Finland's strong growth in Fossil free power generation – The Why’s and How’s

Harald v. Heyden & Justin Fitzhugh

16th of November 2023

ARCTIC

Arctic Securities' Renewable Energy core team brings extensive sector experience

Harald von Heyden

Head of Energy & Infrastructure, Oslo

- >20 years of experience in power, energy trading and renewables
- BSc in Management Science from Warwick Business school; MPhil in Management from Cambridge University

McKinsey & Company · axpo · agder energi · VATTENFALL · Statkraft

Justin FitzHugh

Energy & Infrastructure, Oslo

- >20 years in corporate finance/M&A/project finance specializing in renewable energy
- MSc in Energy Policy (with Distinction) from Imperial College London

J.P.Morgan · AFRY · AUGUSTA & CO

Anton von Rotenhan

Energy & Infrastructure, Hamburg

- 20+ years experience within the power and renewables sector
- BSc from Wharton and MBA from INSEAD

COMMERZBANK · Rothschild & Co

Tom Bernhardsen

Energy & Infrastructure, Oslo/London

- 20 years corporate finance experience within ECM, DCM and M&A in the energy and renewables space
- Significant ECM, DCM and M&A experience

Goldman Sachs · CREDIT SUISSE

veyt

Market intelligence company with focus on the renewable energy market for certificates

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Philip Frøyland

Energy & Infrastructure, Oslo

- 18 years experience within commercial and investment banking
- BSc in Commerce from the University of Sydney; MSc in Shipping, Trade & Finance from CASS Business School

DZ BANK · slb

Carl Fredrik Stange

Energy & Infrastructure, Oslo

- 10 years experience within investment banking
- BSc in Commerce from Sauder Business School; MSc in Corporate Finance from CASS Business School

SEB

Edda Bergsli Bogen

Energy & Infrastructure, Oslo

- 5 years experience in investment banking within renewables/infrastructure
- BSc in Economics from Toulouse School of Economics; MSc in Advanced Economics and Finance from CBS

DNB

Simen Jevne Arnesen

Energy & Infrastructure, Oslo

- 4 years from management consulting and investment banking
- Holds a MSc in Financial Economics from Norwegian School of Economics (NHH)

pwc strategy&

cleanworld

Independent broker firm with core business within green certificates related to production and consumption of renewable energy

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Case Study – Tuulialfa Oy

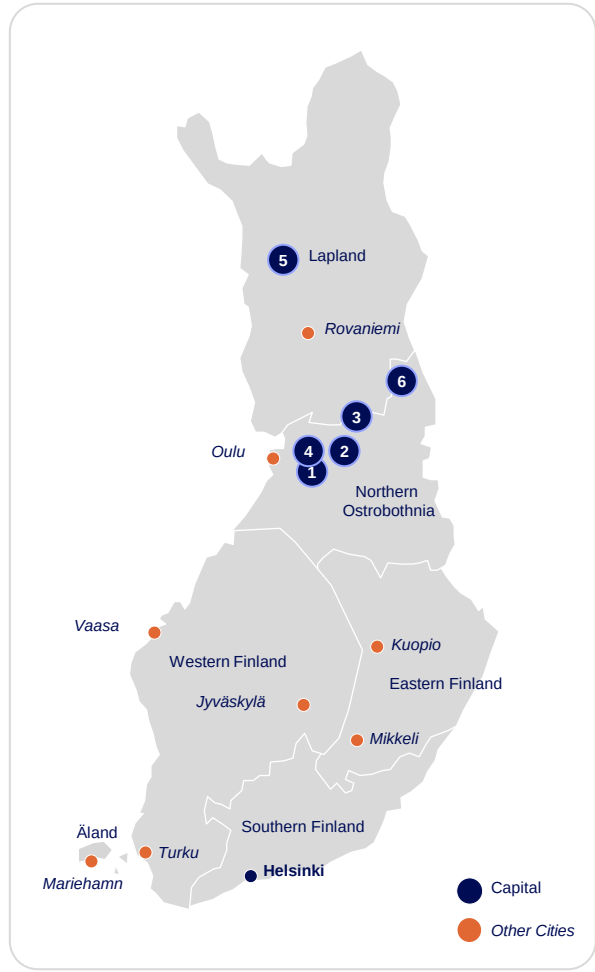
Development agreement of c. 1,200 MW onshore wind portfolio in Finland

Transaction summary

- Arctic acted as exclusive financial advisor to Tuulialfa Oy on the signing of a joint development agreement with OX2 AB in relation to a c. 1,200 megawatts onshore wind portfolio in Finland
- The portfolio covers six projects with a total installed capacity of c. 1,2000 MW and 150 WTG's in Northern Ostrobothnia and Lapland
  - The projects are located in Utajärvi, Pudasjärvi, Oulu, Kittilä and Kuusamo
- Tuulialfa will be responsible for the development of the projects and OX2 for the financing, procurement, construction and operation of the projects
- The projects are expected to be reach FID between 2025 and 2028
- The parties are already working together in developing the Turkkiselä project in Vaala

Portfolio details

	Project information		
	Project	**WTG #**	**Projected capacity MW**
1	Tynnyrikorpi	37	296
2	Aittovaara	29	232
3	Uolevinsuo	20	160
4	Mustasuo	45	376
5	Tuohivaara	6	48
6	Matkavaara	6	48
	Total	**147**	**1,160**



Case Study – Renewable Power Capital

Senior secured EUR 142.5 million construction bridge loan

Renewable Power Capital

Transaction summary

- Arctic Securities AS acted as financial advisor to Renewable Power Capital on its successful acquisition and financing of Greenstat a 154MW ready-to-build onshore wind portfolio in Finland from OX2
- The portfolio consists of 28 x GE158 5.5MW turbines with COD expected in January 2023
- Acquisition closed in January 2021 for an announced consideration of EUR 245 million
- Financing closed in May 2021
  - RPC required a short-term facility to partly fund construction, improve returns, and allow time to optimize the long-term contracting and financing for the projects
  - Kommunalkredit Austria AG, a specialist infrastructure and energy lender, acted as lead arranger on the facility
  - Facility is believed to be the most highly levered non-recourse loan provided against full merchant exposure in the Nordic wind market

Key debt terms

Type
Construction financing bridge loan

Equity support
None, fully non-recourse to sponsor

Gearing on EV
In excess of 60%

Offtaker
None/Full merchant risk

Maturity
COD + max 3 years, bullet

Refinancing strategy
Long-term debt

Article in Finansavisen

Finland leder – Norge stagnerer

Det grønne skiftet krever enorme mengder ny kraftproduksjon. Norge sakker akterut mens våre løsningsorienterte finske naboer er verdensledende, skriver Harald von Heyden i Arctic Securities.

Publisert 22. mai 2023 kl. 14.54 Lesetid: 3 minutter

BEST I NORDEN, KANSKJE I VERDEN: Finland bygger sin grønne og høyst reelle satsing på erfaring, fremtidsrettet tenking og ikke min... Mer ›

Is Norway stagnating in terms of new power production?

Ser mørkt ut for Norges vindkraftutbygging

(Montel) Manglende konsesjoner og forsag om grunnerenteskatt på vindkraft på and gjør at Volt-analytiker Olav Botnen forventer ite ny vindkraft i Norge før 2030. Han tror høye kostnader gjør at det blir vanskellig å få tilll en vellykket havvindauksjon i 2024.

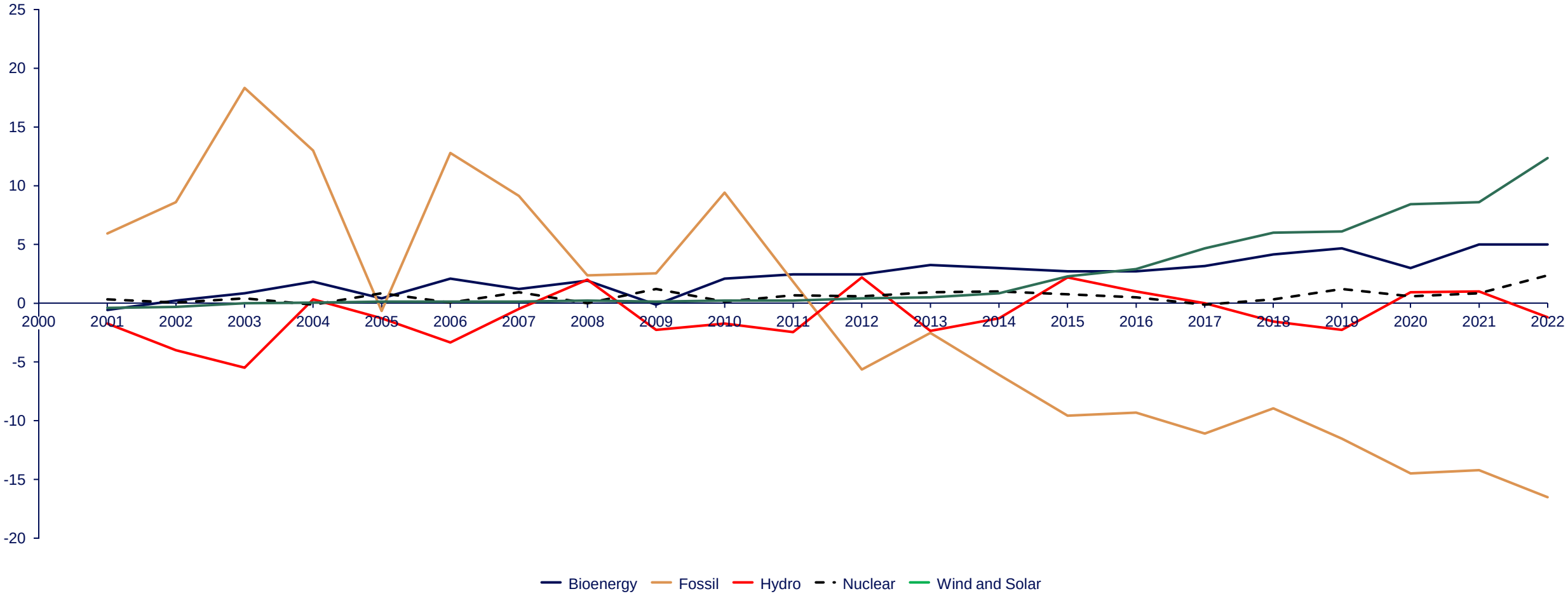
- Både lisens- og skatteproblematikken setter hindringer i veien for storskala vindkraftutbygging på and i Norge nå Men nåvaerende rammebetingelser er ikke hugget i stein. Det er poitiske beslutninger og folkeopinion som kanskje kan snus, sier Botnen ti Montel.
- Men foreløpig ser det reativt mørkt ut for Norges vindkraftutbygging, både på land og til havs. Det bir nok forsinkeser på begge hod, legger han til.
- Volt venter at forbruket i Norge skal øke med 36 TWh til 168 TWh i 2030, som er noen TWh lavere enn tidligere anslag på grunn av begrenset ny kraftproduksjon.
- Regjeringens justerte forslag om 35 prosent grunnrenteskatt på vindkraftverk har møtt sterk kritikk fra flere selskaper. Finske **Taaleri Energia** har ti og med varsllet søksmål.
- Dersom stortingsfertallet justerer ned grunnrenteskatten på landvind vesentig vi det kunne øke produksjonen noen TWh, tror Botnen, men han legger til at konsesjonspollitikken fortsatt er vanskelig.
- Det er granske store vindkraftprosjekter som kan realliseres for eksempel i Finnmark og Hordaland dersom lisenser var tilgjengelig, sier han.
- NVE jobber med en **helhetig plan** for ny kraftproduksjon og nett i Finnmark og har blant annet Davvi vindkraftverk (800 MW) til behandlling. Prosjektet har imidlertid møtt motstand fra reindriften.

Venter havvind etter 2030

- Botnen tror ikke havvind vil kunne bidra med store voumer i Norge før rundt 2033-2034, forutsatt velykkede anbudsrunder senere på 2020-tallet.
- Han påpeker imidlertid at det ligger an til å bli vanskelig å få til en vellykket anbudsrunde med kostnadene som er nå.
- Fere konsortier har sagt at 23 milliarder i støtte er for lite for å bygge ut sørlige Nordsjø II, noe som førte til at Seagust 19. oktober varslet at de **ikke vil levere prekvalifiseringssøknad** likevel. Fornybar Norge har også uttrykt bekymring for om det kommer inn bud i det hele tatt.
- I sum blir det vanskelig å få til i 2024. Det er vanskelig å se for seg noen lønnsom utbygging nå, men forandringer kan skje utover 2020-tallet. Kostnadseksplosjonen kan gå i revers, sier Botnen.
- Han viser til at Eus politikk legger opp til bedre ordninger for de siste årenes problemer i verdikjedene til vindkraft. Forsinkelser har i det siste forårsaket vesentlig dyrere utbygginger, etter renteøkningene som har vaert.

Finland has been on a good energy transition track for over 20 years

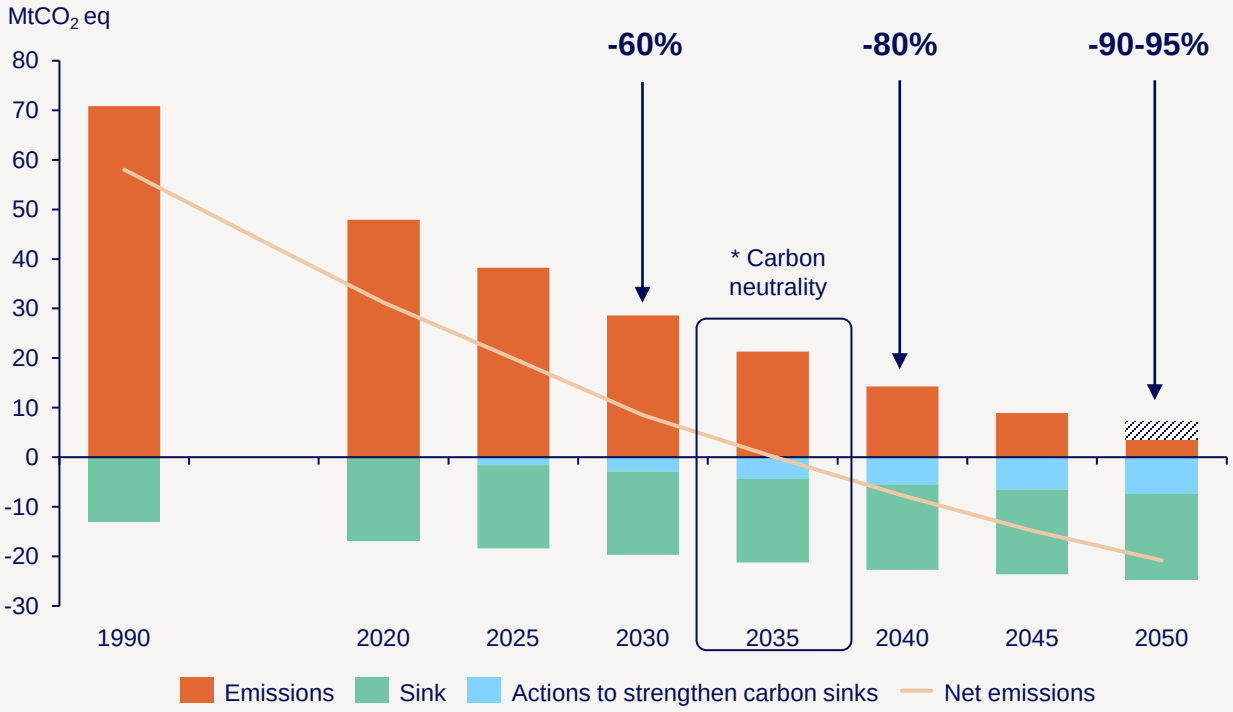
Finland – Evolution of electricity production by source compared with the year 2000 (in TWh)



Source: ember-climate.org

Finland’s ambitious new climate change act set the scene

- **The new Climate Change Act** entered into force in 2022. The Act set emission reductions targets for 2030, 2040 and 2050 and laid down the target of carbon neutrality in 2035.
- **Key pillar of Finland’s climate policy is the Climate Change Act**. The scope of the Act was extended to cover emissions from the land use sector (i.e. Land use, forestry and agriculture) and for the first time the Act includes a target to strengthen carbon sinks.



*Based on the assumption that the carbon sink is -21 Mt CO2 eq in 2035.

20
35

“Finland’s ambitious targets to reach carbon neutrality by 2035 underscore the country’s leadership on climate and energy issues,”

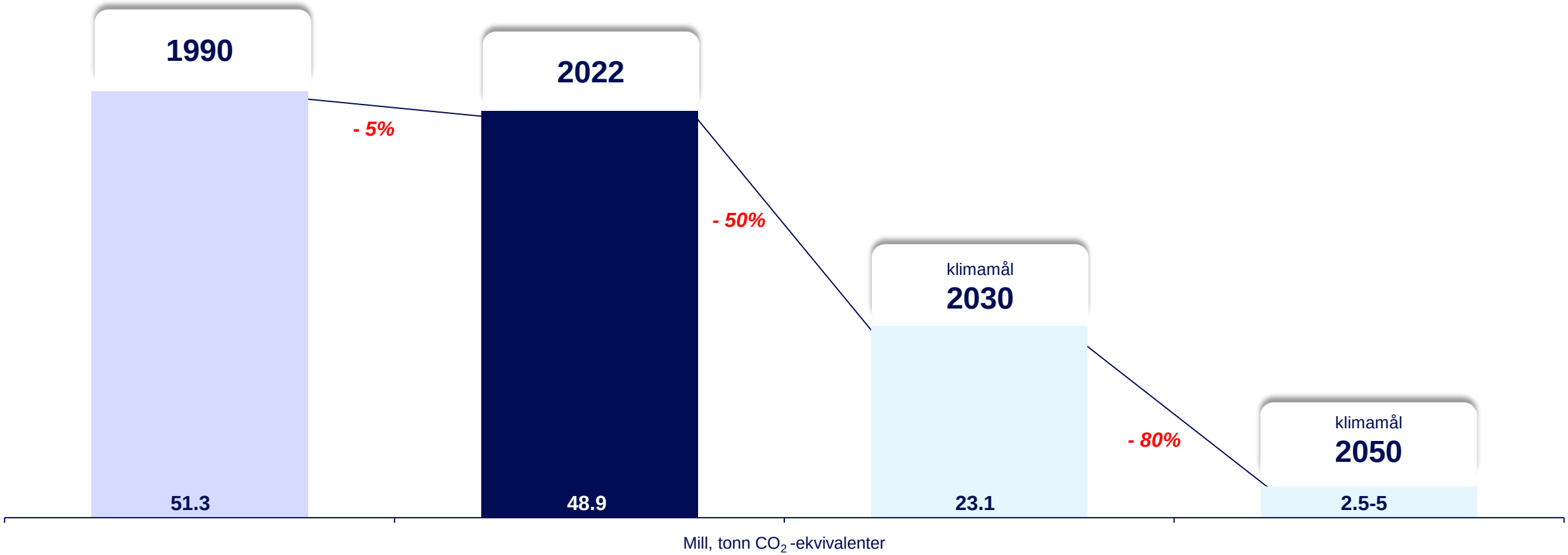
“What we have is basically a market based approach for deployment of wind power with subsidies reserved mainly for new technology demonstration projects and distributed small scale renewables”

IEA Finland Country report. May 2023

Source: Ministry of the environment.

Finland’s 30% emission reduction since 1990 stands in stark contrast to Norway’s track record

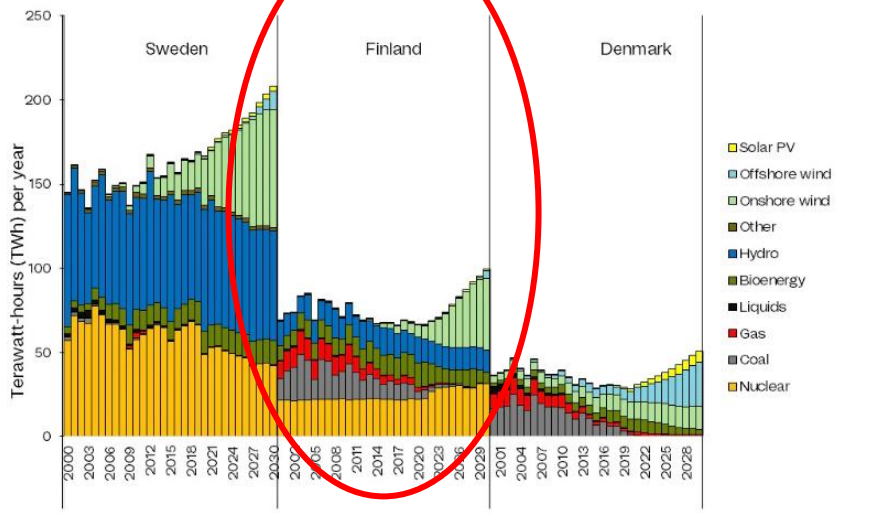
Norway’s historical emission reduction and target’s going forward



Kilde: tilnull.no

Forecasters seem to agree that Finland will add 25-30 TWh of new Renewable production by 2030

Sweden, Finland and Demark power generation mix*



* Rystad Energy Power Solution, 2022

> **Our forecast shows that 25 TWh of new renewable energy will be built in Finland by 2030, which will push down prices,**
>
> **Storm Geo, June 2023**

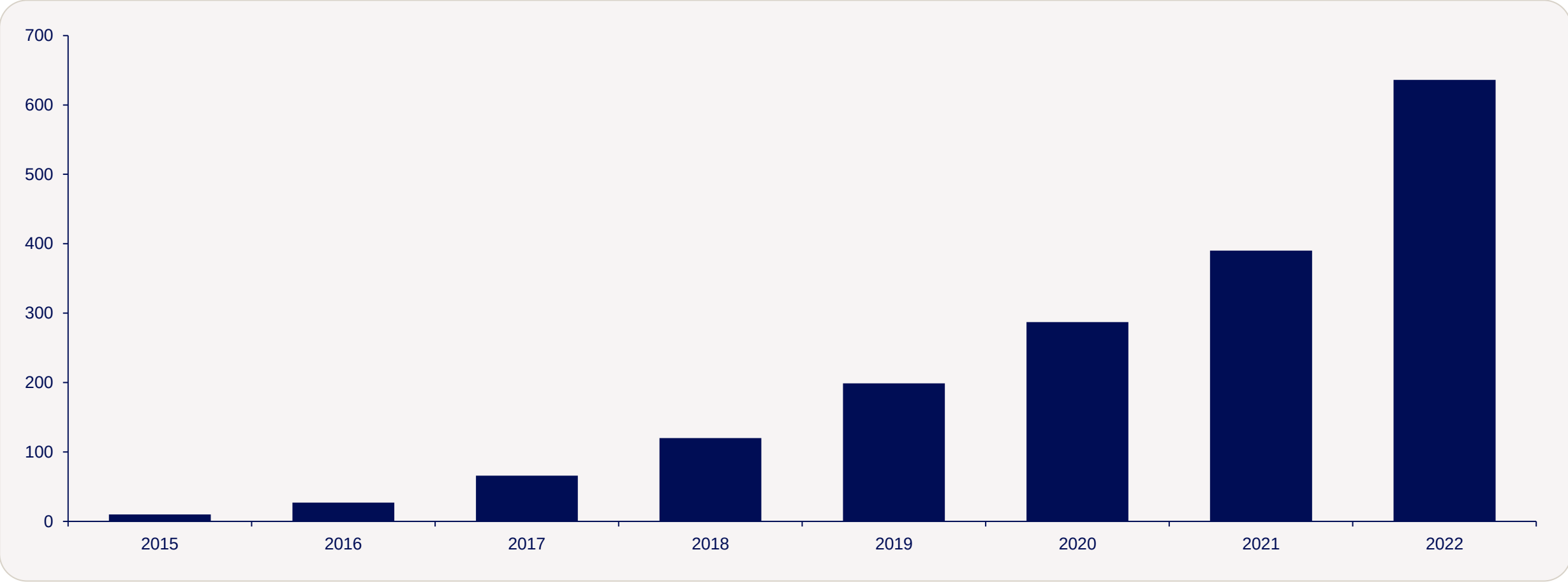
These two forecasters seem to agree that Finland will build around 25-30 TWh of new renewables production before 2030.

Recent developments might adjust this forecast down or up. For example;

- Higher interest rates
- Lower than expected consumption growth
- Delayed construction of new Green industrial initiatives
- Explosive growth of Solar
- Supply chain issues

*Generation data from 2022-2030 is based on Rystad Energy's base case forecast as of November 2022
Source: Rystad Energy Power Solution.

Solar power in Finland - Installed MW



Fingrid: “By 2030, the overall solar power plant capacity in Finland may climb to seven gigawatts”

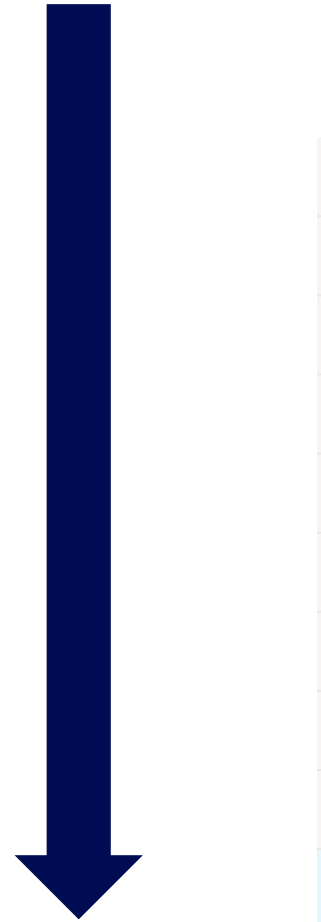
Source: https://energiavirasto.fi/

Onshore pipeline

Finnish Wind Power Association

Onshore wind power projects by numbers

Offshore wind power	MW
0 Identified Project / Pre-Screening	11 093
1 Land use Plan Process Started	16 489
2 Land use Plan Draft	2 581
2 EIA Process Ongoing	18 938
3 Land use Plan Proposal	2 397
3 EIA Done	2 271
4 Land use Plan Done	2 856
5 Fully Permitted	3 069
6 Under Construction	3 405
Total	**63 100**



Source: Finnish Wind power Association

Offshore pipeline – Ahead in terms of regulations, but behind in terms of subsidies

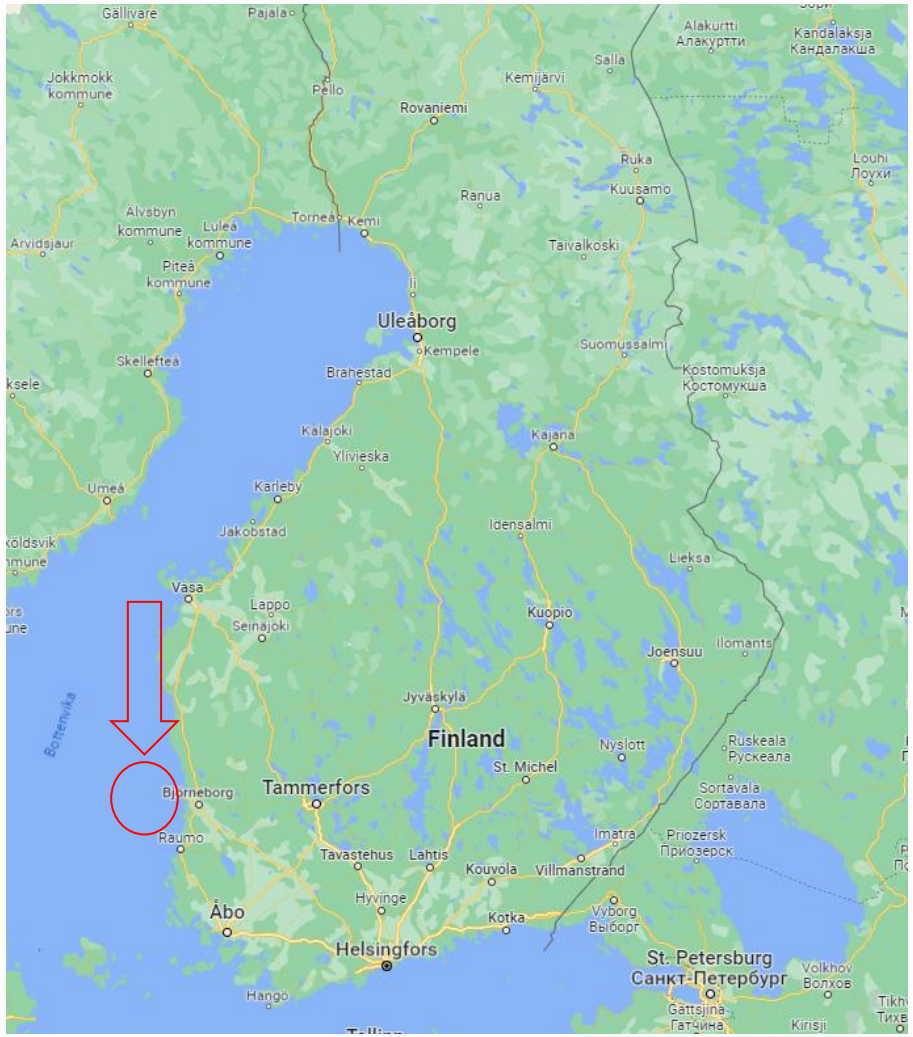
Offshore wind power rojects by numbers

Offshore wind power	MW
0 Identified Project / Pre-Screening	42 960
1 Land use Plan Process Started	1 400
2 Land use Plan Draft	0
2 EIA Process Ongoing	10 792
3 Land use Plan Proposal	0
3 EIA Done	900
4 Land use Plan Done	1 155
5 Fully Permitted	700
6 Under Construction	30
Total	**57 607**

Finland offers no subsidies for offshore windpower. It is first and foremost relying on it's large and advanced onshore pipeline

Source: Finnish Wind power Association

First offshore project of the block: TAHKOLUOTO



Demonstration project

- The wind farm is located 4–22 km off the coast of Pori, in Western Finland. The demonstration project received a grant of 30 million euros from The Ministry of Economic Affairs and Employment in Finland.
- The production of the demonstration has been around 160 GWh/annum.

TAHKOLUOTO offshore wind farm Extension project

- The findings of the demonstration project will be put into use in the full scope of the Tahkoluoto Extension project, which consists initially of forty wind turbines of over 15 megawatts.
- The Extension project was expected to be taken into production in 2027–2028 with a total capacity of between 500–700 MW and an production of between 1.8 and 2.6 TWh.
- 2 days ago, the developer SH announced that it will postpone the investment decision for the extension project until 2026 at the earliest, given the high interest rates and other high cost levels.

Project approvals

- The Environmental Impact Assessment for Tahkoluoto Extension project was carried out in 2020–2021.
- The land use plan was approved by Pori City Council in Nov. 2022.
- Metsähallitus, the state enterprise that manages state-owned lands and waters in Finland, and Suomen Hyötytuuli signed an access right contract by which Metsähallitus leases the public water area off the coast of Pori Tahkoluoto to Suomen Hyötytuuli for wind power production in Jan. 2023. The agreement is the first long-running access right contract for public water area designated for wind power production in Finland.
- The water permit for the Extension project was approved on 30 Oct 2023.

Finland seems to attract green industrial projects

Finland

Arctic leopard

Vast green fuels farm in Northern Lapland - plunged in full darkness 23 hours a day in winter - powered by relentless Arctic winds.

The foundation stone of P2X Solutions' green hydrogen production plant was laid in Harjavalta

20.01.2023

"Today, we are making history in Finnish industry in Harjavalta. Once completed in 2024, P2X Solutions' plant will open the market for Finnish green hydrogen. We believe that the Harjavalta plant is only the first development step in taking Finland to the top of the European hydrogen economy," says **Esa Härmälä**, Chairman of the Board of P2X Solutions.

The 20-megawatt plant based on Power-to-X technology will be able to store renewable electricity as fuel in hydrogen. Hydrogen is produced from water with electrolysis without emissions using wind power, which can be utilized later, further refined or converted back into electricity. The Harjavalta hydrogen plant received an enterprise development grant from the Ministry of Economic Affairs and Employment in Finland in December 2021, as well as venture capital from e.g. the Finnish Climate Fund. P2X Solutions took the investment decision on February 2nd 2022. The total investment is approximately EUR 70 million.

PRESS RELEASE

Prime Capital AG acquires new Renewable Energy projects in Finland and Sweden and establishes a joint venture to build and operate a green hydrogen/e-methane plant in Finland, with a total new power generation capacity of over 1GW

September 27, 2022

Frankfurt, 27th September 2022

- The Prime Green Energy Infrastructure Fund ("PGEIF"), managed by Prime Capital AG, has entered into two major agreements for the acquisition and construction of new Renewable Energy projects in Finland and Sweden
- A joint venture ("JV") with CPC Finland has been established to develop a green hydrogen/e-methane plant with a capacity of up to 200MW close to Kristinestad, Finland, with construction scheduled to start in 2024. CPC Finland will provide 600MW of Renewable Energy projects to the JV
- Secondly, a cluster of three wind farms with a total capacity of 290MW in the municipality of Lycksele, Sweden, has been acquired from RES. Commissioning is scheduled for 2025. Part of the green electricity is planned to be used to power a green power-to-X ("PtX") project in the region
- With these investments, PGEIF is already fully committed well before the end of its investment period, and fundraising for its successor fund PGEIF II is expected to start in the next weeks

Plug Power plans $6 billion hydrogen projects in Finland

Reuters

May 30, 2023 3:36 PM GMT+2 · Updated 5 months ago

Companies

Plug Power Inc — Follow

HELSINKI, May 30 (Reuters) - Plug Power Inc (PLUG.O), a U.S. maker of hydrogen fuel systems, said on Tuesday it aims to build three plants in Finland costing some $6 billion to produce green hydrogen and ammonia for the European market.

The company said it was in talks with potential financial investors and debt providers and aims to find industrial partners to secure offtake for its planned production ahead of a final investment decision in 2025 or 2026.

Plug had spent two years searching around the world for the right locations, CEO Andy Marsh told Reuters on the sidelines of a presentation in Helsinki.

"When you look at the Finnish grid, it's 87% renewable already. That really makes it much simpler and straight-forward to generate green hydrogen," Marsh said.

19 Aug 2023

Wärtsilä to provide FEED for Power-to-X plant in Finland

Wärtsilä will provide the front-end engineering design (FEED) for the liquefaction and storage of liquefied synthetic methane (LSM) plant. The plant is to be built by Koppö Energia Oy, a joint venture company between Germany's Prime Green Energy Infrastructure Fund and CPC Finland Oy, in Kristinestad, Finland. The FEED will be booked by Wärtsilä in Q3, 2023.

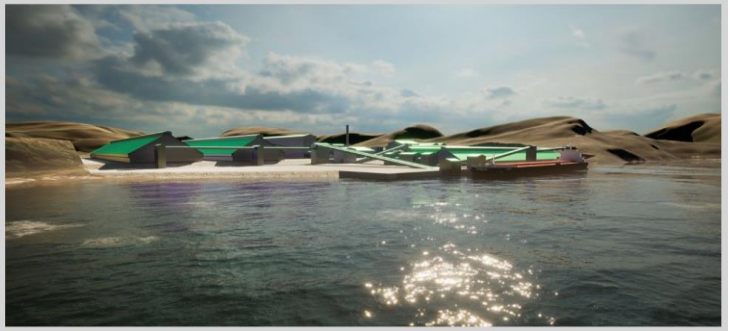
The Power-to-X plant represents a leading Finnish sustainable energy transition project. It will have a capacity of 200 MW and will convert green electricity into H_2 and sustainable LSM. Up to 500 MW of wind and 100 MW of photovoltaic power will be developed under the Koppö Energy Cluster to supply the plant with completely emission-free renewable energy.

Pellet plant

BLASTR Green Steel

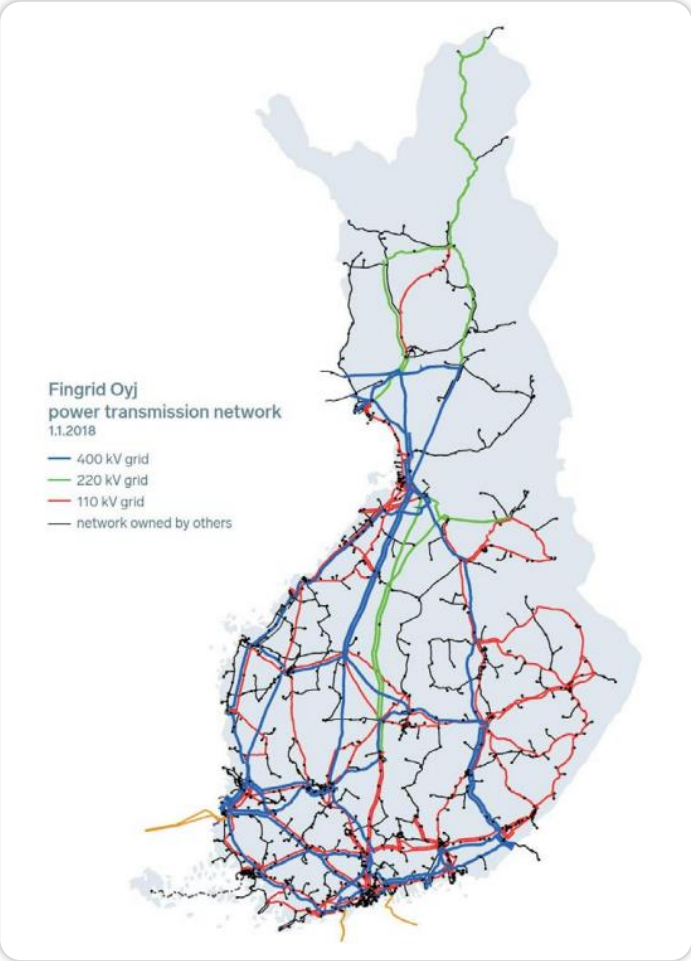
Blastr Green Steel plans to invest in an iron ore pellet plant producing high-quality direct reduction pellets to supply its steel plant in Inkoo, Finland, as well as a significant and growing world market for direct reduction pellets.

Blastr is in the process of exploring alternative locations for the pellet plant in Norway and the United Kingdom.



Why is Finland succeeding in the energy transition where others are not?

Fingrid Power transmission network

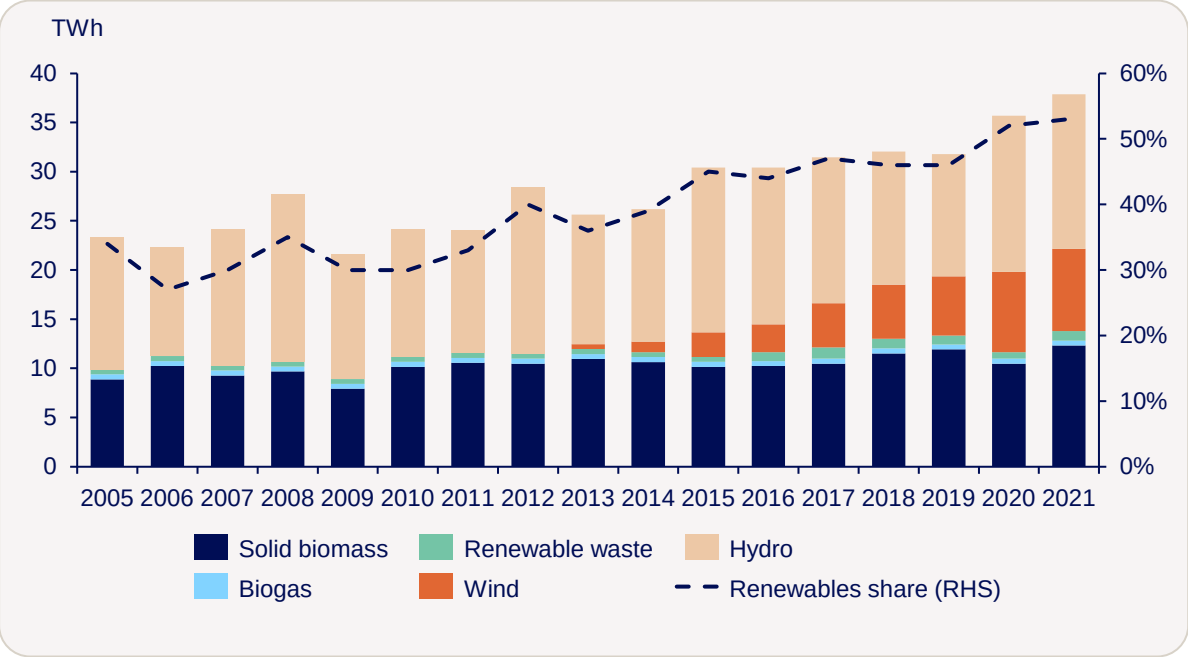


- Culture of self sufficiency (long border with Russia)
- Not putting the cart before the horse, meaning that they believe that reasonably priced and abundant renewable power creates green industries, and not the other way around
- Fewer conflicts with cabin owners or reindeer (but more with the military in the East)
- Well developed grid and grid planning. Fingrid is at the forefront.
- No difficult discussions around “export cables”
- An understanding among the population that “power is important and doesn’t magically appear out of the wall”
- No strong Oil & Gas or Hydropower lobby. Strong nuclear lobby.
- A culture for long term planning and risk sharing (e.g. Mankala principle)
- Few political surprises or 180 degree turns

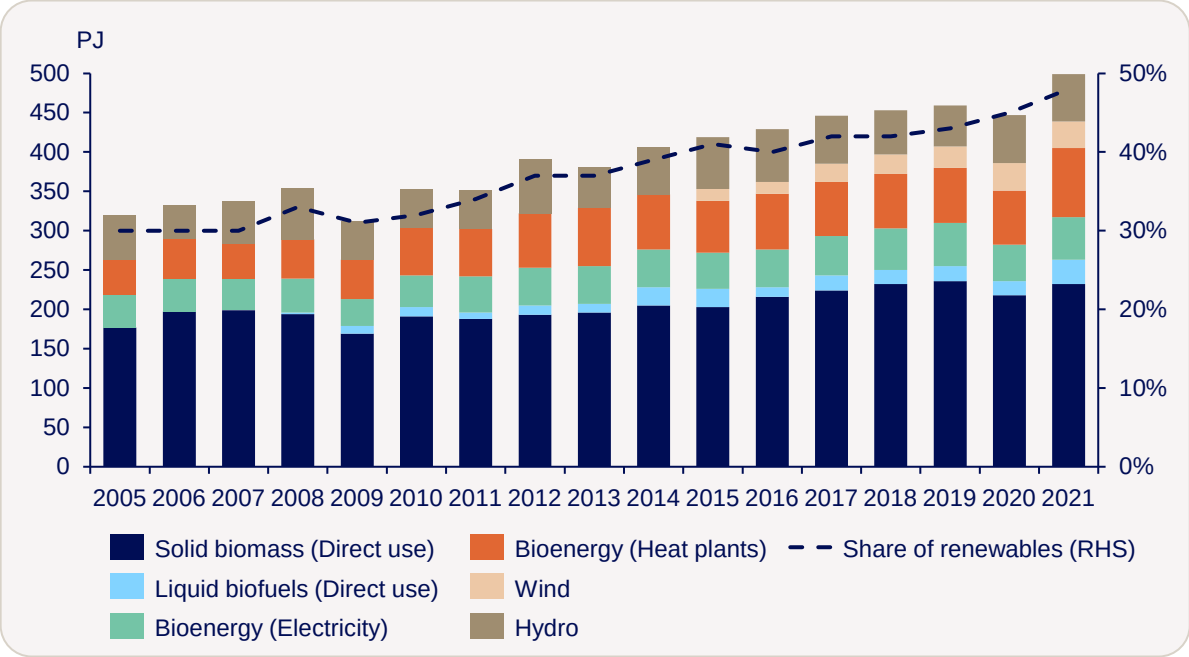
Appendix

Is Finland leading?

Renewable energy in electricity generation in Finland, 2005-2021



Renewable energy in total final consumption in Finland, 2005-2021



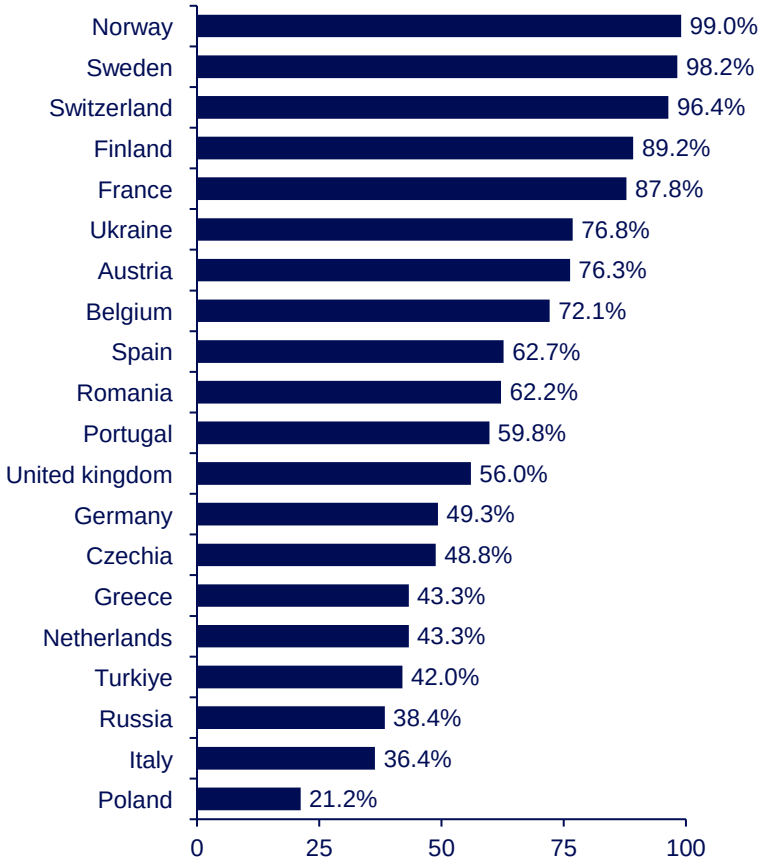
On both of these measures, things have been going slowly but steadily in the right direction

Source: IEA (2022).

Is Finland leading?

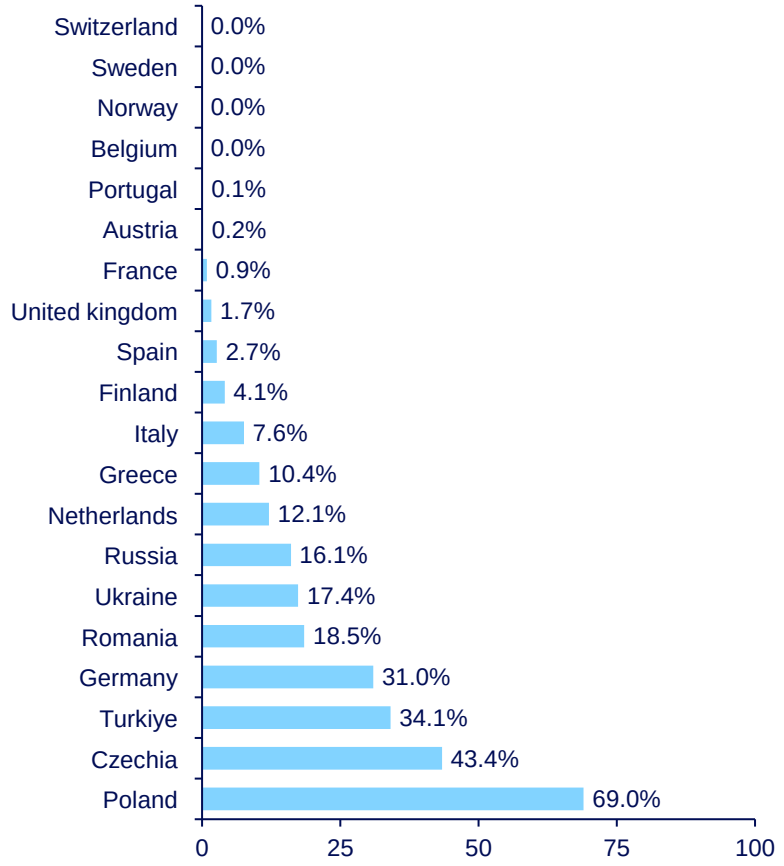
Clean electricity ranking

*Share of electricity production in 2022 (*2021 data)*



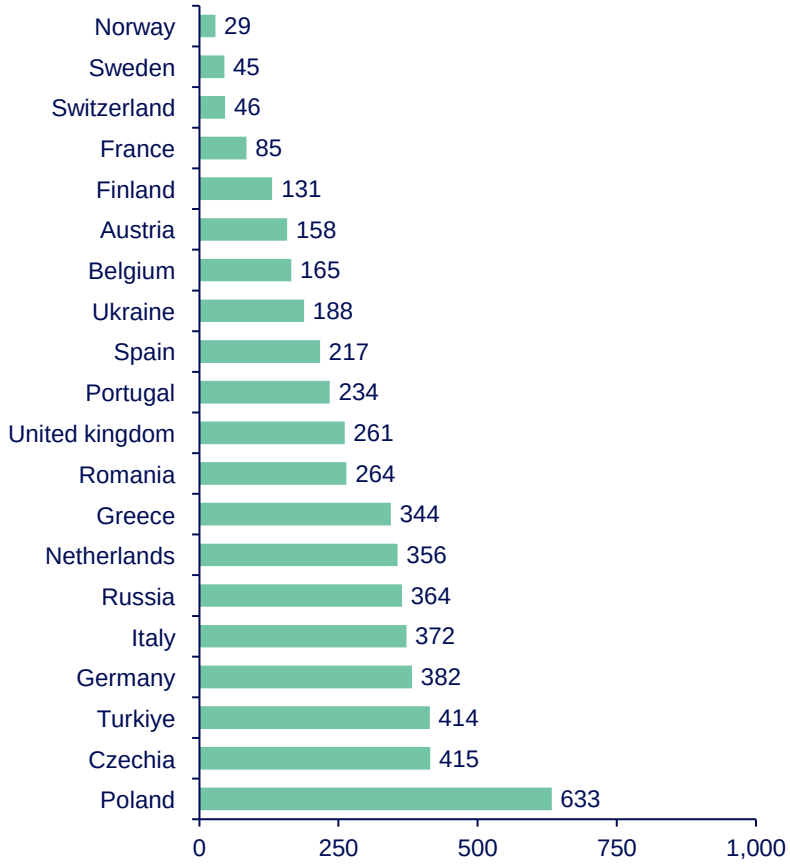
Coal ranking

*Share of electricity production in 2022 (*2021 data)*



Carbon intensity ranking

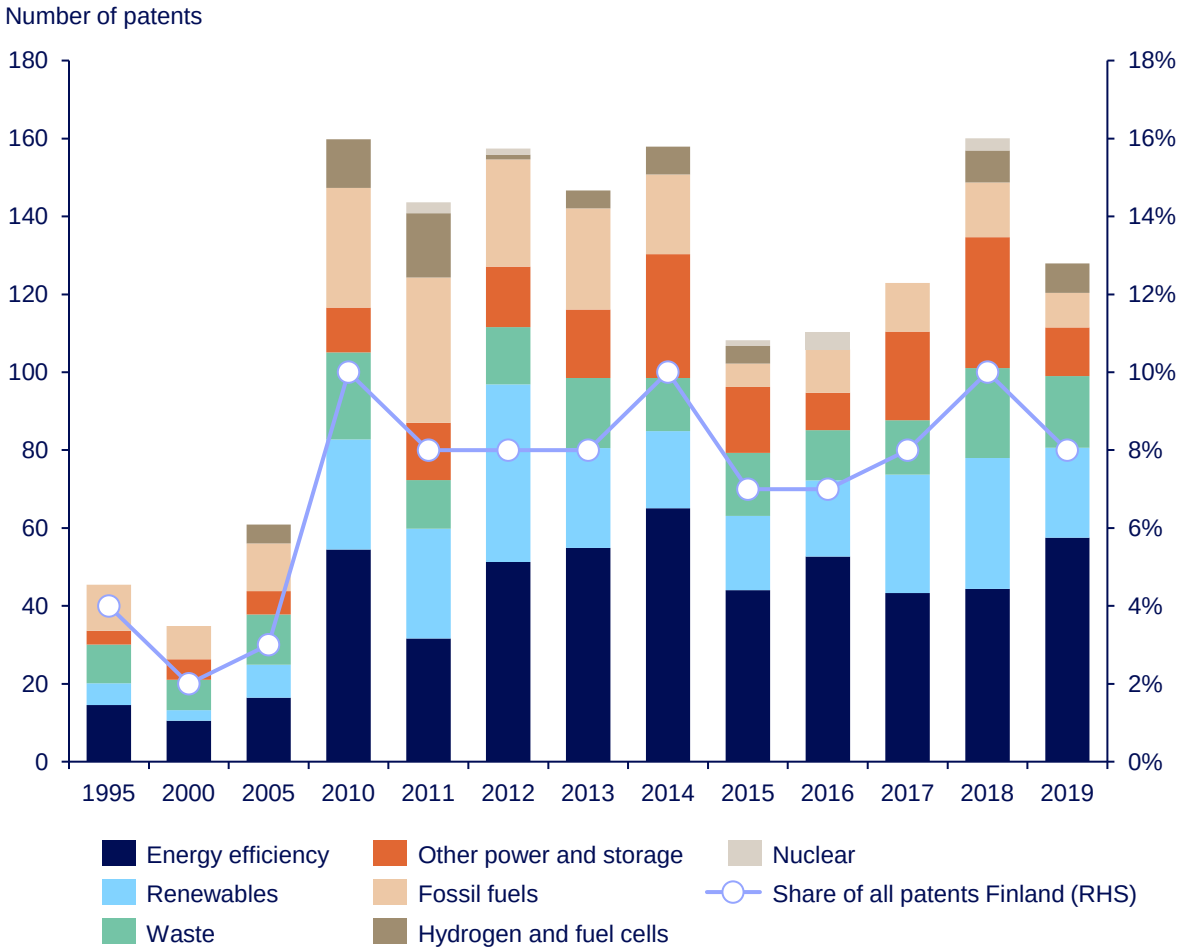
*Emissions intensity of electricity production in 2022, *else 2021 (gCO2eq/KWh)*



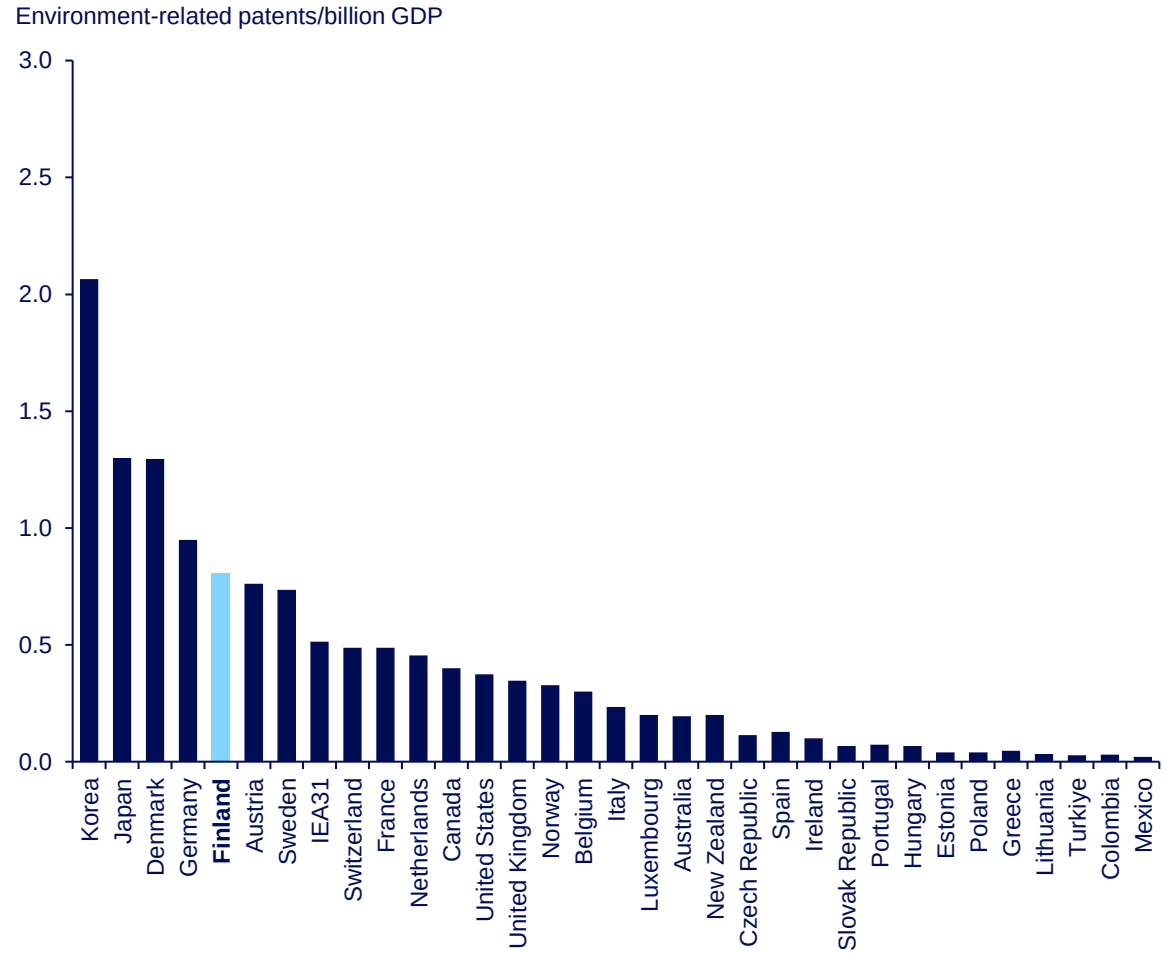
Source: Matti Kahra, Senior Climate Specialist – Nordea.

Finland confirms it’s innovative reputation also within energy

New patents in energy-related technoogies in Finland, 1995-2019

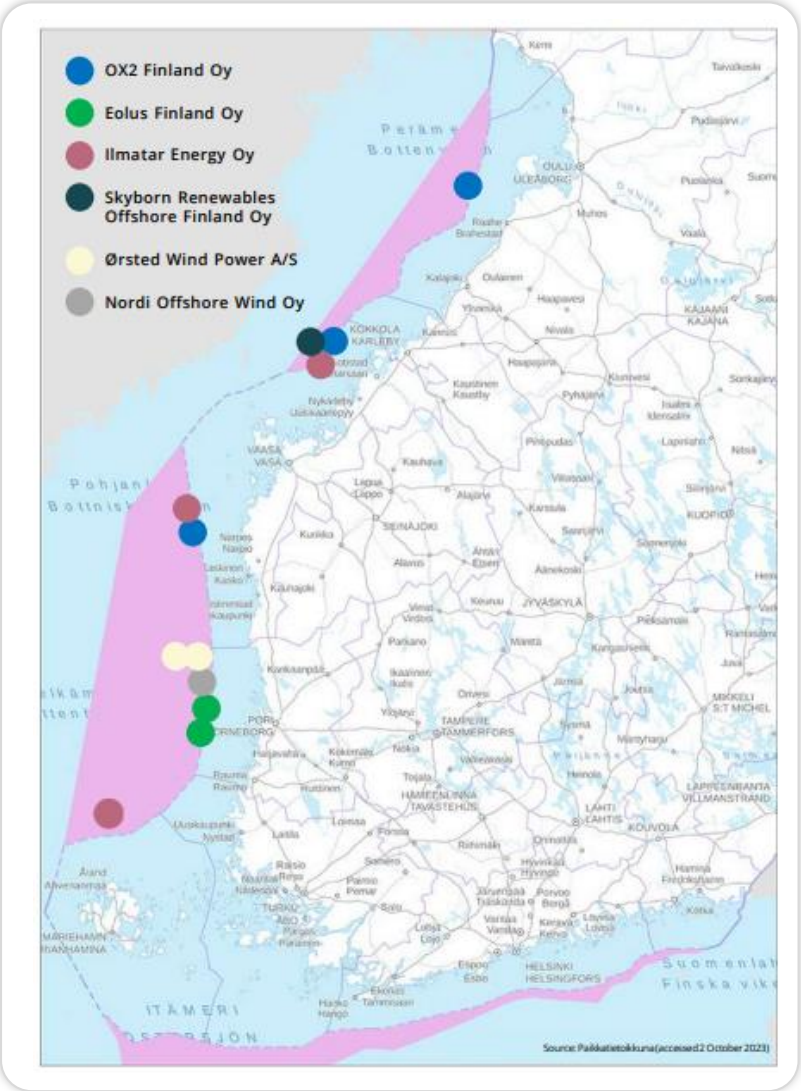


New patents in environment-related technologies by GDP in IEA conuntries, 2019



Source: IEA based on data from OECD (2022).

Location of Other offshore projects at various stages of development



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