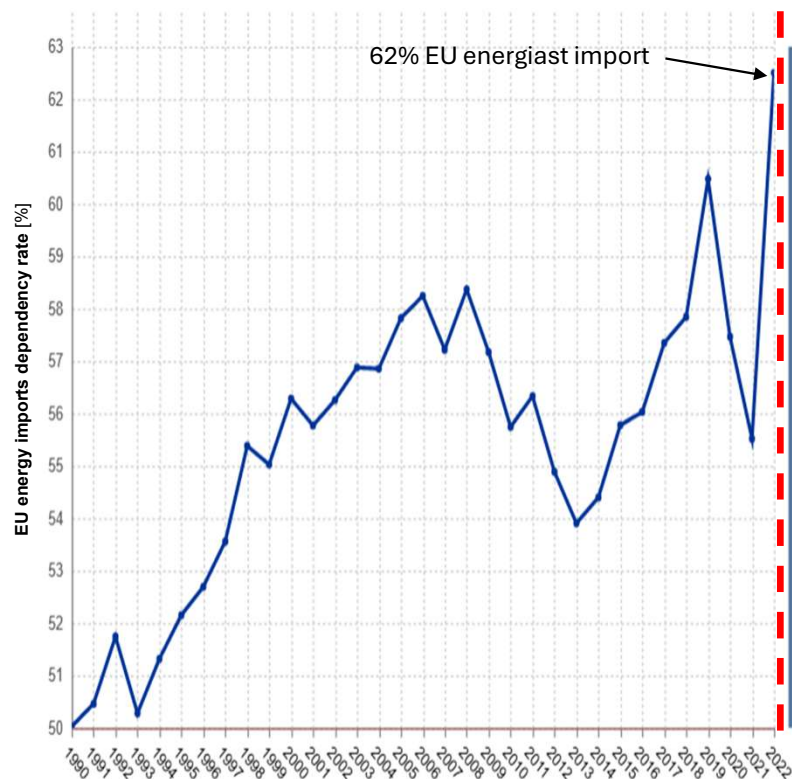
Suur hulk keskkonna-
ja majandusanalüüse

Loastatud suurprojekt

Analüüsimajade
soovitus

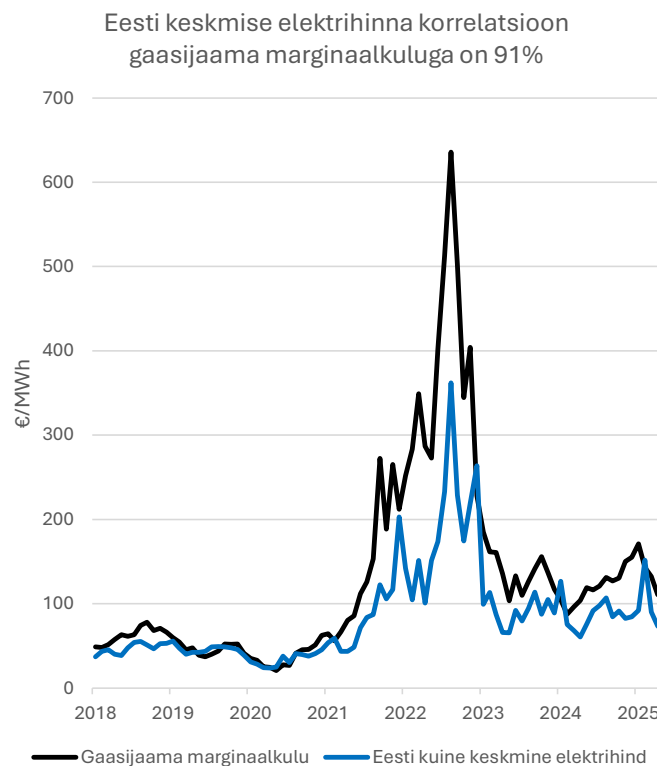


Euroopa energiapoliitika vajab struktuurset muutust



EU energy imports dependency rate shows the extent to which an economy relies upon imports to meet its energy needs. It is measured by the share of net imports (imports minus exports) in gross inland energy consumption (meaning the sum of energy produced and net imports).

Russia main EU supplier of oil and petroleum products, natural gas and solid fossil fuels in 2022



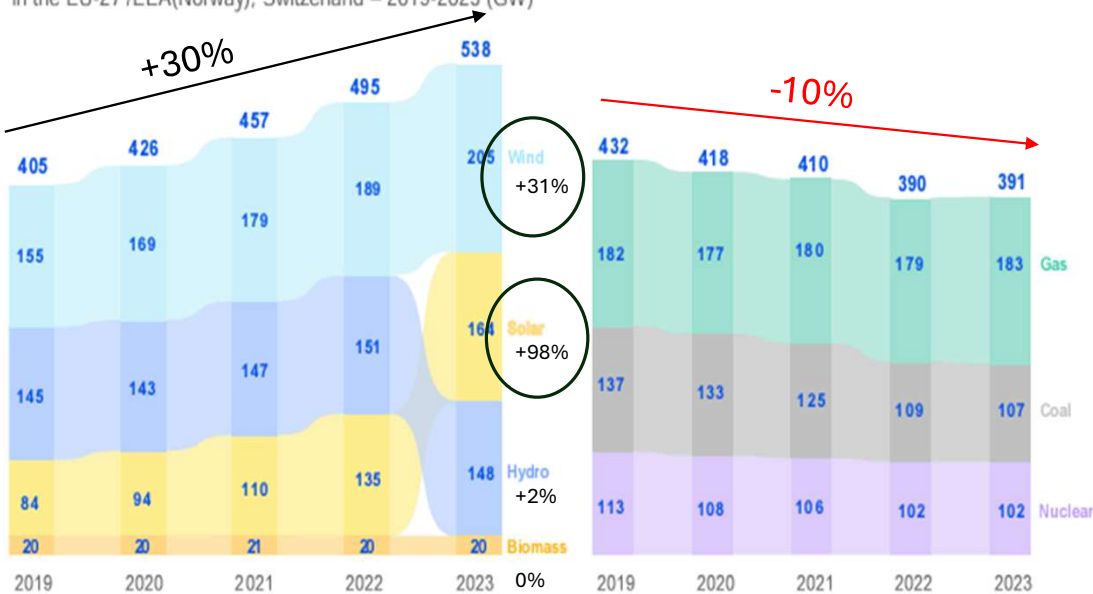
Algallikas: Elering, <https://dashboard.elering.ee/et> & <https://www.investing.com/commodities/>

Gaasijaama marginaalkulu on arvutatud arvestades termilist kasutegurit 40% ja eriheidet 0,45 t/MWh (TTF/0,4+0,45xETS).

Taastuvenergia roll kasvab

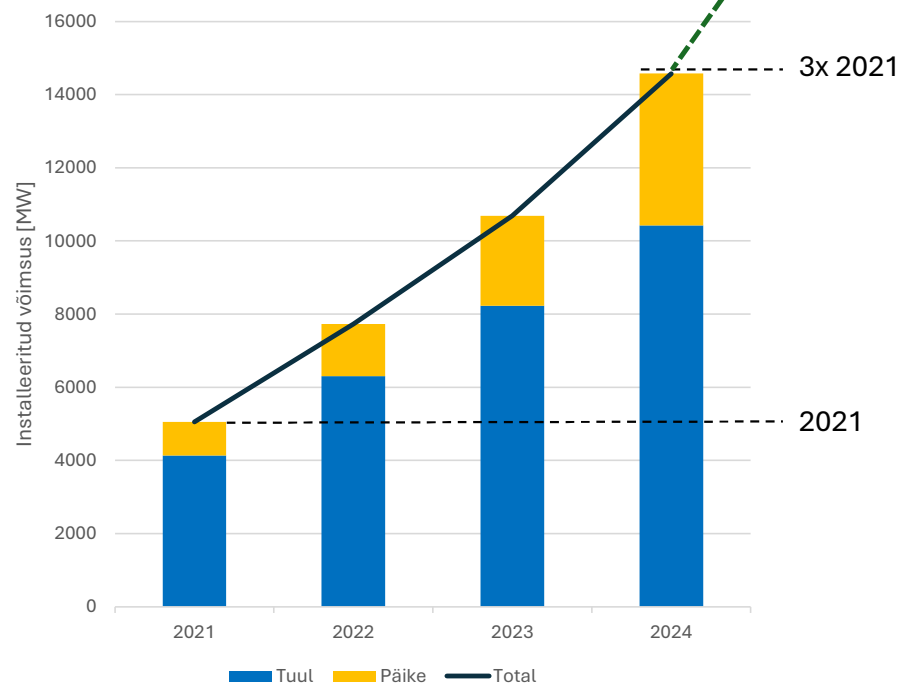
Installed electricity capacity: in 2023, solar overtakes hydro

Evolution of installed capacity for renewable (left) and conventional (right) generation technologies, in the EU-27 /EEA(Norway), Switzerland – 2019-2023 (GW)



https://www.acer.europa.eu/sites/default/files/documents/Publications/ACER_2024_MMR_Key_developments_electricity.pdf

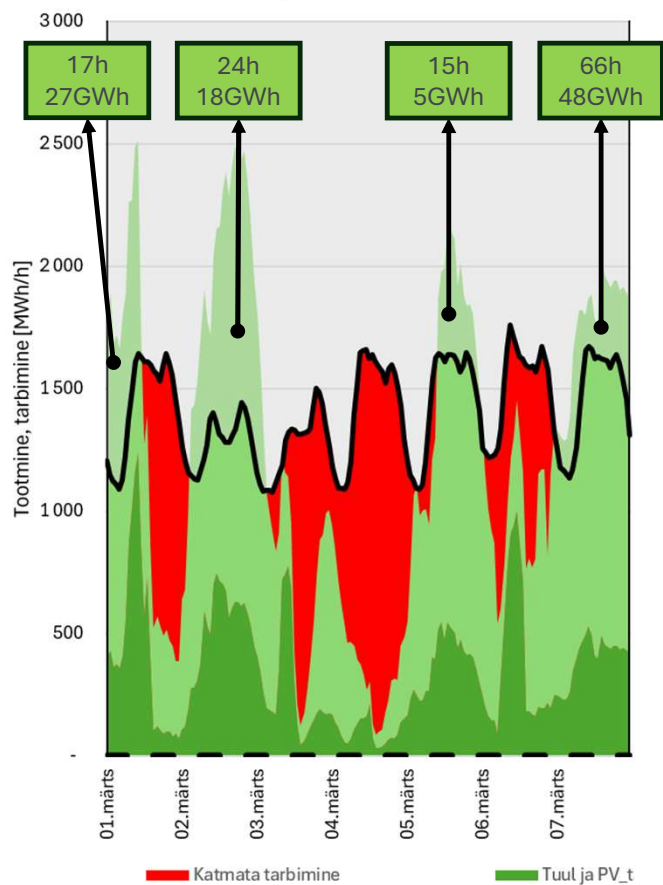
Installeeritud päikese- ja tuulevõimsused (Soome + Baltimaad)



Allikas: ENTSO-e

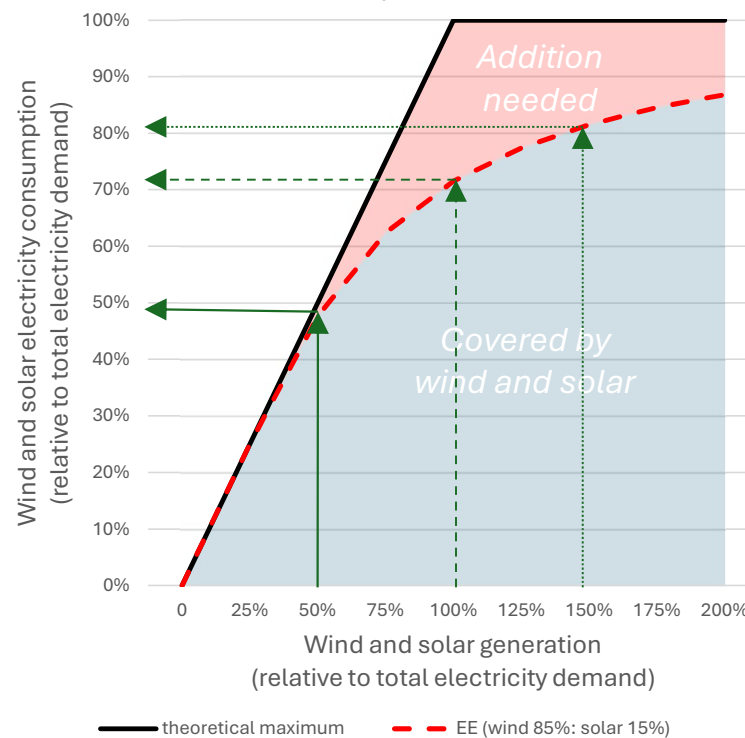
Taastuvenergia võimekus piiratud

Kronoloogiline, näidisnädal



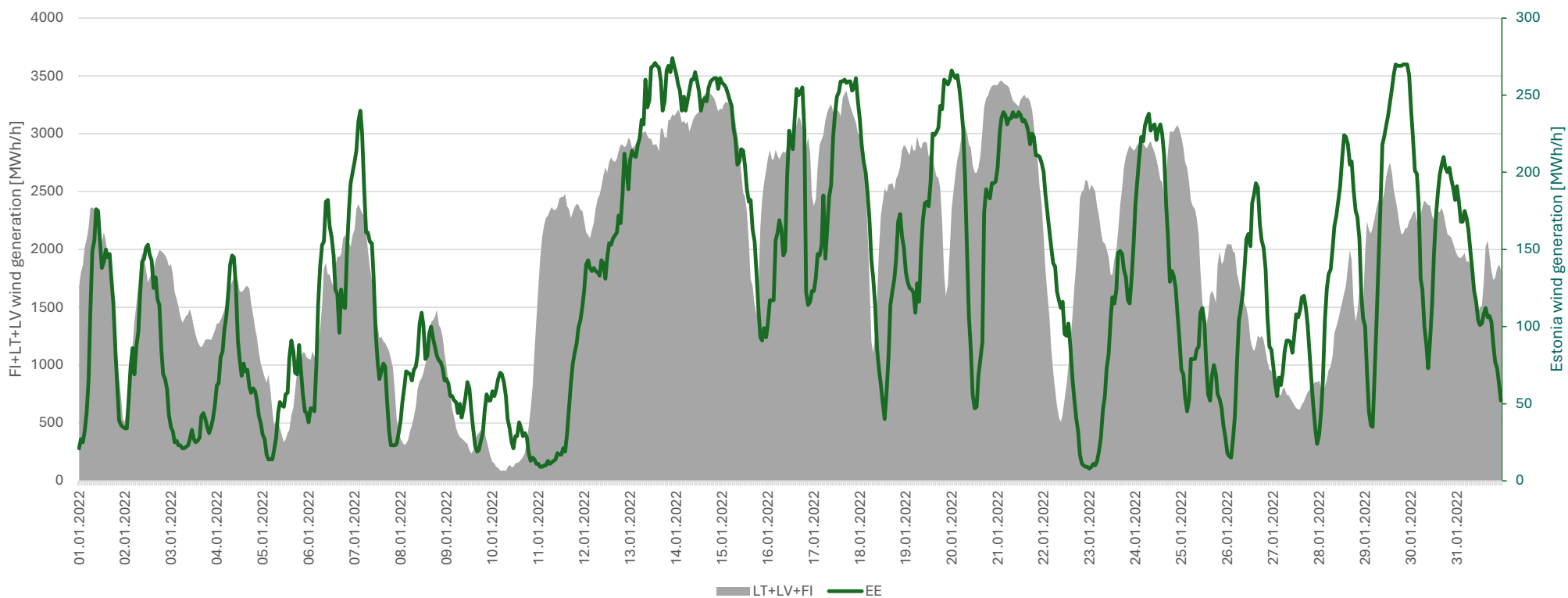
! Väljakutse: kahanev “kasutatavustegur”

Weather dependent generation will not meet our consumption needs



Naabrid pigem võimendavad probleemi

Neighbors can't help: due to geographical correlation of wind generation

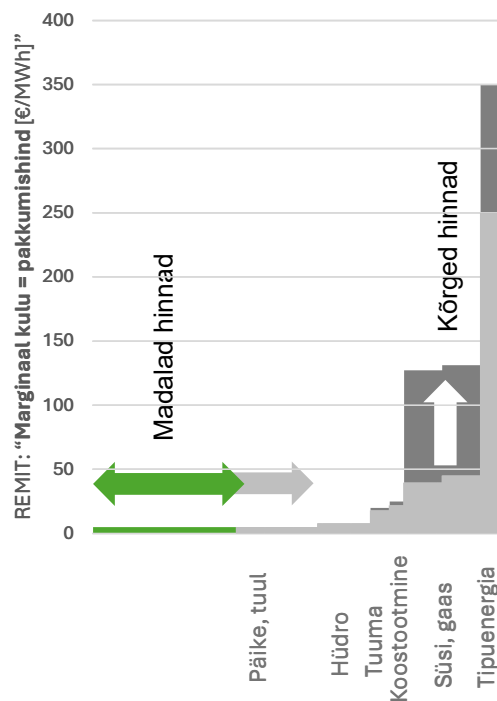


TAASTUVENERGIA ARENG JA TIPUHINDADE KASV TÕSTAVAD HINNAVOLATIILSUST

Pakkumiskõverad 2019 vs
2024

■ 2020 ■ 2024 päike ■ 2020 ■ 2024 kütus, CO2

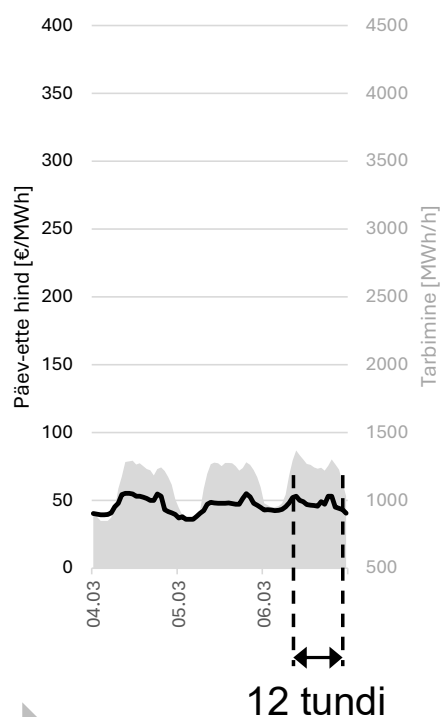
NB! Pakkumine ei tohi sisaldada kapitalikulusid



Juhitavus

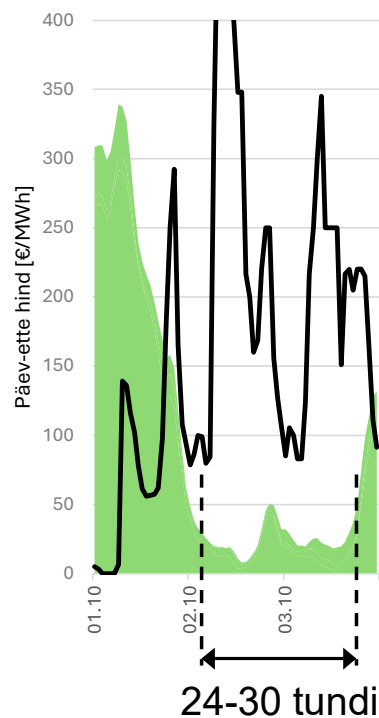
2019 hinnamuster
hind=f(tarbimine)

■ Tarbimine
— Päev-ette hind, Eesti [€/MWh]



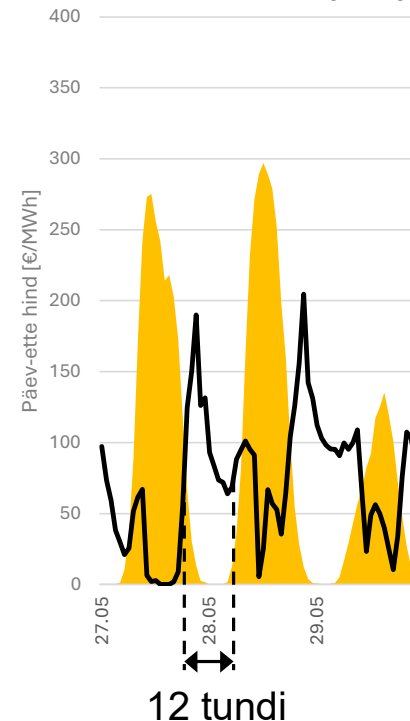
2024 sügis-talv
hind=f(tuuleenergia)

■ Tuule toodang
— Päev-ette hind, Eesti [€/MWh]



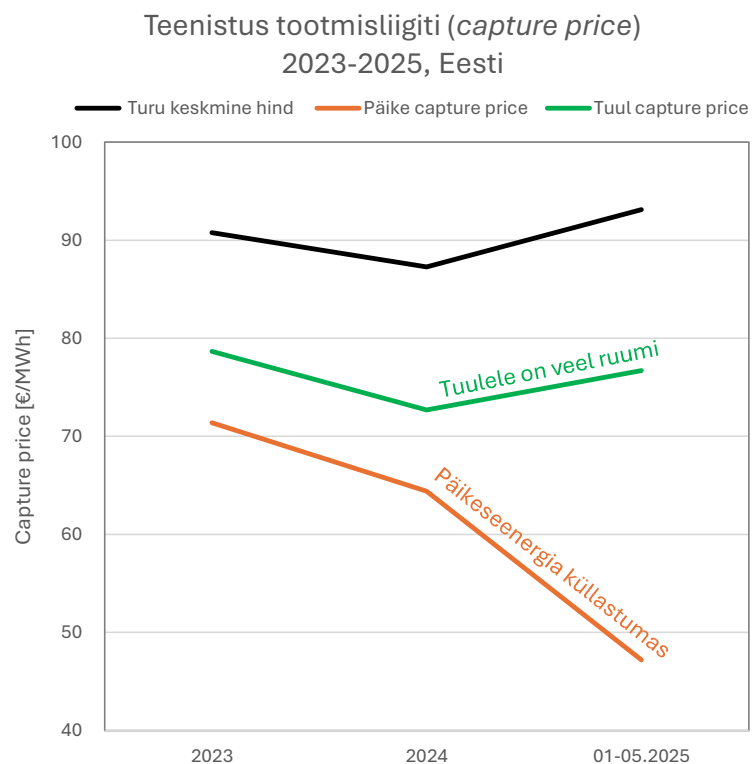
Kevad-suvi 2025:
hind=f(päikesenergia)

■ Päikesenergia toodang
— Päev-ette hind, Eesti [€/MWh]

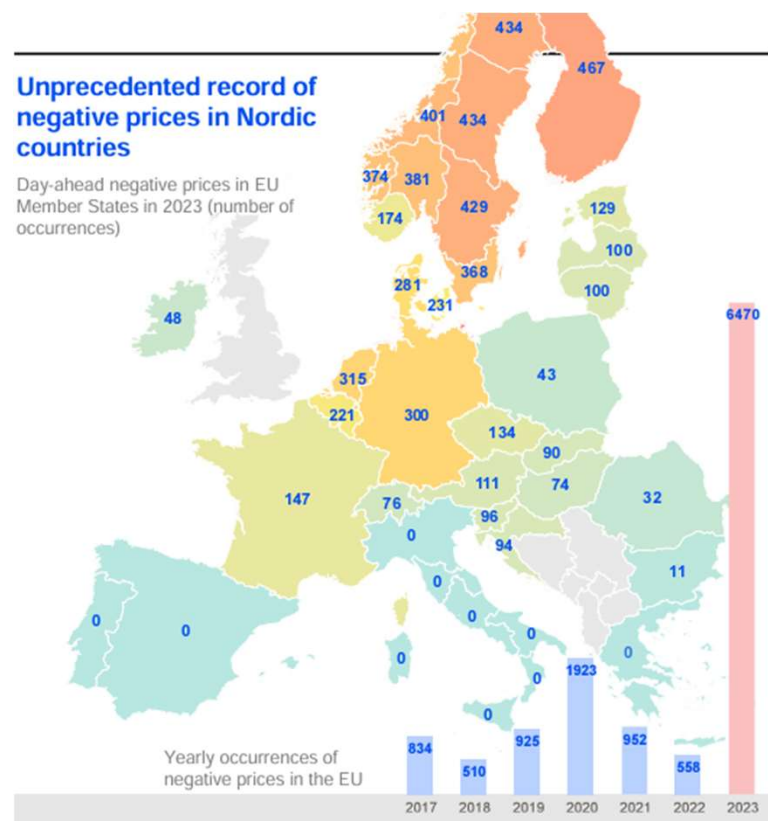


Tarbimine ja päike sobituvad 12h salvestusega, tuul 24-30h salvestiga.

Taastuvenergia arengul ka majanduslikud piirid



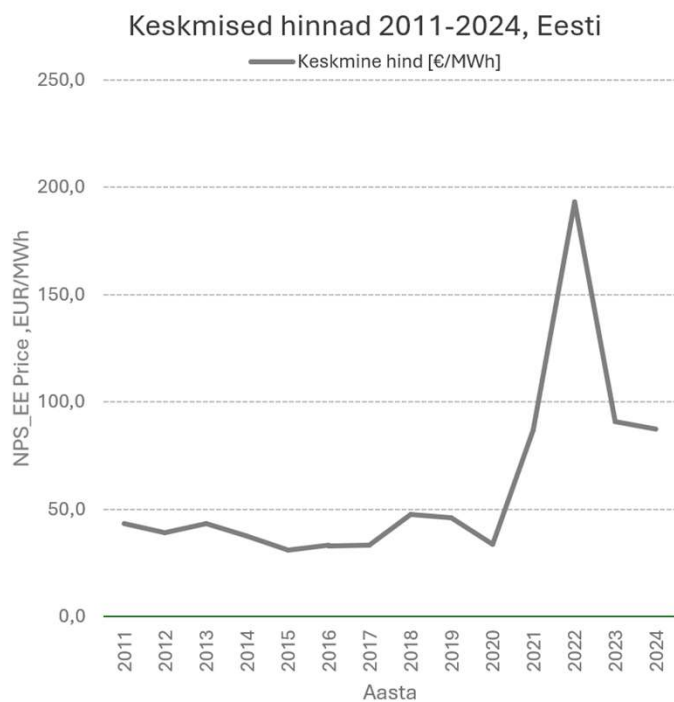
Algallikas: Elering, <https://dashboard.elering.ee/et>



https://www.acer.europa.eu/sites/default/files/documents/Publications/ACER_2024_MMR_Key_developments_electricity.pdf

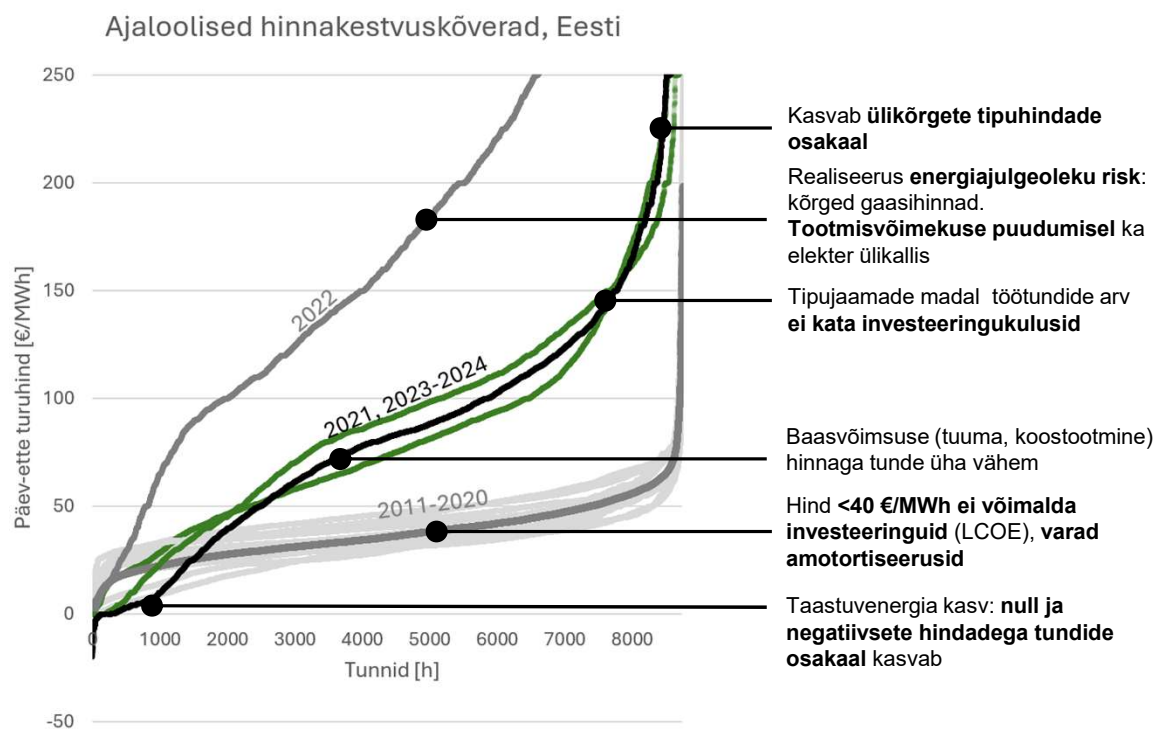
Taastuenergia areng üksi ei vabasta gaasi sõltuvusest Pigem vastupidi...

2022 energiakriisis realiseerusid energiajulgeoleku riskid



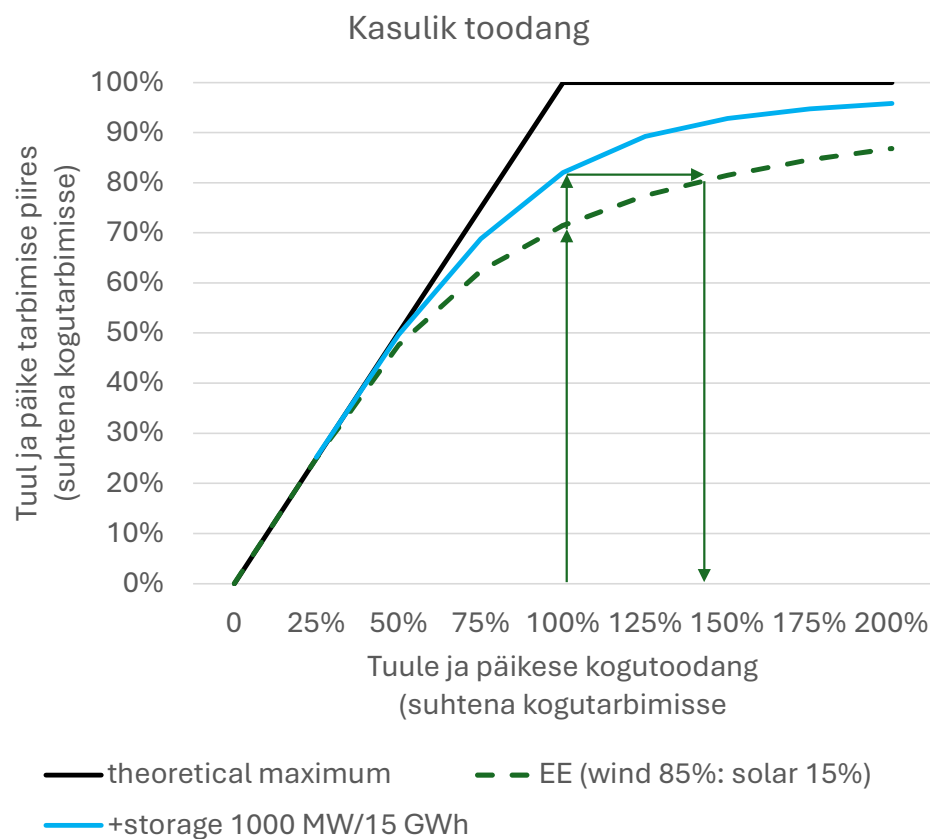
Allikas: Elering, <https://dashboard.elering.ee/et>

Näeme üha enam soodsaid tunde, paraku tipuhinnad isegi kõrgemad

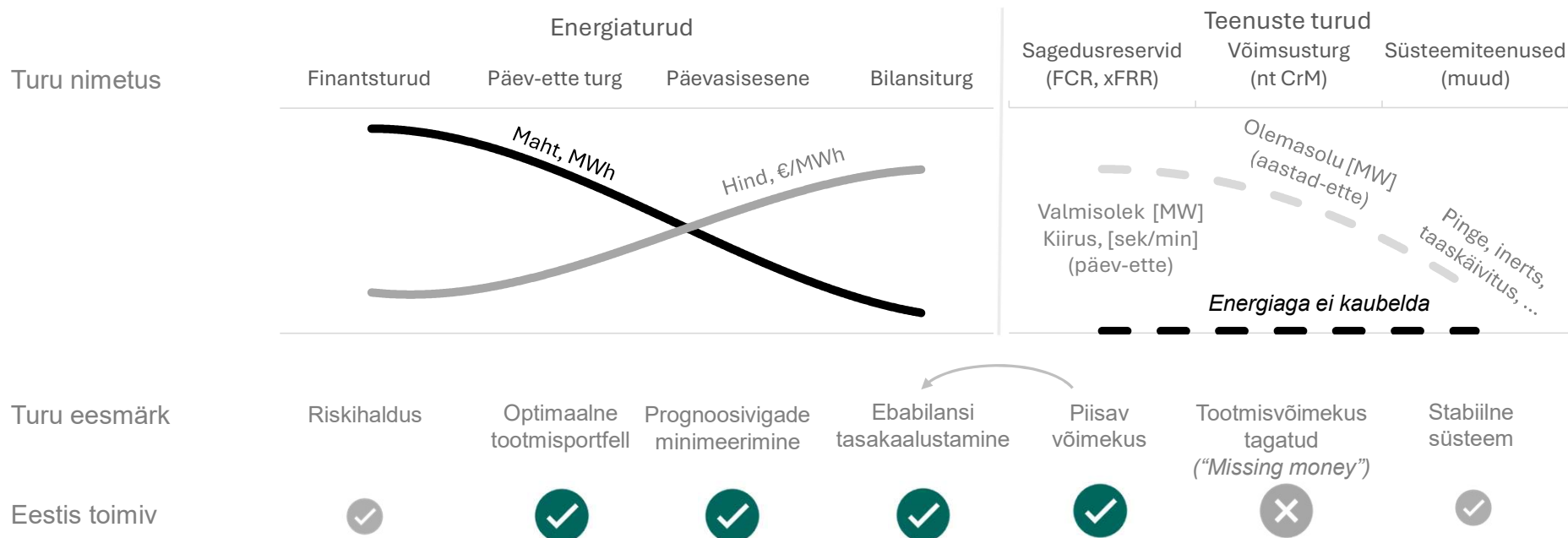


Allikas: Elering, <https://dashboard.elering.ee/et>

Salvestus: järgmine paratamatu etapp energeetikas Poole madalam sõltuvus gaasist



Päev-ette turg on ainult osa kogu süsteemist

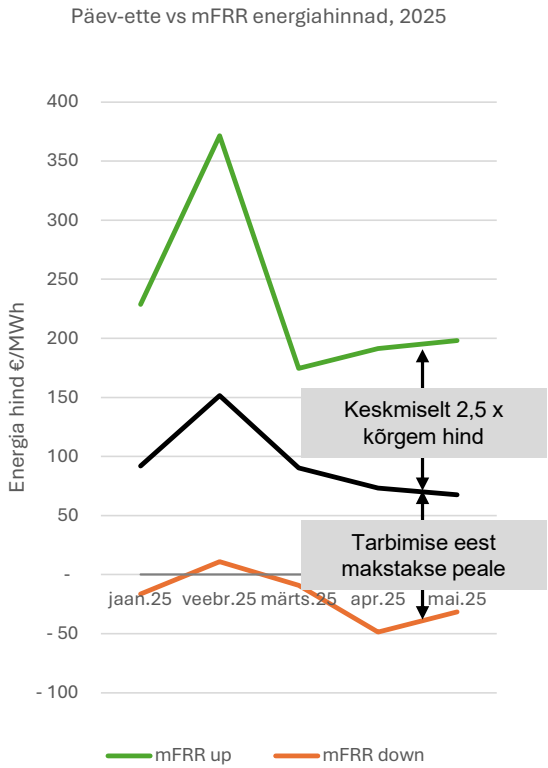


Juhitavus muutub üha väärtuslikumaks



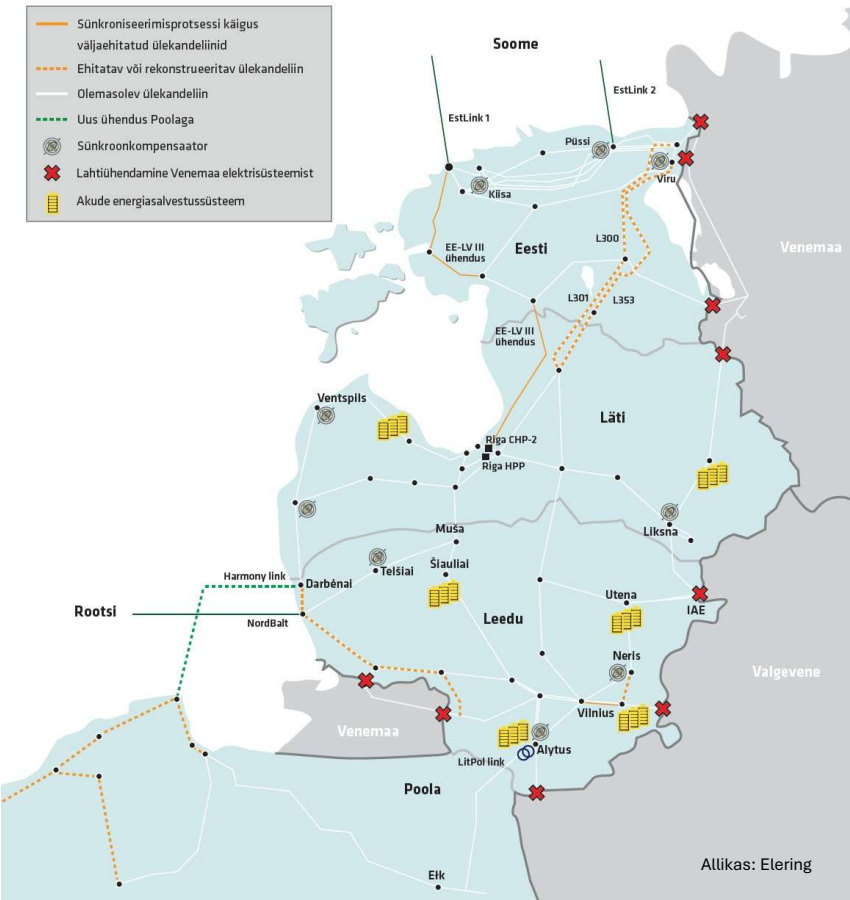
Reguleerimisturu hinnad on oluliselt volatiilsemad

Desünkroniseerimine eeldab kohalikke reservvõimsusi (Baltikum on väike)



Allikas: <https://baltic.transparency-dashboard.eu/>

		Baltikum 02-05.2025	Baltikum 2030 (ISO-de prognoos)	Soome 2023	Soome 2024	Soome 2025
Kogused [MW/h]						
FCR	MW/h	25	25	45	60	83
aFRR up	MW/h	72	192	47	51	61
aFRR down	MW/h	67	192	38	52	65
mFRR up	MW/h	690	1445	184	265	282
mFRR down	MW/h	469	1187	200	405	548
Up_kokku	MW/h	787	1662	276	376	426
Down_kokku	MW/h	561	1404	283	517	696
Hinnad [€/MW*h]						
FCR	€/MW*h	113		47	46	23
aFRR up	€/MW*h	56		41	26	22
aFRR down	€/MW*h	320		29	23	14
mFRR up	€/MW*h	53		15	11	8
mFRR down	€/MW*h	53		17	15	20
Up_kaalutud keskmine hind	€/MW*h	53		21	15	11
Down_kaalutud keskmine hind	€/MW*h	85		20	17	18

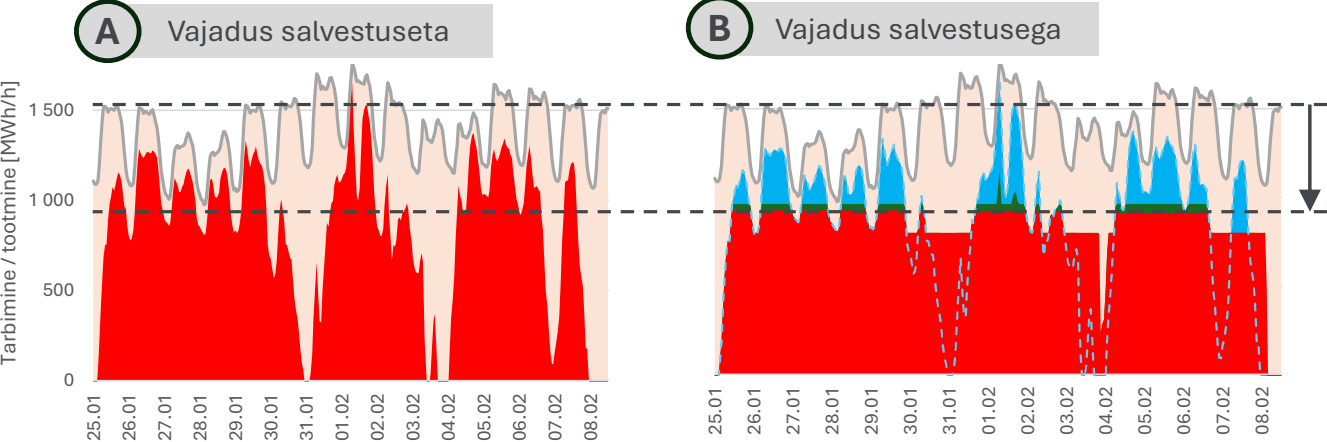
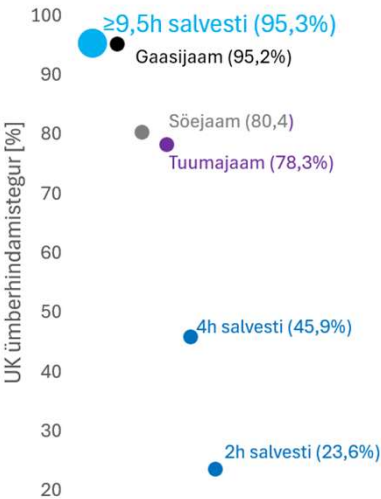
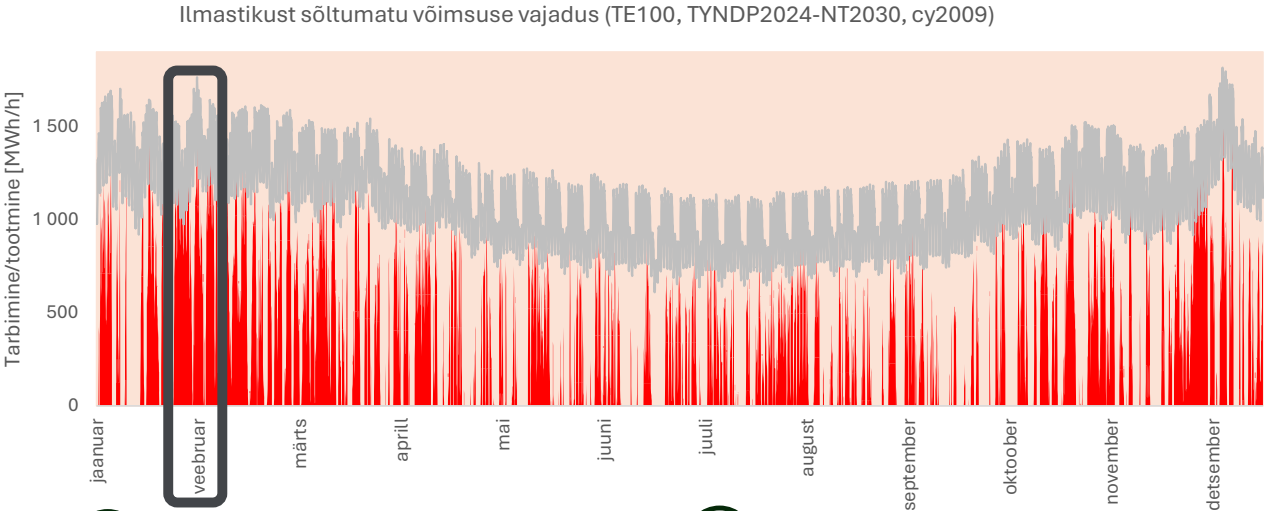


Salvestus vähendab juhitavate jaamde vajadust

Kallis asi peab palju töötama, et end tagasi teenida! Kui tööd ei ole, tuleb vajadus minimeerida!



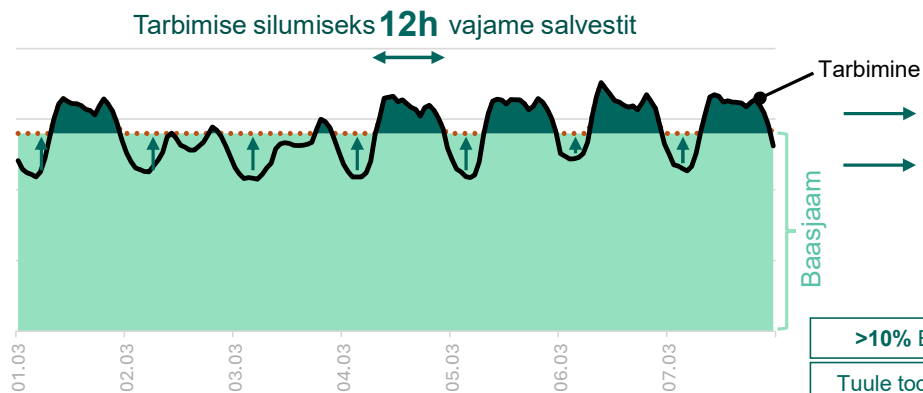
nationalgridESO



- C**
- Vajadus väheneb ca 30%
 - Efektiivne → madalam kulu
 - Puhas → tulevikukindel
 - Sobitub baaskoormusega

Miks vajame pikaajalist salvestust, kuidas see aitab?

Salvesti + baasvõimsus



- Tipujaamade vajadus ↓
- Baasjaama kasutus ↑
- Sõltuvus importkütustest ↓

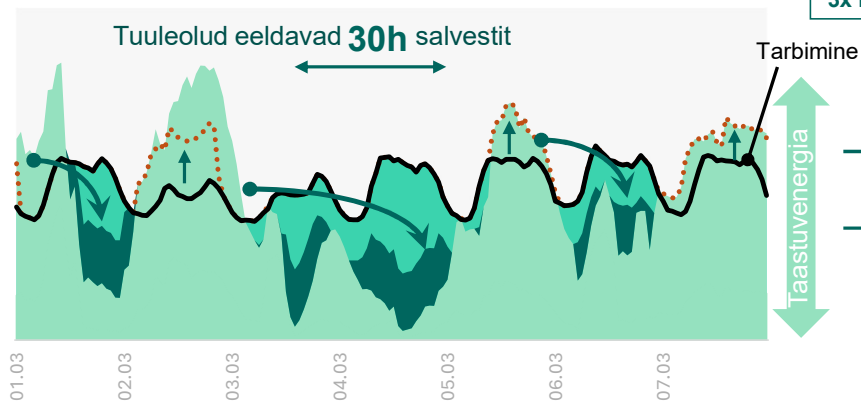
>10% Eesti tarbimisest
Tuule toodang Eestis 2024
130 mln €/a gaasi ja kvooti
3x Eesti biogaasi potentsiaal

=

...1,2 TWh/a

...500 MW

Salvesti + taastuvenergia



- Taastuvenergia kasutus ↑
- Sõltuvus importkütustest ↓
- Tipujaamade vajadus ↓

Energiasalv ≈ Estlink 3
(ENTSO-e, TYNDP2024)

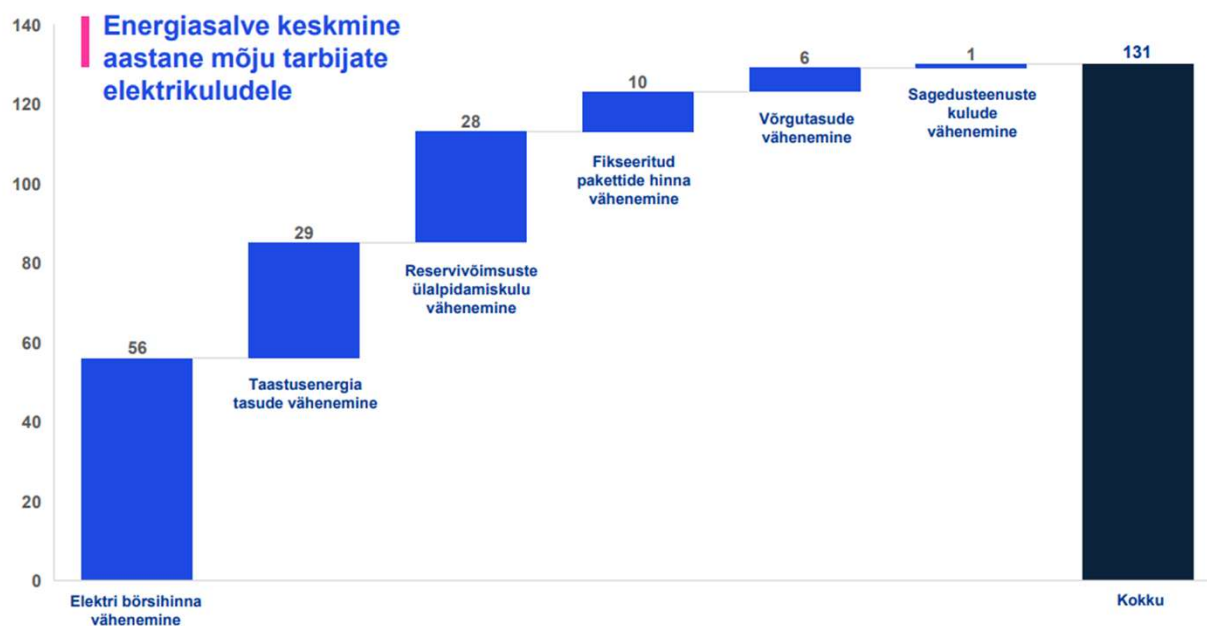
Rohetiger
Energia teekaart

UK, Poola
arvestustegurid

EESTI TARBIJATE ELEKTRIKULUD VÄHENEVAD 131M€ AASTAS

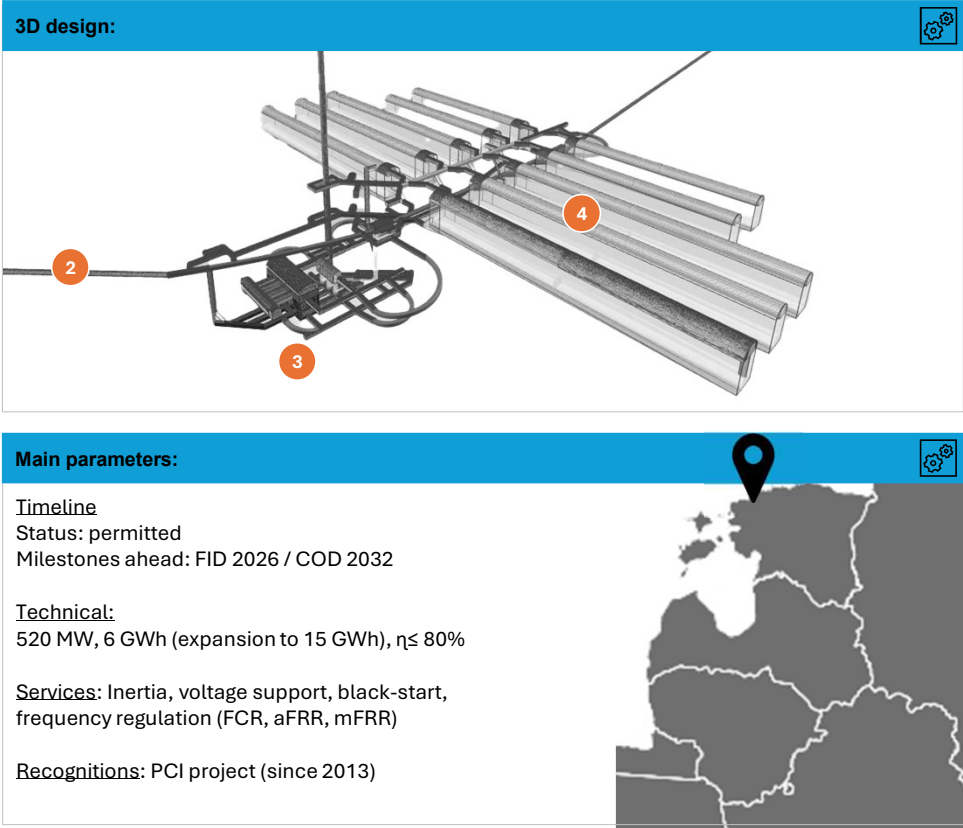
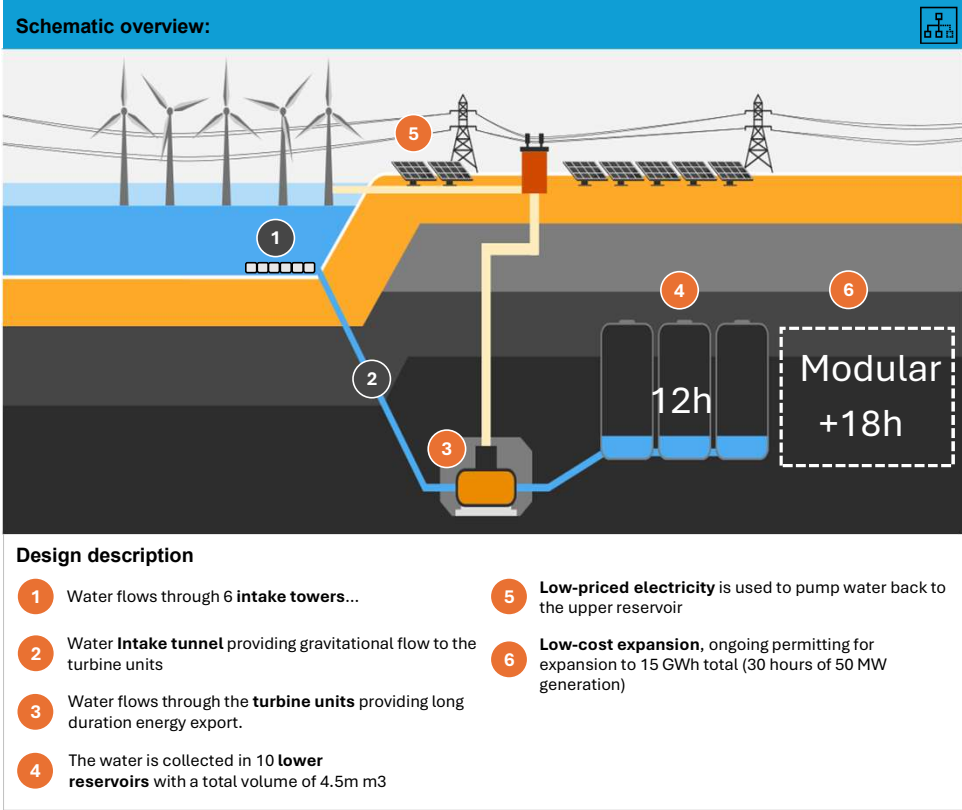


Energeetika – tarbijate elektrikulud



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Energiasalv on planeeritud arvestades Baltimaade vajadusi



Zero Terrain relies on the Traditional PHS technology

The upper reservoir is on the ground surface compared with a lower reservoir of a conventional PHS

The powerhouse is underground – as with most large-scale PSH

A lower reservoir is excavated underground which makes it modular

The solution can be built anywhere with reasonable geology as with most large-scale PHS



*Paldiski, Eesti –
Energiasalve pilootprojekti asukoht.*