Energy policy in the Nordic countries in 2030: towards a more carbon-neutral energy system - together and separately

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Abstract [*Full text available in Finnish, see:* https://el-tran.fi/analyysit/]

Norway, Sweden and Denmark have all set their own objectives for 2030 on the road to a more carbon-neutral energy system by the year 2050. These objectives are partly spontaneous and partly in response to commitments at the EU level and to the Paris climate agreement of 2015. Although for Norway with almost carbon-neutral electricity production the pressure to make changes is least, the country undertakes to achieve net carbon neutrality by 2030. Denmark aims at a 40 per cent reduction in emissions by 2020, entirely renewable electricity and heat production by 2035 and a more decentralized system involving the whole of society. Sweden's target for entirely renewable electricity production is set at 2040.

Choices concerning Finland's energy system are governed by emissions targets at the EU level. The EU aims at a 40 per cent reduction in emissions by 2030. In addition to this political commitment, the Finnish legislation commits Finland to the EU's common objective of a 20 per cent emissions reduction target by 2020. The Government of Prime Minister Juha Sipilä has set a further objective to raise the share of renewable energy sources to over 50 per cent of total energy consumption in the 2020s.

Alongside EU policy, target-setting is shaped by the historically developed solutions of each of the Nordic countries and wider economic and societal interests and the interest groups driving these. Finland and Sweden have built a system relying on large power plants for the needs of energy-intensive industry in which the price of energy is one major competitive asset of the country. Although Finland's and Sweden's target-setting is driven by the technology-neutral principle, in practice bioenergy is a core development goal.

Regarding energy production it is advisable to guide Nordic co-operation to explore natural gas and biogas solutions and also power-to-gas solutions. These can offer storage capacity that is extremely valuable in the future while at the same time the Nordic countries have complementary expertise in these areas. It would be worthwhile to intensify the ongoing co-operation for the development of the transmission connections. In the field of energy consumption Nordic co-operation can promote the implementation of flexibility in demand, the further development of regulations on the energy efficiency of buildings and also solutions in electric traffic solutions to achieve flexibility and energy stores and to better control power peak situations. It would further be desirable to scrutinize jointly the implementation options of systems relying on local renewable resources. These also include micro-grids or 'island use' solutions. These can serve not only as solutions for sparsely populated areas and apartment buildings but also afford exporting opportunities. Nordic co-operation needs the support of comparable statistics and more multi-disciplinary

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research taking account holistically of needs for change in society.

The management of the transition of Finland's energy system should assess the applicability of Denmark's ambitious objectives and experiences for involving the whole of Finnish society. Whether implementing the principle of technology neutrality optimally promotes the economic and societal interests of a rather small country might also be taken under consideration. In the field of bioenergy the level of objectives in export efforts should be ascertained while being mindful of the risks originating at the EU level regarding the fate of carbon sinks and the use of wood in energy production.

Objectives regarding security of supply should be scrutinized from the perspective of adequacy of power supply rather than energy supply, also at the level of the whole of Northern Europe. A distinction should be made between objectives of self-sufficiency and security of supply. Although reducing emissions by increasing domestic renewable generation and nuclear power serves to enhance energy self-sufficiency, the pursuit of national self-sufficiency as such will hardly yield resource and cost efficient solutions in conditions of an integrating EU energy market.

Figure 1. Summary of 2030 policies in the Nordic

	NORWAY	FINLAND	SWEDEN	DENMARK
Share of RES in final energy consumption (2020-40)	2020: 67,5 %	2020: 38 % 2030: over 50 %	2020: 50 % (achieved) 2040: 100 % of electricity generation from RES	2020: 50 % of electricity from wind power 2035: 100 % of electricity and heat from RES
Emissions reduction (incl. own reductions and offsetting with international investments)	2030: carbon neutrality	2050: carbon neutrality	2020: 40 % reduction in non-EU-ETS emissions from 1990 level; 2045: carbon neutrality	2020: 40% reduction in total emissions from the 1990 level; 2050: carbon neutrality
Emissions reduction (European Commission)	–	2030: 39 %	2030: 40 %	2030: 39 %
The R&D and capacity building interests	Hydro, solar, offshore-wind, energy efficiency, flexible energy systems, CCS	Bioeconomy, esp. cleantech and bioenergy incl. biofuels & demonstrations	In principle technology neutral approach (incl. process engineering, CCS), in practice emphasis on bioenergy; demonstrations	Wind, transportation, energy storages, smart grids, local RES solutions, bioenergy, fuel cells; demonstrations; household-level solutions
Energy market development interests	Hydropower dominant both in production and storage; wind power emerging (first onshore; off-shore long-term); joint RES support certificate system with Sweden to be renounced by 2021, investments made until then supported until 2035	Strong emphasis on nuclear and bioenergy; moving towards more technology-neutral support scheme for RES and new energy technologies	Nuclear decommissioning repealed in 2016; emphasis on RES (esp. hydro and bioenergy); RES support via certificate system	Wind power and decentralization crucial, strong emphasis also on bioenergy; support scheme for off-shore wind and biogas
Energy business, including economic development, employment and taxation benefits	Increasing capacity for hydro power; exports to Germany, UK with new cables; aggregation of small-scale producers in Germany; energy storages (hydro); electrification of transport (e.g. via tax exemptions); CCS; taxes on energy and carbon	New jobs in cleantech and bioenergy (incl. exports); tax exemptions on biofuels and -gas, low-emissions transport; taxes on energy and carbon; dilemma of low prices limiting investments	New jobs in cleantech and bioenergy (esp. products and services); taxes on energy and carbon, tax exemptions on biofuels	New jobs in energy efficiency and biogas; tax exemptions on the basis of energy efficiency improvements; high taxes on energy and carbon
Energy efficiency	30% reduction in energy intensity	Audits, agreements and support schemes for energy efficiency; efficiency through cogeneration, energy consumption may stay on a high level even with more efficiency	Energy efficiency improvements in e.g. buildings and businesses (incl. use of taxes); flexibility, reducing energy use; energy efficiency programs for energy intensive industry	Energy efficiency improvements in buildings and a program for energy intensive industries (tax breaks); reducing energy use
Security of supply including import and export	No import dependency; more cross-border transmission capacity under construction for exports (to the UK, Germany;) maintaining the national security of supply of electricity	Power reserve exists; decreasing import dependency (esp. from Russia) via new nuclear, RES, peat capacity and small-scale production; goal of >55% of self-sufficiency in RES energy during 2030	Power reserve exists; nuclear decommissioning repealed in 2016; enhancing national and cross-border transmission capacity; flexibility	Power reserve under development due to increasing share of wind power; transmission capacity; flexibility