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Finland's energy system for 2030 as envisaged by expert stakeholders

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ABSTRACT

To reach the 2030 decarbonization targets, EU Member States develop national strategies. We examine the views of key stakeholders in Finland to outline how those responsible for developing, steering and implementing the energy system assess the various solutions. The Finnish choices are of interest owing to the mixture of assets, constraints and path-dependencies shaping them. Our Q methodological analysis uncovers three main views: international competition and smart solutions; active consumers; national competitiveness and local solutions alongside a consensus upon which the implementation of Finland's own 2030 strategy can be built. The key stakeholders in Finland are ready for solutions comprehensively shaping the energy system, which can also influence several vested interests, existing business models and eventually break existing path-dependencies.

1. Introduction

The Member States of the European Union (EU) have agreed on several energy strategy targets for 2030, including a 27% increase in energy efficiency, a 27% share for renewables and a 40% reduction in greenhouse gas emissions. To help reach these targets on the Union level, the Member States prepare their own national plans for the European Commission [1]. The Member States also commit to such planning and monitoring processes coordinated by the Commission in preparation for the Energy Union [2].

The targets for 2030 represent a step towards a more resource effective and decarbonized energy system, implying not only a technological transition but also profound economic and social transformations [3]. This means that many stakeholders with established interests in the economy and society will be affected. Since it is realistic to expect that the transition will be more successful if it serves these interests, the way in which the stakeholders involved envision the process really matters. Which solutions to prioritize vis-à-vis the production, network and consumption sectors? How to combine these solutions and, eventually, support the realisation of the strategic targets set for 2030? In this article, we examine how the key expert stakeholders of the electric energy system in Finland envision the solutions for the 2030s. Our focus on the case of Finland is timely; it reminds us how even Member States with considerable assets supporting the energy transition simultaneously face significant constraints and path-dependencies standing in the way, some of which relate to stakeholders.

1.1. Finland's energy system in 2030: assets, constraints and path-dependencies

On the one hand, the asset base of Finland's energy system includes a high share of carbon neutral production, i.e. renewable energy sources (RES) such as hydropower, various types of biomass, wind and some solar power potential, as well as nuclear power. The share of RES is roughly speaking twice the EU average. In 2015, RES in Finland covered an estimated 39% of final energy consumption. In electricity production the share of RES was 45% with nuclear power accounting for an additional 33% of low-carbon production [4]. The 2030 energy strategy of the Government of Finland, published in November 2016 as an input to the Union level planning, targets an over 50% share of renewables in the final consumption of

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Table 1
Energy policy targets of Denmark, Finland, Norway and Sweden.

	Denmark	Finland	Norway	Sweden
Share of RES in final energy consumption (2020-40)	2020: 50% of electricity from wind power; 2035: 100% of electricity and heat from RES	2020: 38% 2030: over 50% (incl. peat)	2020: 67.5%	2020: 50% (achieved) 2040: 100% of electricity from RES[b]
National emissions reduction targets[a]	2020: 40% reduction in total emissions vs. 1990; 2050: carbon neutrality	2050: at least 80% reduction from 1990 levels	2030: carbon neutrality	2045: carbon neutrality
European Commission proposal for emissions reduction (non-ETS)	2030: 39%	2030: 39%	[2030: 40%]	2030: 40%

[a] Includes own reductions and offsetting with international investments.
[b] Implies 'a target, not a deadline for banning nuclear power, nor does it mean closing nuclear power plants through political decisions' [12].

energy. Cross-border transmission networks link the Finnish electric energy system to the Nord Pool electricity market, where two thirds of the electricity traded is from RES, consisting mainly of Norwegian and Swedish hydropower but increasingly also of Danish and Swedish wind power. In the consumption sector, Finland's new 2030 strategy targets a 30% share for biofuels in road transport, reflecting the asset base of the country's forestry industry [5].

On the other hand, Finland remains a relatively energy intensive economy. The ratio between gross inland energy consumption and GDP far exceeds the levels of the other Nordic states except for Iceland, which has a large geothermal powered aluminium industry. In the EU, this puts Finland into the same group as the east and central European Member States [6]. The high energy intensity is attributable to Finland's export-oriented forestry, metal, machinery and shipbuilding industries, long distances within the country, sparse and unevenly distributed population and relatively low temperatures in winter. The structure of the Finnish economy therefore generates a marked interest in energy supply on the part of the industrial and transport sectors as well as the building stock, resulting in some powerful path-dependencies.[1] One such example is the high share of nuclear power, which is set to increase towards the 2030s, reflecting the interests of industry for a stable supply of base-load power [8]. The Commission's 2016 proposal for Finland of a 39% emissions reduction target in the non-emission trade sectors, made as part of the Union's 2030 planning, also cuts into such existing paths. The Confederation of Finnish Industries criticized the resulting pressures on transport costs and on the use of oil in transport in particular, and the Central Union of Agricultural Producers and Forest Owners for moving production out of the country [9].

Given this constellation of assets, constraints and path-dependencies, the Government's energy policy targets in the 2030 energy strategy remain more cautious than those of its Nordic neighbours, even though the Nordic states jointly strive to decarbonize the energy system by 2050 [10] (Table 1). Yet Finland's 2030 strategy clearly departs from the country's previous policies, which prioritized the production sector of the energy system in the interests of the energy intensive industries [5,11]. The new 2030 strategy moves towards a more holistic understanding of the system by discussing partial solutions for decarbonization in the sectors of smart networks and transport, the benefits of improving flexibility and by noting the prospects of involving energy consumers and citizens in the transition [5].

[1] However, the energy intensive industry has potential for the demand response needed in an energy system with a higher share of intermittent RES, and can profitably use any momentary surplus RES [7].

1.2. The importance of stakeholder views

Even though we acknowledge that several visions may ultimately lead to similar outcomes [13], we propose that the implementation of any vision will benefit from agreement among stakeholders. Furthermore, because the 2030 strategy is a guideline document not strictly prioritizing any possible solutions, it is useful to know how those responsible for developing, steering and implementing the system assess the various solutions vis-à-vis each other.

In the next section we introduce Q methodology as a tool enabling us to systematically uncover and compare the views of stakeholders. The results section presents three different views emerging from the analysis. Our discussion elaborates the areas of consensus upon which the implementation of the 2030 strategy could be built.

2. Research design and methods: do the key stakeholders share the same vision?

2.1. Existing studies

Existing studies on stakeholders have mostly used interviews. They agree that experts are crucial for the formation of Finnish energy policies. Although in the past decade the circle of key stakeholder experts has widened towards the expanding RES and nuclear power sectors [11], it nevertheless remains narrow [14]. Simultaneously stakeholders' views regarding RES depend on the interests they represent [15]. A survey among energy experts and decision-makers found support for a market driven energy transition where RES subsidies could continue until the 2020s if they were technology neutral, while opinions diverged regarding capacity payments. The same experts wanted to maintain the country's strengths in combined heat and power (CHP) [16]. Yet we lack information on how key stakeholders view the full spectrum of solutions.

2.2. How to systematically compare stakeholders' views?

We use Q methodology to conduct a systematic comparison of the views of key expert stakeholders vis-à-vis the Finnish energy system (17). Q methodology combines qualitative and quantitative techniques in order to model the subjectively held views of stakeholders and build firm typologies of these views according to where they agree and disagree [18]. Q methodology can moreover uncover the extent of consensus that could pave the way for widely accepted energy strategies. We asked the key stakeholders: which solutions should Finland prioritize on the way towards a more resource efficient and climate neutral energy system by 2030?

The first step in a study applying Q methodology is to carefully scrutinize the full range of views expressed in the relevant debate