St1 Nordic Energy Outlook Launch

14.6.2016

St1 Nordic Energy Outlook – the opening words

Climate change is a race where the finishing line shifts further all the time. The global energy challenge calls for significant measures. Otherwise we selfishly waste the possibilities of future generations.

Action is needed now, but you have to know your roadmap. This document presents our view of changes and challenges in the energy market during the next couple of decades.

We have collected data from various sources and analysed it in order to present the St1 view of the Nordic energy market development. We do not have a crystal ball to show the future. However, we do believe in the views presented in this outlook so much that our renewable energy strategy is based on them. We also believe in staying on top of Nordic energy market developments and steering them in order to overcome the tremendous challenges we have ahead of us. We feel there is a great value in sharing our views with you. We will update this outlook as we learn more and we invite you to help us. The most important measure to combat climate change is the smart use of energy and continuous development of energy-efficiency and renewable energy solutions. In this first version we focus on renewable electricity and heat, as well as the decarbonization of road transport.

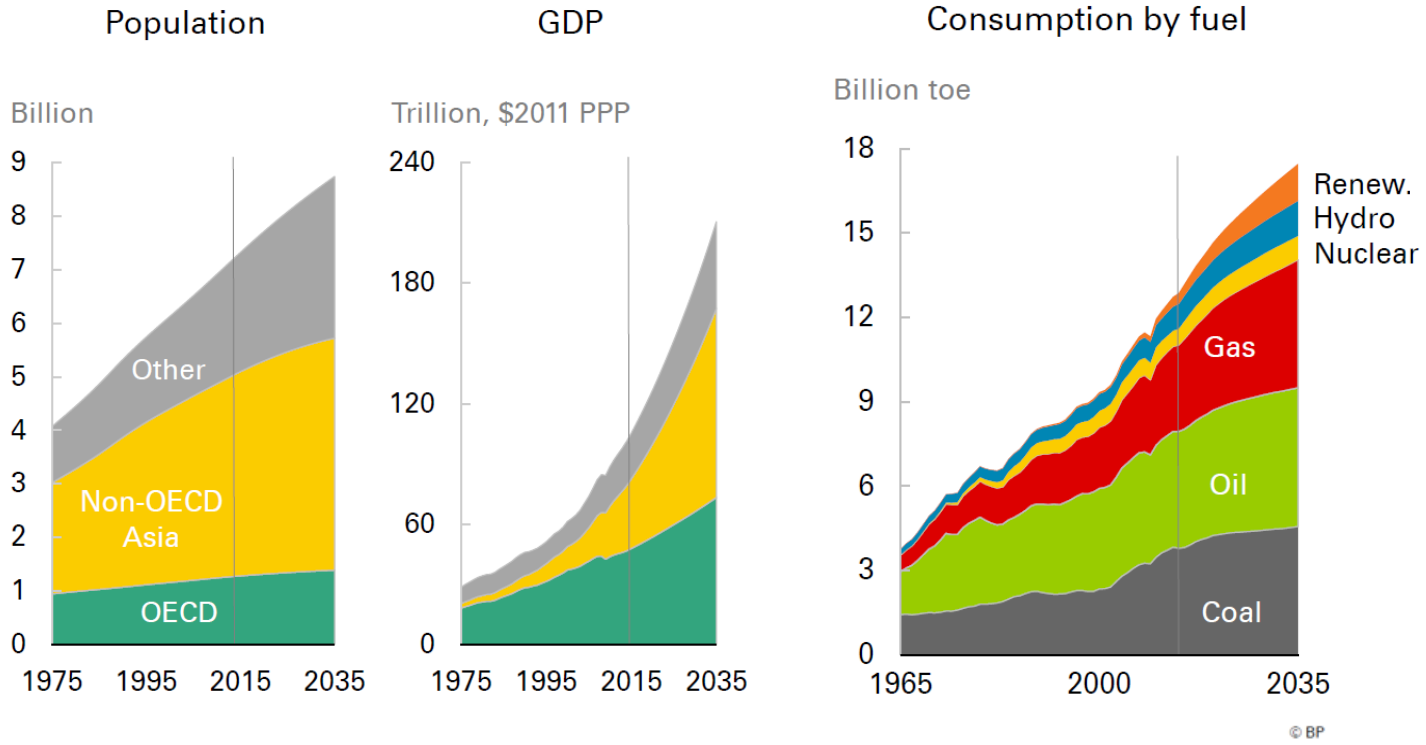
We thank all the sources and are grateful for the excellent data and analysis provided. It gives us a solid foundation to make forward-looking statements about our home markets in the the Nordic countries: Finland, Sweden and Norway. We will be grateful for any comments and suggestions that you have to improve this document. And we welcome all the people with new ideas and innovations to work together to reduce fossil emissions.

Setting the scene...

> A responsible company must ambitiously take in the big picture at all times. It must keep abreast of what's going on in the world and understand what clients will need in the future. Based on such an understanding and on demand, we are building world-class expertise in the use of renewable energy. We try to ensure that everything we do is based on this world-conquering mentality and passion.

Mika Anttonen
Chairman of the Board of Directors

The global energy challenge



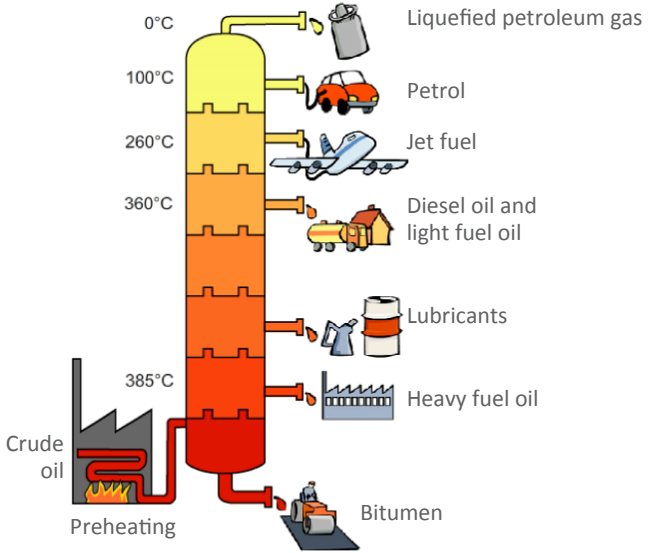
Base case: Primary energy

...driven by strong growth in emerging Asia

- Population and income are the key drivers behind growing demand for energy.
- The world's population is projected to increase by around 1.5 billion people to reach nearly 8.8 billion people by 2035.
- Over the same period, GDP is expected to more than double; around one-fifth of that increase comes from population growth and four-fifths from improvements in productivity (i.e. GDP per person).
- China and India together account for almost half of the increase in global GDP, with OECD economies accounting for around a quarter.
- Africa accounts for almost half of the increase in the world's population, such that by 2035 it is projected to have 30% more people than China and 20% more than India. Yet Africa accounts for less than 10% of the increase in both global GDP and energy consumption over the Outlook.

The challenge – oil refining products

- Crude oil refining produces always the same oil products:
  - light distillates, middle distillates, heavy distillates and residuum
    - i.e. if you produce Jet fuel, the process produces the other products as well



ÖLJY & BIO polttoaineala

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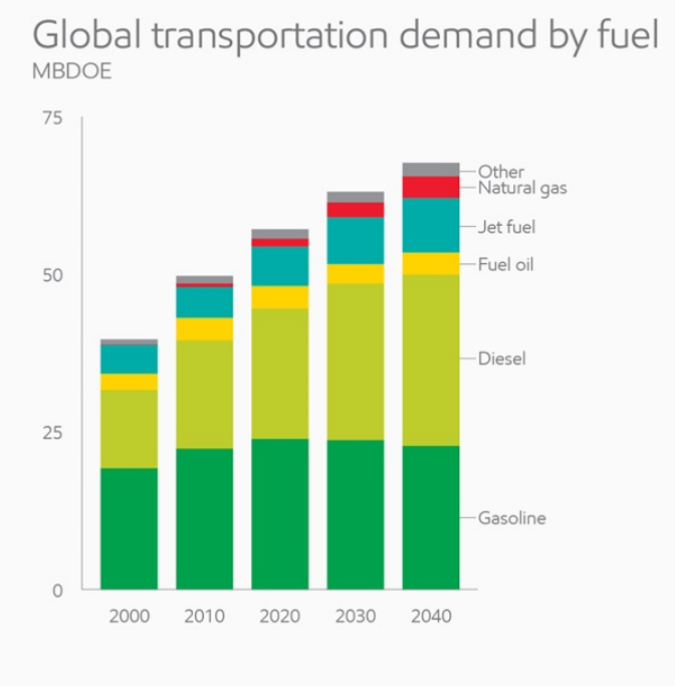
An example of the challenge: demand of jet fuel



- Jet fuel demand to rise by 55% as air travel keeps increasing world-wide (ExxonMobil Outlook)
  - Center for Climate and Energy Solutions estimate that:
    - Emissions from aviation make 2 percent of global emissions already in 2013
    - If global aviation were a country, it would rank as the seventh largest carbon dioxide emitter
    - In 2010 2.4 billion passengers and 40 million metric tons of goods
    - By 2050, that could grow to 16 billion passengers and 400 million metric tons of goods
- But no significant large scale renewable energy replacement developed

We have an urgent need to create new cost-efficient renewable energy solutions

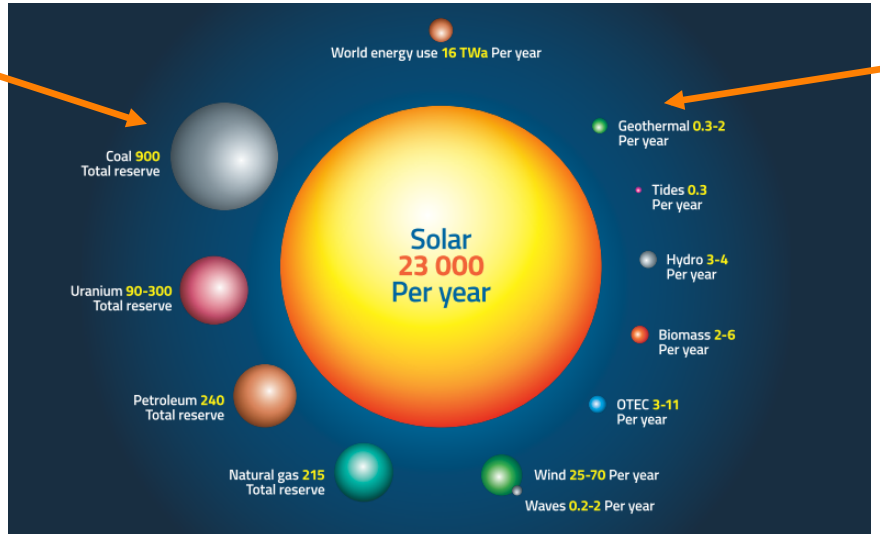
- Although the share of renewable energy is growing, fossil energy continues to grow much faster, creating increased amount of emissions
  - Emissions trading has proven to be an expensive and non-efficient support mechanism and it does not create the needed investments fast enough towards low carbon energy solutions
- Most countries do not have the ability to offer incentives to convert fossil energy to renewables
  - Emissions reduction mandates should be given to the companies producing fossil energy
- Fossil energy has high price flexibility
  - Increases in CO_2 taxes in developed countries should be used to promote the development of the use of renewable energy and new low-carbon technologies
- Development of new cost efficient renewable energy technologies is the key in the battle against climate change
  - Developed countries need to increase resources in R&D and demonstrations of new technologies

WE HAVE TO MAKE EFFORTS NOW - BECAUSE THE FUTURE IS DECIDED TODAY

Renewable Energy Potential

Renewable energy potential does not limit its use

Fossil energy: total estimated resources



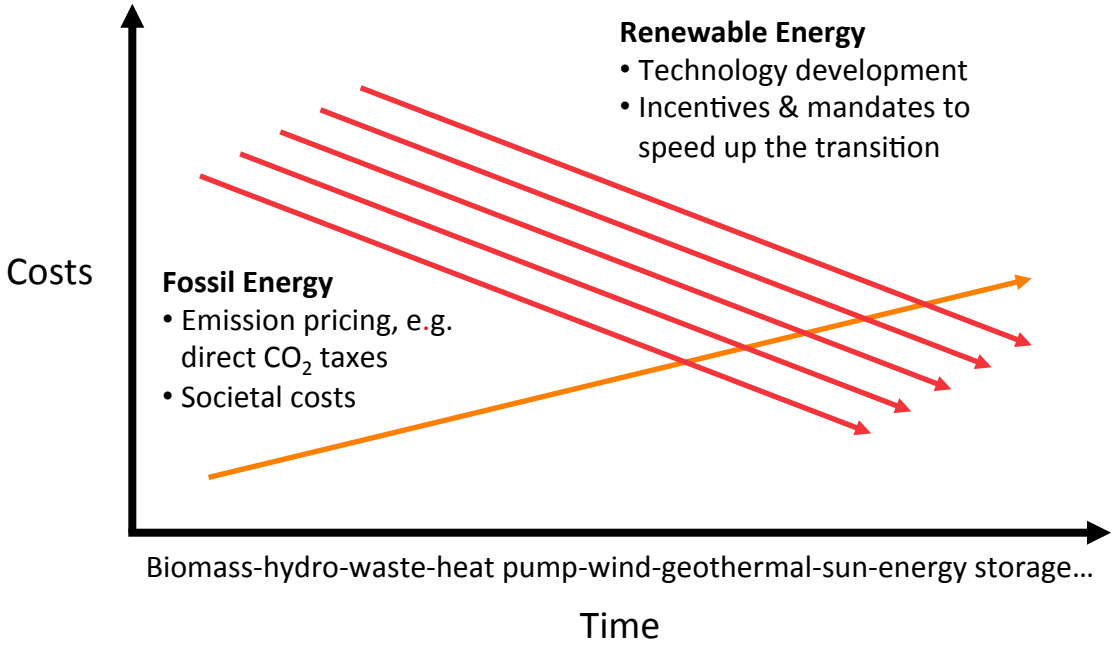
Renewable energy: estimated annual potential

As a comparison, the Nordics' annual energy use is ~0,1 TWa

LIMITS COME FROM A LACK OF SPEED IN LEVERAGING EXISTING ADVANCED RENEWABLE ENERGY SOLUTIONS AND DEMONSTRATING NEW ONES

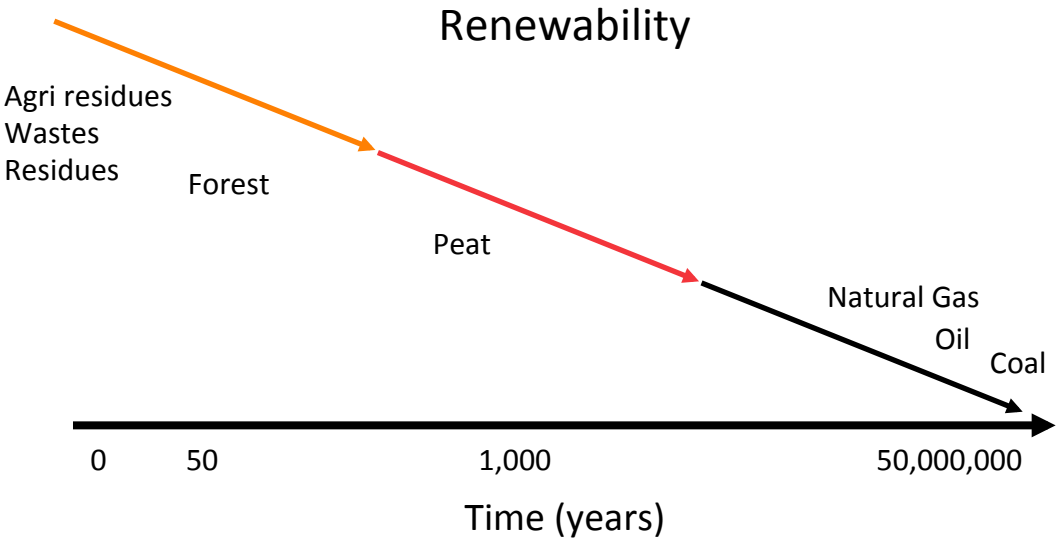
http://www.asrc.albany.edu/people/faculty/perez/Kit/pdf/a-fundamental-look-at%20the-planetary-energy-reserves.pdf

Centralized production is the strength of fossil energy, decentralized production is the strength of renewable energy



THE INEVITABLE DECREASE IN RENEWABLE ENERGY COSTS IS THE KEY TO ITS LONG-TERM SUCCESS

CO_2-neutrality of the biomass is mainly a function of the time of renewal rate of the biomass in question



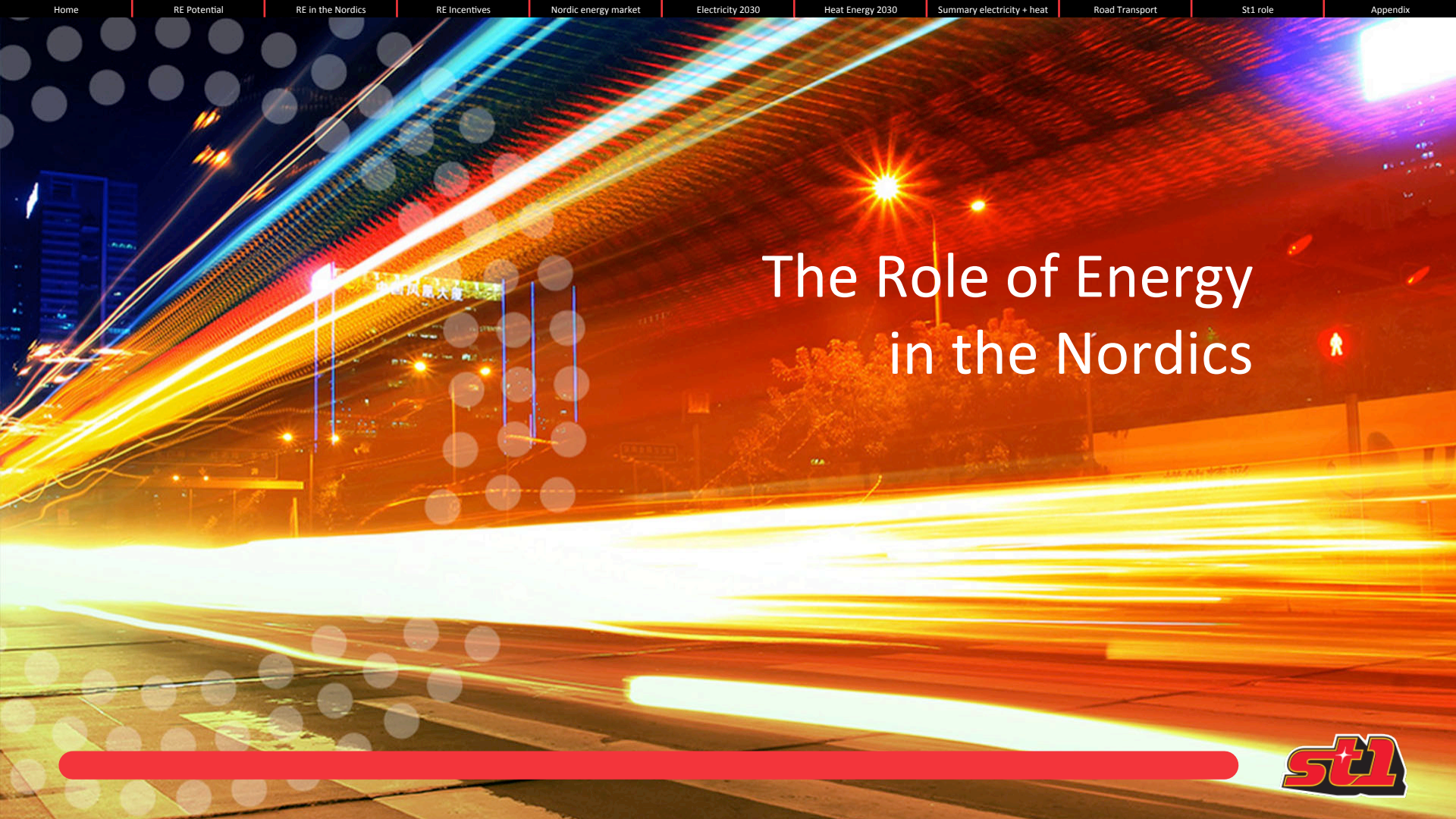
EFFORTS SHOULD BE CONCENTRATED ON BIOMASS OUTSIDE OF THE FOOD CHAIN

Drivers of the transition from fossil fuels to renewable energy are based on political decisions

- Key in the transition to renewable energy is the relative price competitiveness
  - In the longer term, renewable energy has to be competitive without subsidies
  - The most cost efficient forms of renewable energy will set the benchmark and replace fossil energy
- Fossil energy prices have to include GHG emission-based direct taxes and societal costs caused by global warming (e.g. provisions for extreme weather conditions, floods, droughts, international migration)
- Renewable energy prices will decrease and production capacity increase due to technology development through the learning curve, mandates and incentives
  - The US ethanol industry as well as the EU wind and solar industry have shown that a significant increase in production capacity is possible provided the right policy framework is in place*
- Incentives for R&D and demonstrations are needed to speed up the development of cost efficient renewable energy technologies and solutions

THE CHOICES OF INDIVIDUALS ARE UNPREDICTABLE AND WILL NOT DRIVE THE TRANSITION TO THE SUSTAINABLE RENEWABLE ENERGY SYSTEM

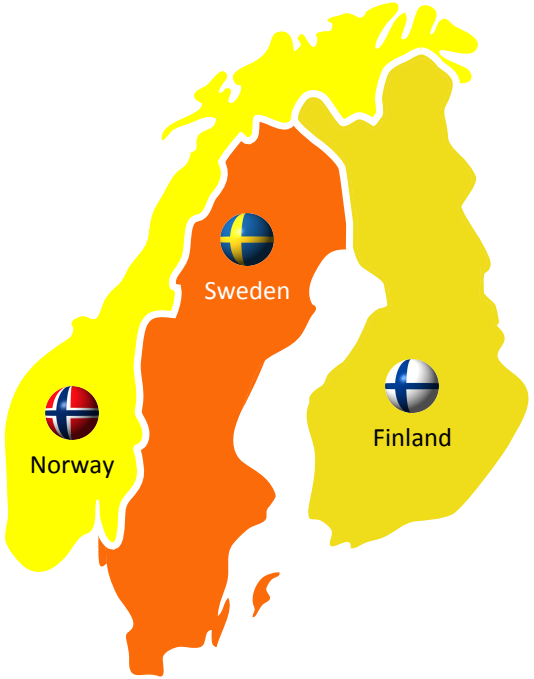
* University of Sussex: http://www.sciencedirect.com/science/article/pii/S2214629615300827



The Role of Energy in the Nordics

The Nordics in a nutshell

	Norway	Sweden	Finland
Population bn	5.2	9.8	5.5
Area km^2	385,178	450,295	338,424
Population density/km^2	15.5	21.5	18.0
GDP (nom.) USD million	522.3	579.7	267.3
GDP (nom.) per capita USD	103,586	60,566	49,265
GDP (PPP) per capita USD	64,363	43,407	40,045
Real GDP growth rate %	1.6	0.9	-0.6
Labour force million	2.7	5.1	2.7



THE NORDICS COULD AND SHOULD BE THE GLOBAL LEADER IN RENEWABLE ENERGY

Role of the Energy is critical in the Nordics

- Cold climate, low population density, long distances, the dark winter period and energy intensive industry have forced the building of robust and well functioning energy systems during the past 100+ years, offering an excellent platform for further decarbonisation of the energy sector
  - A highly interconnected regional electricity market has had a pivotal role in that
- Energy should be considered as part of everybody's basic legal rights, like transport infrastructure, health, education etc.
- Although private companies are and will be the market players, a so-called pure market-driven energy system is a myth
- Energy-related taxes form a significant share of the total taxes collected in each country
- Geopolitical development and the location of the Nordics underlines the need for enhanced energy security
- The transition to a local carbon-neutral energy system improves both employment and the trade balance and in addition decouples local energy prices from global energy price fluctuations

THE INTEGRATION OF ELECTRICITY MARKETS SHOULD BE DEEPENED TO ENABLE FURTHER EMISSION REDUCTIONS AND IMPROVED ENERGY SECURITY IN THE REGION

Energy taxes finance a great share of welfare society

FINLAND: Tax revenues (2014)

- Road transport related EUR 7.9 bn (incl. fuels & VAT)
- Electricity & Heat EUR 1.9 bn

SWEDEN: Tax revenues (2014)

- Road transport related EUR 10.1 bn (incl. fuels & VAT)
- Electricity & Heat EUR 2.3 bn

NORWAY

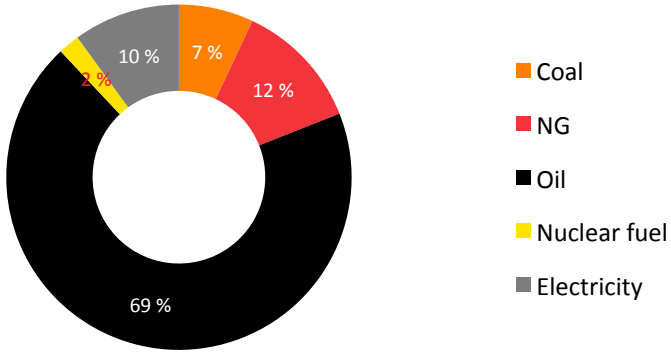
- Road transport related EUR 5.6 bn (incl. fuels & VAT)
- Electricity EUR 0.9 bn

RENEWABLE ENERGY INCENTIVE SCHEMES SHOULD BE FINANCED TROUGH CO_2 TAXES

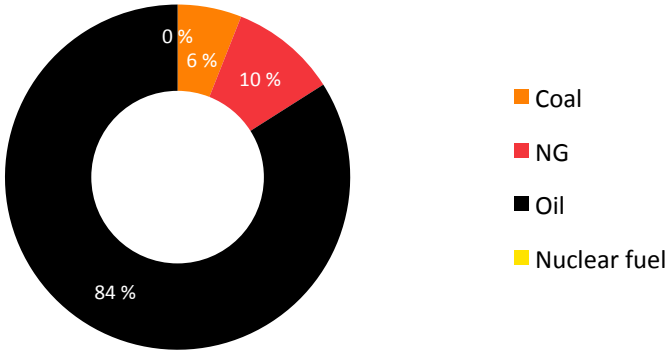
	Norway	Sweden	Finland
Energy and transport related taxes	EUR 6,5 bn	EUR 12,4 bn	EUR 9,8 bn
Central Goverment tax revenues	EUR 106 bn	EUR 85 bn	EUR 40 bn
Share of total tax revenue	6.1%	14.6%	24.5%

Oil constitutes 75% of Finland's and Sweden's energy import costs

2014 Net energy imports Finland 5.4 Bln€ of which oil is 3.7 bln€



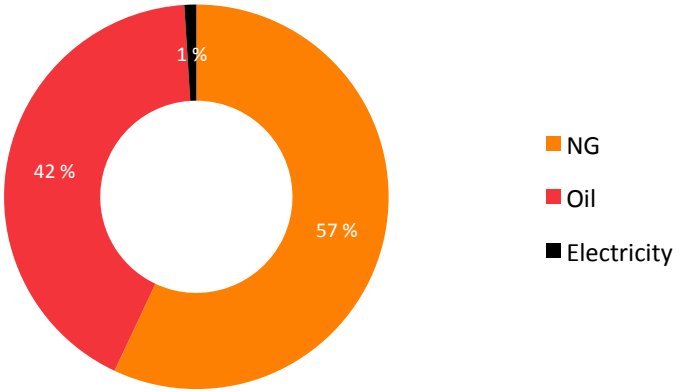
2014 Net energy imports Sweden 5.8 bln€ of which oil is 4.8 Bln €



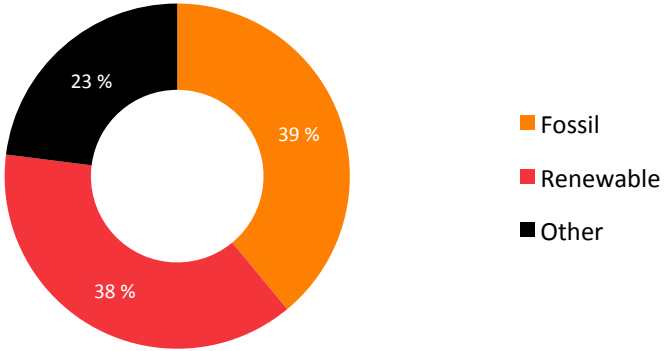
NET ENERGY IMPORTS ARE 10% OF TOTAL IMPORTS IN FINLAND, 5% IN SWEDEN BUT NORWAY IS SELF-SUFFICIENT IN ENERGY

Norway has significant energy resources

2014 Norway Net energy export 1968 Twh



Nordic 2014 gross energy consumption by energy source (1242 TWh)

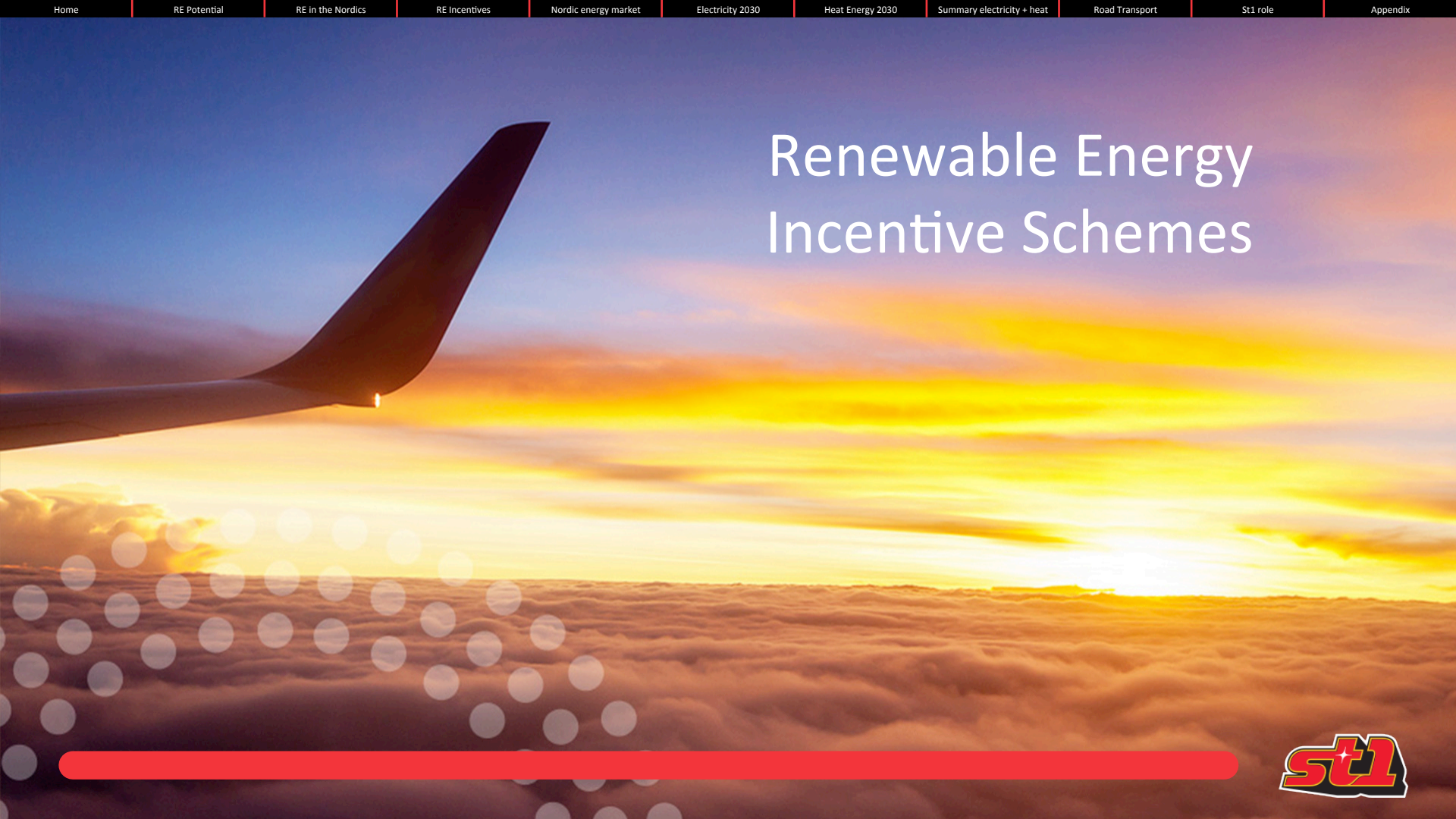


NORWAY EXPORTS MORE ENERGY THAN IS USED IN THE NORDICS

National regulations should be aligned in the Nordics

- Electricity export and replacing imported fossil energy with local renewable energy has a potential market of EUR 100 bn by 2030 in the Nordics
  - Equals the costs of imported fossil energy by 2030
- Renewable technology R&D, local demonstrations and investments have significant employment effect vs. imported energy
- Approximately 10% of the Nordic tax revenue is collected from energy consumption and transport, which is not expected to change. However, taxation of CO_2 is expected to increase to levels that accelerate the market penetration of renewable energy
- Targeted start-up subsidies on renewable energy demonstrations and first-of-kind units is a cost-efficient way of generating and accelerating the build up of a significant renewable energy production capacity
- An increase in the electricity transmission capacity is an important stepping stone to a common Nordic electricity market

ALIGNED REGULATIONS ENABLE THE DEVELOPMENT OF A TRULY NORDIC ENERGY MARKET



Renewable Energy Incentive Schemes

Energy policy should generate new, smart energy solutions without wasting future generations' opportunities

Objectives and political decisions should ensure short- and long-term continuity, energy efficiency and development of cost-efficient new solutions by

- Ensuring the availability of competitive local renewable energy for the entire economy and using energy cost-efficiently, resulting in a
  - Reduction of carbon dioxide emissions and costs
  - Reduction of imports, which will improve the trade balance

- Enabling fair and technology-neutral competition between renewable energy alternatives, which results in a diverse energy mix (required levels of baseload power – adjusting power – flexible production – reserves)
- Leveraging existing advanced renewable energy business and technologies and at the same investing in R&D and demonstrations of new technologies

A SMART ENERGY POLICY WILL CREATE NEW PROFITABLE BUSINESS, EXPERTISE AND EMPLOYMENT

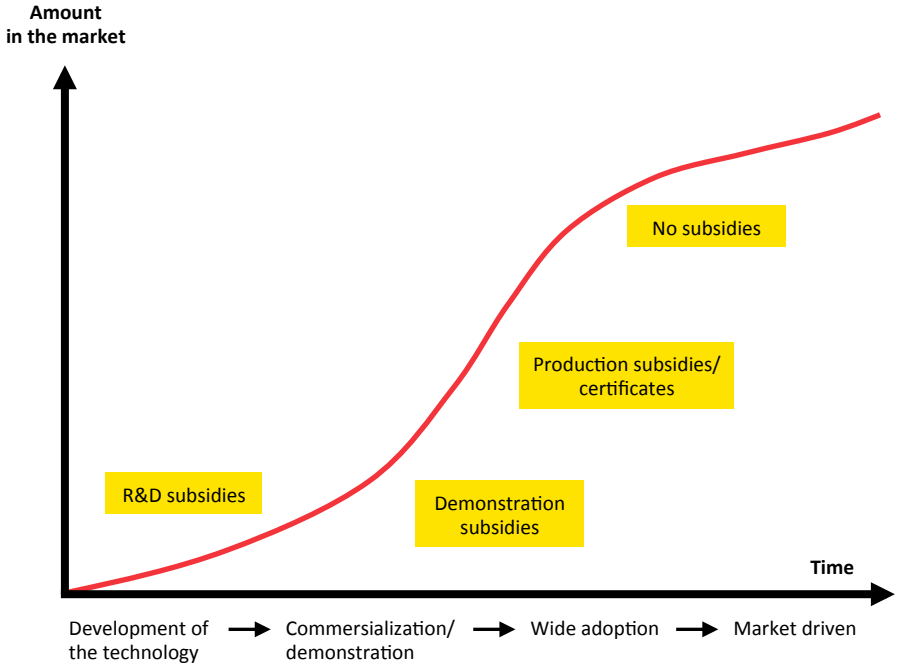
Several support systems are in use in the Nordics

	NEUTRALITY		EFFECTIVENESS				NORDIC COUNTRY EXPERIENCE			
	Technology	Competiton	Cost efficient	Creates investments	Volume effect	Environmental effect	Transport	Electricity	Heating	R&D, Demonstrations
Emissions trading										
Energy tax							*			
CO_2 tax							*		*	
Volume mandate							*			
'Mand.+ double count.							*			
Green certificates										
Sliding premium										
Sliding premium + auction								*		
Investment support							*			*
Investment support + auction							*			*
Fixed premium										
Fixed premium+ auction										
Investment mandate										

Not effective
Moderate
Effective

* The best proven systems should be applied in energy politics at the Nordic level

A smart energy policy will enhance introduction of new technologies and business models



THE TARGETED SUBSIDIES CREATE NEW COST EFFICIENT TECHNOLOGY AND PROFITABLE BUSINESS

Renewable energy investments and R&D require a long-term stable political investment environment 1/2

Biofuels

- The biofuels mandate combined with tax incentives, double counting of advanced biofuels and CO_2 taxes are proven to be the most cost efficient and technology neutral incentive system
- Mandates need to be aligned with vehicle and fuels standards to ensure the ability to use high concentrate biofuels

Power

- A sliding premium based on the auction of cost per produced MWh leads to the most cost efficient local and technology neutral production of defined renewable capacity and portfolio

Heat

- The long-term stable outlook of increasing fossil CO_2 taxes will lead to a cost efficient and technology neutral transition to energy efficient renewable heat production

Renewable energy investments and R&D require a long-term stable political investment environment 2/2

R&D

- Investment support to R&D is needed to accelerate development and market entry

Demonstrations

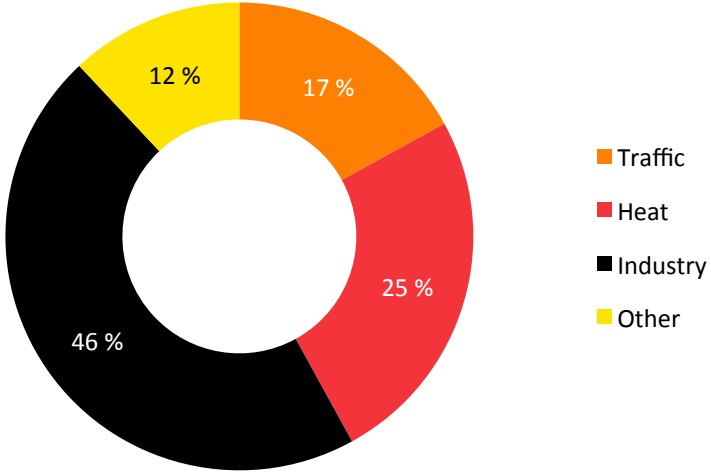
- Investment support based on the auction system to demonstrations lead to the most cost efficient development of new renewable business models and technologies

INCENTIVES TO REPLACE FOSSIL ENERGY SHOULD INCLUDE COST EFFICIENCY AND TECHNOLOGY NEUTRALITY

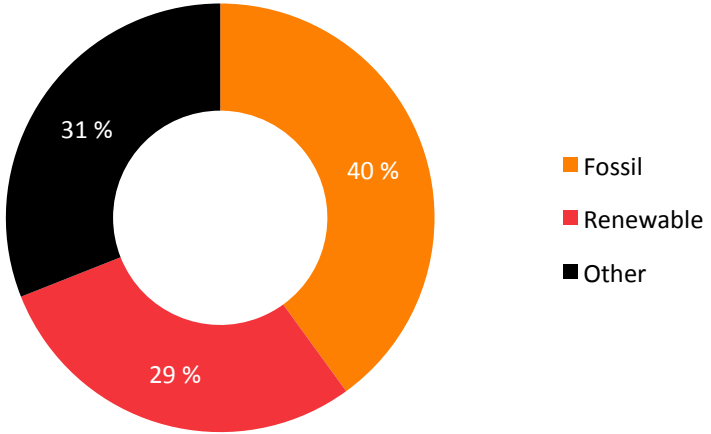
Nordic energy market today, 2020 renewable energy targets and potential

Fossil and nuclear represent 60% of Finnish energy consumption

Net energy use by sector 304 TWh



Gross energy consumption by energy source 372 TWh



40% FROM GROSS ENERGY CONSUMPTION TODAY IN FINLAND IS FOSSIL, CREATING A HUGE POTENTIAL FOR LOCAL RENEWABLE ENERGY INVESTMENTS

Finland has met its 2020 renewable energy targets by 2014 1/2

- In road transport 22.3% (target 20% including double counting) and in general 39% (target 38%) share of renewable energy out of total energy end-use was achieved in 2014
- Finland is the forerunner in biofuels technology development due to a long-term quota obligation of renewable energy in transport since 2009
  - Neste and UPM in renewable diesel
  - St1 in waste and wood residue based advanced ethanol production and development
- 6 TWh wind power will be built by the end of 2017, based on existing feed-in tariff system (2.3 TWh -15)
- Olkiluoto 3 nuclear power plant 1.600 MW is estimated to be in production 2018/2019

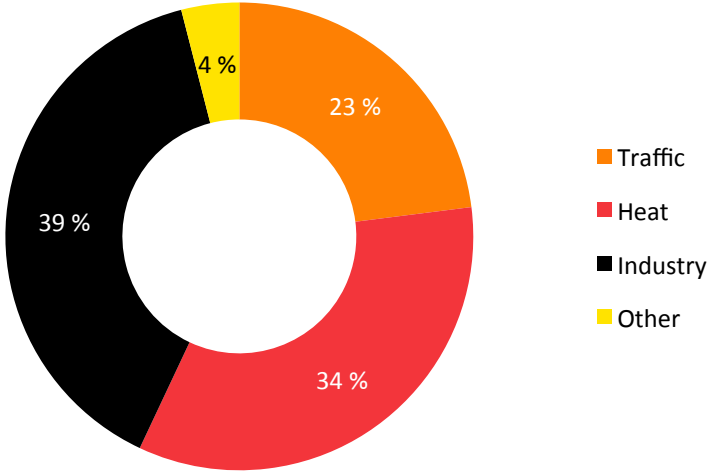
Finland has met its 2020 renewable energy targets by 2014 2/2

- 2030 objectives set by government
  - Renewable energy share to exceed 50% and domestic energy share to exceed 55% (including peat)
  - No fossil coal in use
  - 50% reduction of mineral oil in energy use (reference year 2005)
  - 40% share of renewable energy in transport
- Updating of the climate and energy strategy is ongoing, estimated to be ready 2017
- Government assigned EUR 100 M€ to investment grants for the demonstration of renewable energy technologies and projects. Grants will be awarded through competitive tender in 2016–2018

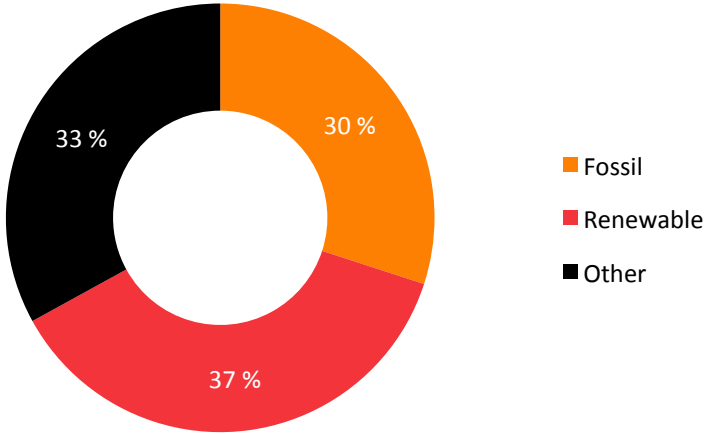
INCREASED SHARE OF RENEWABLE ENERGY IS A KEY ELEMENT TO IMPROVING FINLAND'S ENERGY SECURITY, ECONOMIC GROWTH AND EMPLOYMENT

Fossil and nuclear represent 63% of Swedish energy consumption

2014 net energy use by sector 373 TWh



2014 gross energy consumption by energy source 555 TWh



30% FROM GROSS ENERGY CONSUMPTION TODAY IN SWEDEN IS FOSSIL, CREATING A GREAT POTENTIAL FOR LOCAL RENEWABLE ENERGY INVESTMENTS

Sweden will meet its 2020 renewable targets 1/2

- 50% of renewable energy and 10% of renewable in the transport sector
- Renewable wind power 2020 target is 30 TWh
- Potential in changing district heating sector
  - Geothermal to replace forest-based biomass/waste
  - Potential to free up waste and forest based material for renewable fuels
- Investment programs from government
  - Solar PV = 1,400 MSEK 2016–2018
  - “Klimatklivet” = Appr 600 MSEK/year 2016–2018.
    - Open for two to three 1 months’ periods/year
    - GHG-related local initiatives to be supported for lowering of emissions according to target -40%
    - Examples of supported investment: upgraded district heating, biogas, electricity chargers

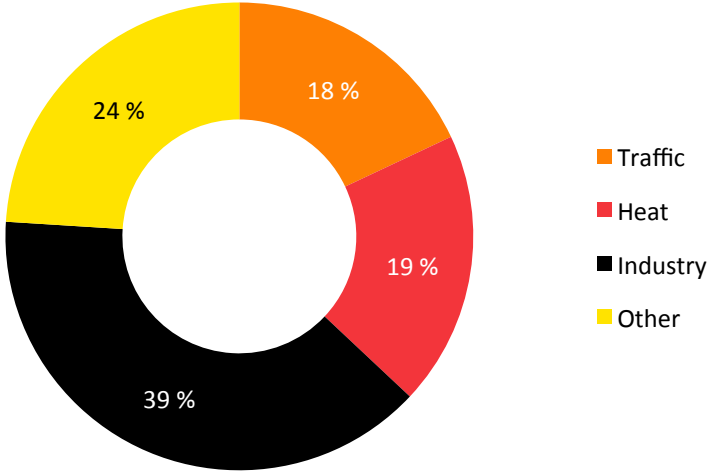
Sweden will meet its 2020 renewable targets 2/2

- 2030 objectives
  - Sweden suffers from a lack of overall energy strategy for the whole energy sector, no clear targets for 2030
  - New Energy Commission to deliver Strategy update latest by 1/1 2017
  - Shift in nuclear dependency for overall electricity forecast, varies from 0 to reduction of 10–30 TWh/a nuclear in 2030
    - Hydropower development during the period will be limited due to regulations

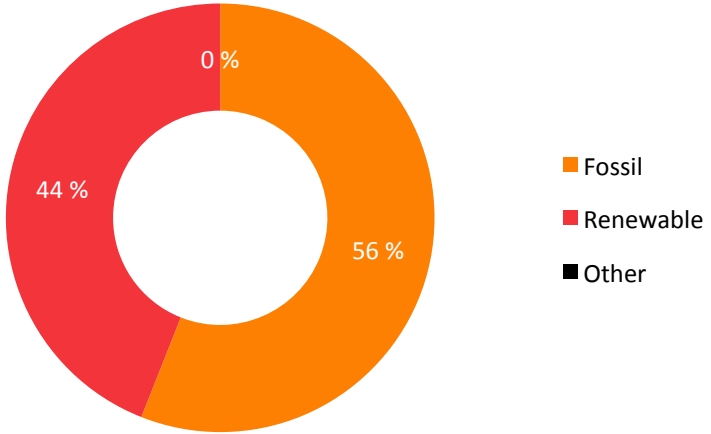
SWEDEN IS THE LEADING COUNTRY IN THE NORDICS IN UTILISING HEAT PUMPS AND WIND RESOURCES

Norway uses the highest relative share of fossil energy in the Nordics due to its offshore industry

2014 net energy use by sector 231 TWh



2014 gross energy consumption by energy source 315 TWh



ELECTRIFICATION OF THE OFFSHORE INDUSTRY REPRESENTS A HUGE OPPORTUNITY FOR RENEWABLE ENERGY

Low crude oil price effects the Norwegian energy policy 1/2

- 2020 targets, 30% reduction in CO_2 emissions not met by local production
- EU energy directives are generally introduced into Norwegian law through the EEC framework, although with a delay
- Norway is currently negotiating to be part of the EU climate policy framework (Energy union) and the EU Targets and schemes
- Transport is the biggest emitter of GHG (1/3) in Norway
  - Heavy subsidies for electric vehicles extended – but running into capacity issues
- Electricity generation is based on hydropower
  - Heavy investment in grid infrastructure, and 1.4 x 2 GW connections to UK and Germany will impact market outlook

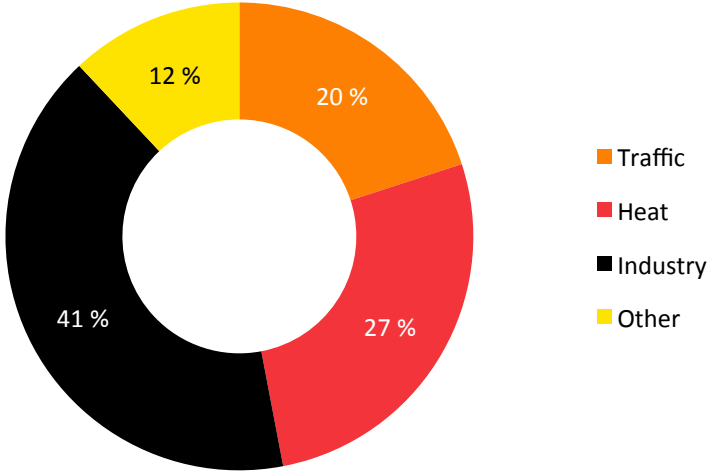
Low crude oil price effects the Norwegian energy policy 2/2

- Heating/cooling has been historically electric
  - Investment in remote heating Infrastructure & production in last 5–8 years, production dominated by waste incineration
- Political mechanisms in use are taxes, various incentive schemes and to a large extent, direct investment supports
- Preliminary 2030 targets set
  - 40% reduction in CO_2 emissions through reductions in the transport sector, increased use of electricity in oil/gas production, Carbon capture storage (CCS) and quota purchases
  - Expressed target is to have all new cars emission free from 2025

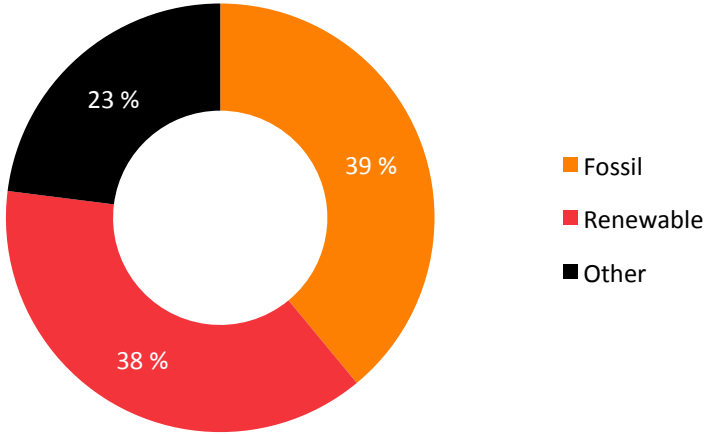
NORWAY HAS THE BEST WIND AND HYDRO RESOURCES IN EUROPE

39% of gross energy consumption today in the Nordics is fossil

2014 net energy use by sector (908 TWh)

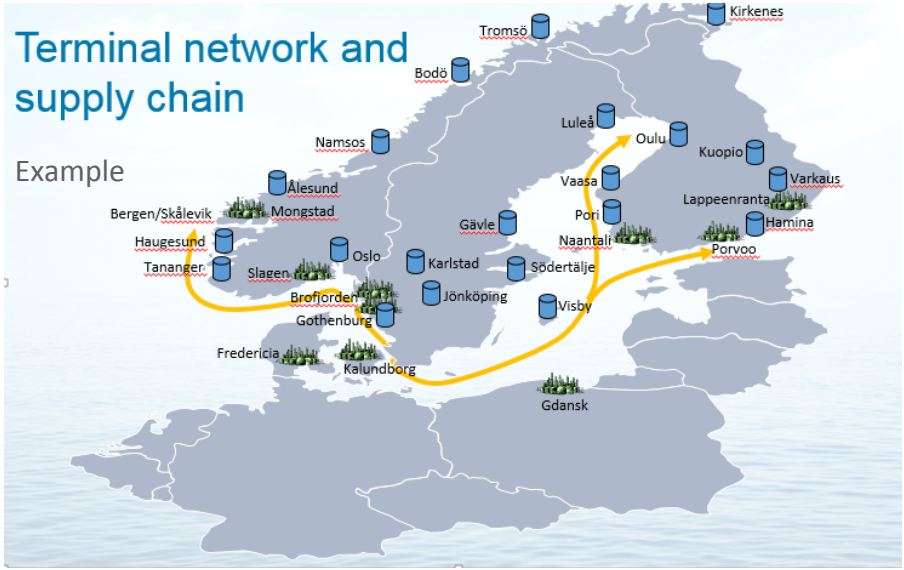


Nordic 2014 gross energy consumption by energy source (1,242 TWh)



TRANSITION TO RENEWABLE ENERGY IS LEAD BY POLITICAL DECISIONS AND REPRESENT SIGNIFICANT POTENTIAL FOR LOCAL ENERGY INVESTMENTS

Nordic liquid fuel supply logistics is based on international shipping



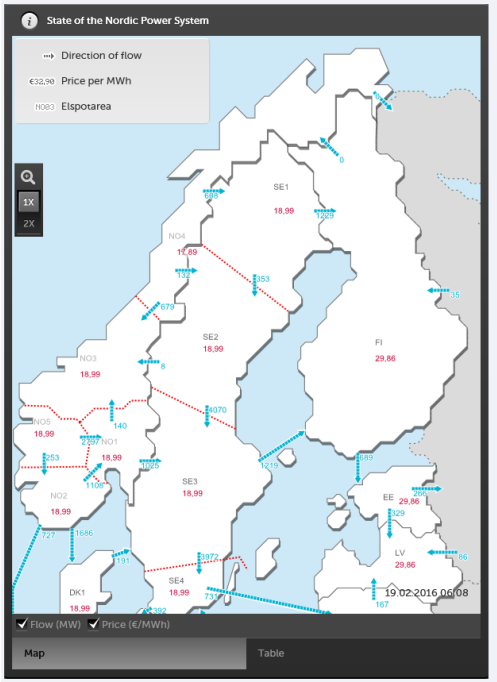
BIOFUELS LOGISTICS' COST EFFICIENCY IS BASED ON EXISTING INFRASTRUCTURE

Nordic countries including the Baltic states form together the Nord Pool Power system, however…

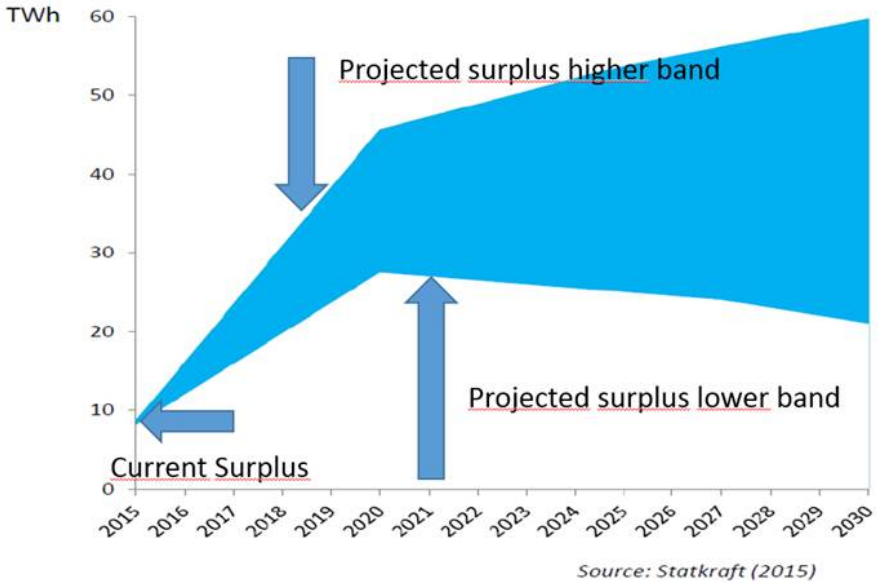
The price difference between Finland and Sweden was in 2015 ~EUR 10 per MWh

- That equals ~EUR 800 million/a, which has respectively weakened Finland's competitiveness

…ELECTRICITY PRICE IS BASED ON HIGHEST PRODUCTION COST IN THE MARKET AREA, WHILE BOTTLENECKS IN GRID CONNECTIONS LIMIT FREE TRANSFER



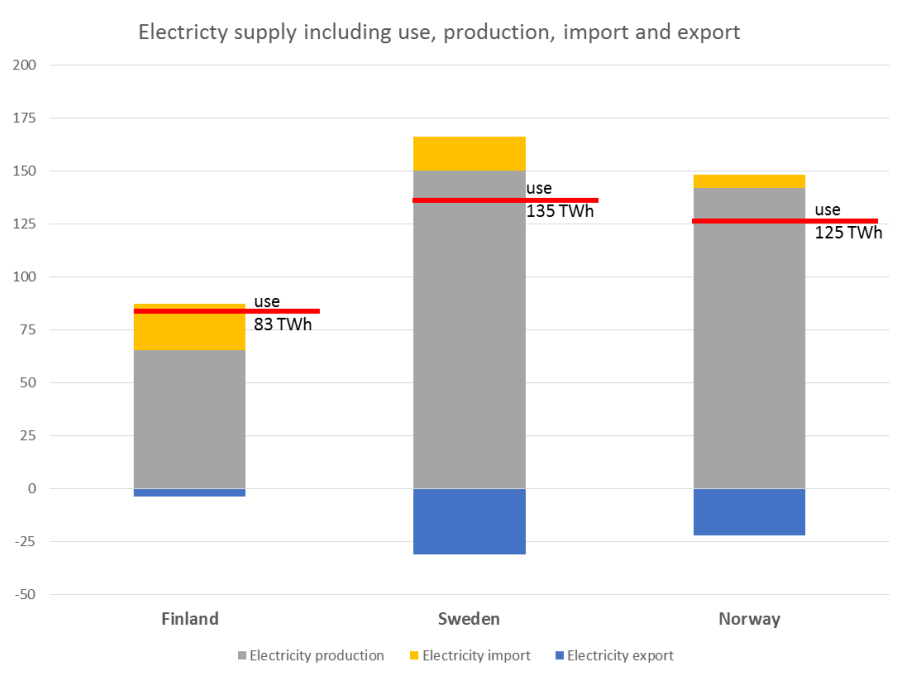
The Nordics electricity surplus is estimated to increase



Source: Statkraft (2015)

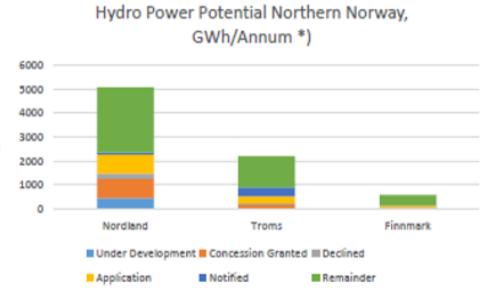
THE NORDICS HAS BECOME THE RESERVE OF ELECTRICITY BALANCING POWER, CREATING HUGE EXPORT POTENTIAL

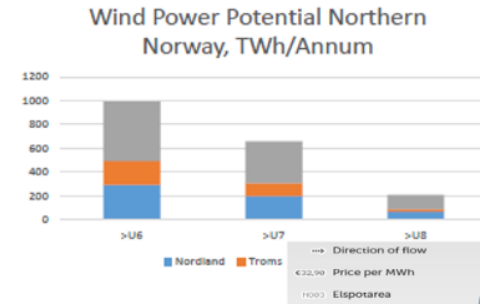
Norway and Sweden are CO_2-free electricity exporters already today

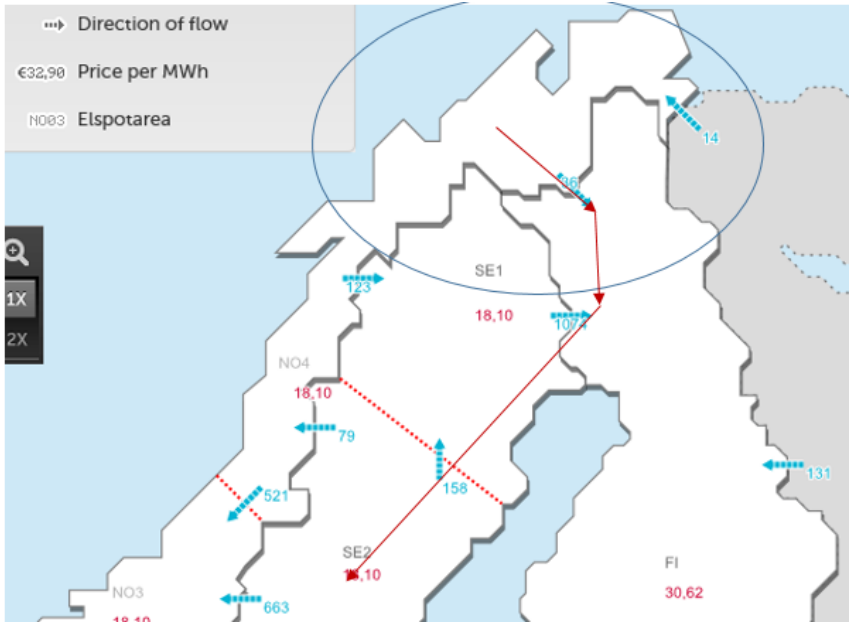


BOTH NORWAY AND SWEDEN WILL CONTINUE TO BE NET EXPORTERS AS HYDRO AND WIND HAVE GOOD POTENTIAL IN THE NORDICS

Norway has the highest hydro and wind potential in Europe





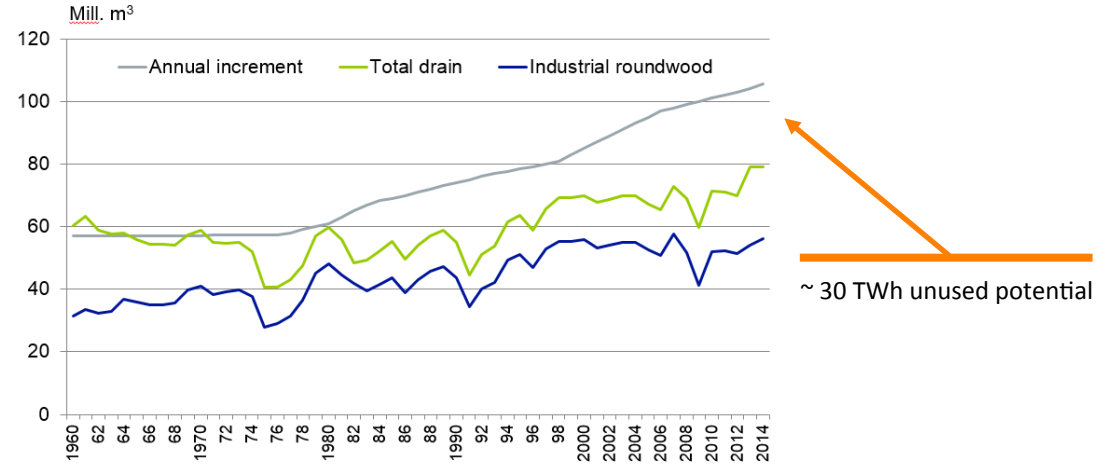


GRID CONNECTION IS THE BOTTLENECK IN UTILISING HYDRO AND WIND RESOURCES IN NORTHERN PARTS OF THE NORDICS

Unused biomass offers huge potential in the Nordics
~ 60% from the annual growth of forests in Finland is used

The growth of Finnish forests is over 100 mill. m^3 per year

Forest balance in Finland 1960-2014



~ 30 TWh unused potential

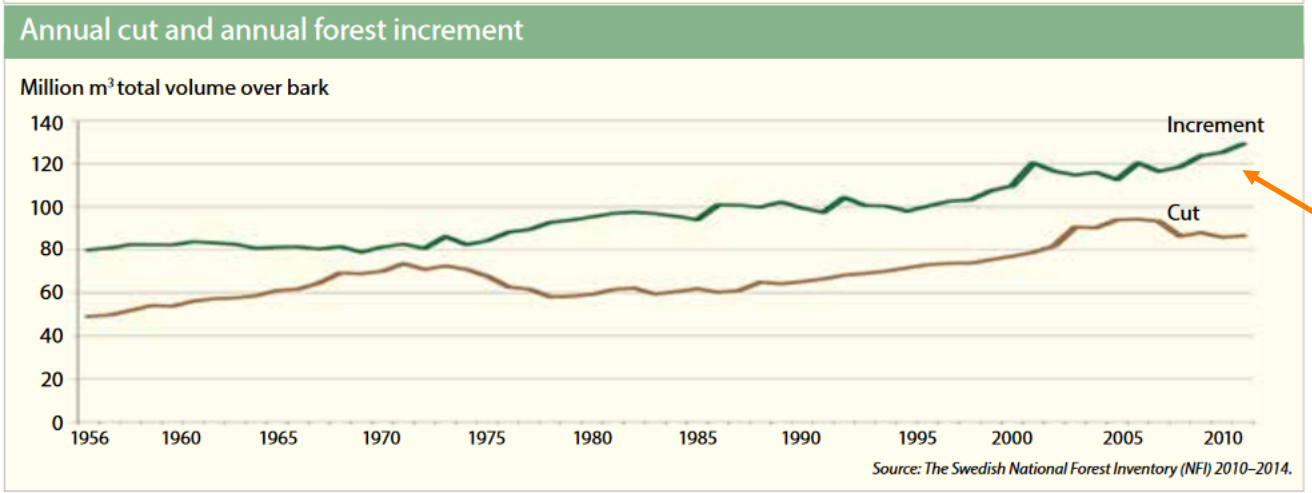
NORDIC FOREST RESOURCES HAVE INCREASED OVER 30% IN THE PAST 40 YEARS

13.8.2015

SOURCE: Luke

EVOLVING FOREST INDUSTRY
PROSPEROUS BIOECONOMY

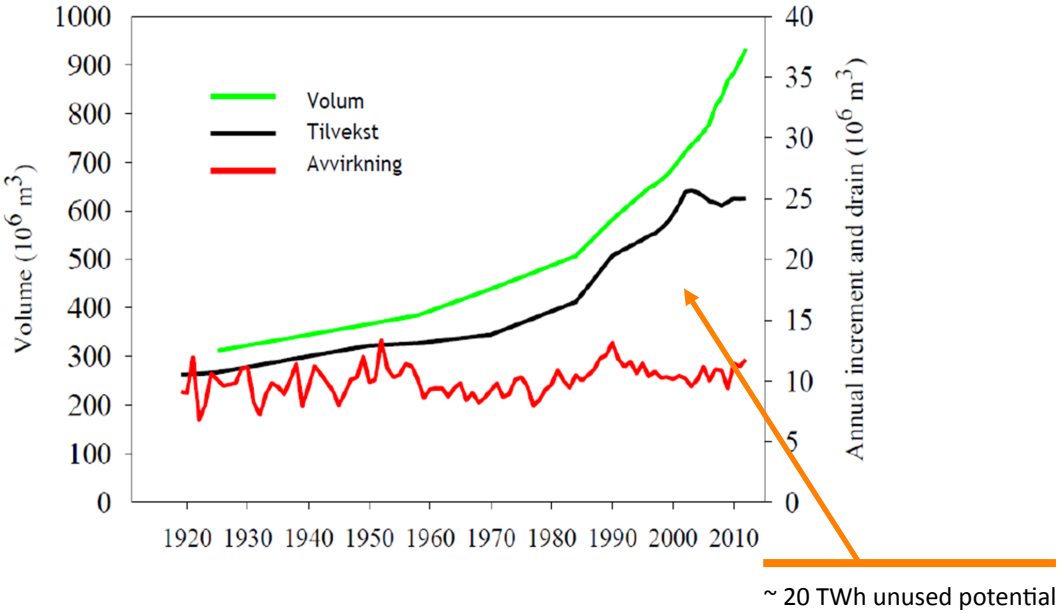
About 65% of annual growth of forests in Sweden is utilized



~ 30 TWh unused potential

NORDIC FORESTS ARE GROWING MORE THAN THEY ARE USED

Forest growth, utilization and potential in Norway



ANNUAL NORDIC FOREST BIOMASS GROWTH EQUALS MORE THAN 80 TWH, WHICH OFFERS A HUGE POTENTIAL FOR THE PRODUCTION OF LIQUID AND SOLID BIOFUELS

The Nordic countries are the forerunners in renewable energy use

- 2020 renewable targets will be met without any major additional investments, despite a relatively low fossil energy price outlook in the short-term
- Surplus supply of electricity in the Nordic markets is increasing in the short-term
  - Olkiluoto 3 nuclear plant start up estimated 2018/2019
  - Wind power investments 2016–2017 ~ 2,000 MW
  - Low electricity prices up to 2025
  - Finland moving from import parity to export
  - Electricity use has been declining and is estimated to be stable, while additional use is offset
- Role of electricity is changing slowly (heat pumps, electric cars)
- New buildings will gradually transfer from being energy users to energy producers

… AND COULD TAKE THE POLE POSITION IN THE FUTURE

Challenges & opportunities during the transition need to be recognized upfront

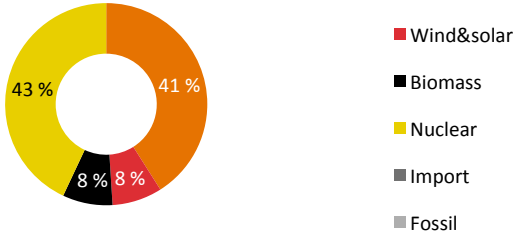
- Renewable energy development does not support CHP investments
- Decentralized renewable energy is challenging district heating networks
- Uncertainty about who decides customers' needs is increasing – the energy company or customer?
- Uncertainty and volatility in the overall economy and energy markets is increasing
- Removing bottlenecks in the grid will reduce in the short- and medium-term the need for energy storage options in the Nordic markets

SLOW ECONOMIC GROWTH AND ENERGY EFFICIENCY IMPROVEMENTS HAVE LED TO DECREASING ENERGY CONSUMPTION

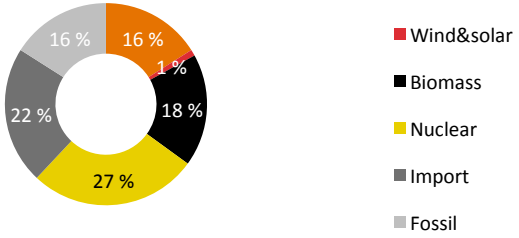
Electricity Outlook 2030

In Norway and Sweden, electricity production is already fossil CO_2 free

Sweden 2014



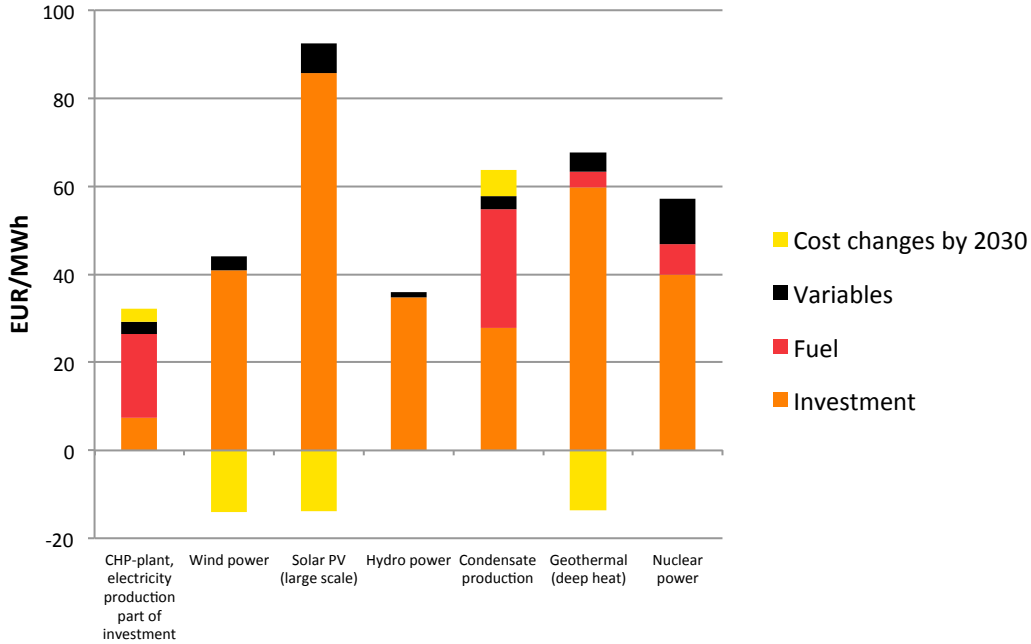
Finland 2014



Norway 2014

NORWAY AND SWEDEN ARE ALSO SIGNIFICANT ELECTRICITY EXPORTERS

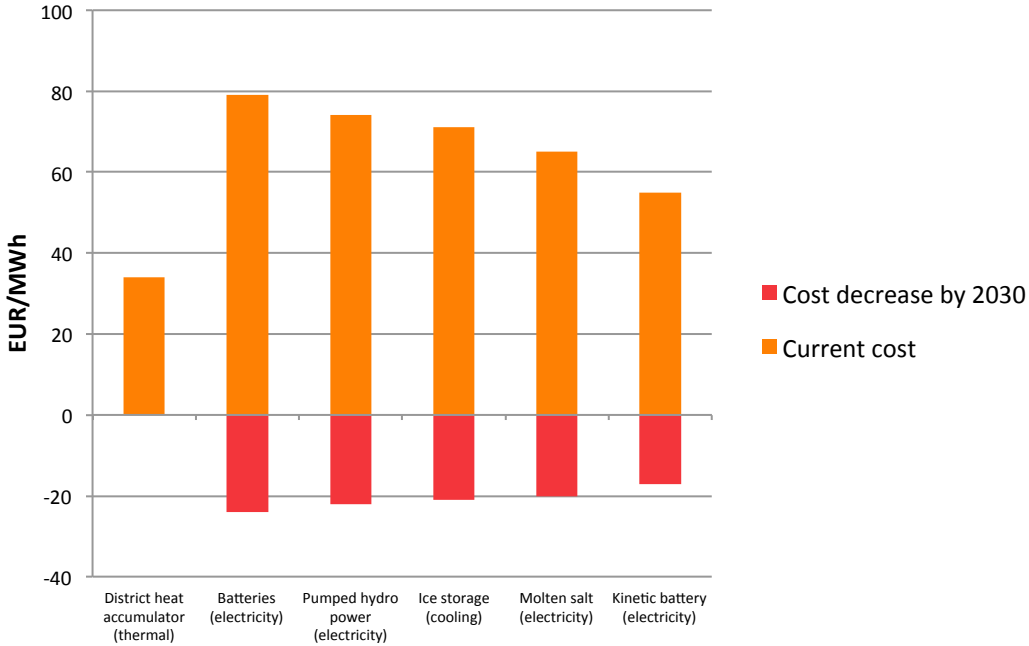
Renewable electricity production costs continue to decrease due to technology development



Source: St1 own analysis

WIND, HYDRO AND BIOMASS ARE THE MOST COST EFFICIENT WAYS TO INCREASE RENEWABLE ELECTRICITY PRODUCTION

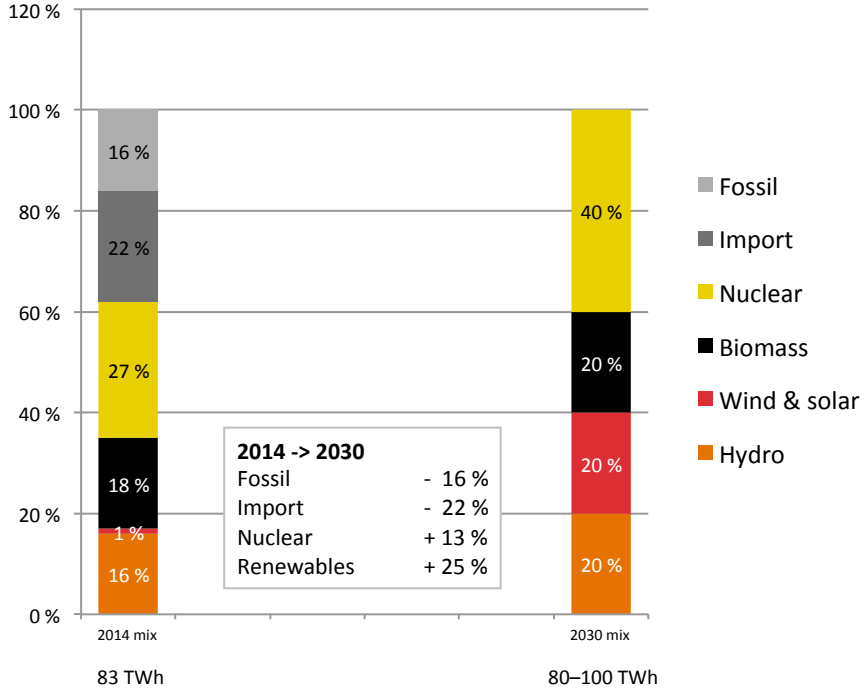
Improved energy storage would enhance even wider use of renewable energy



Note: assumes 30 €/MHh electricity price

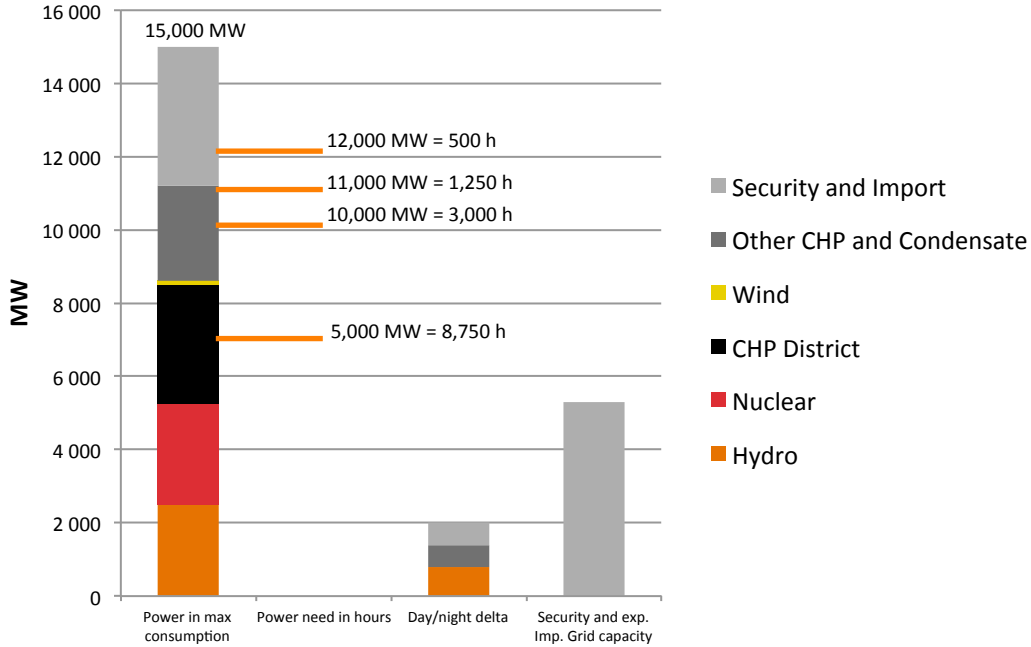
ENERGY STORAGE IS STILL EXPENSIVE – R&D IS REQUIRED TO IMPROVE FLEXIBILITY IN THE ELECTRICITY SYSTEM

Renewable energy will cover the amount of fossil and imported energy at the annual level in Finnish electricity consumption by 2030 vs. today



OPTIMIZED NORDIC ELECTRICITY SYSTEM ALLOWS FLEXIBLE IMPORT AND EXPORT AND AT THE SAME TIME ENSURES SECURITY OF SUPPLY

Electricity market volatility and peak loads will increase in Finland



PEAK LOAD HOURS NEED TO BE COVERED BY E.G. CAPACITY MARKET

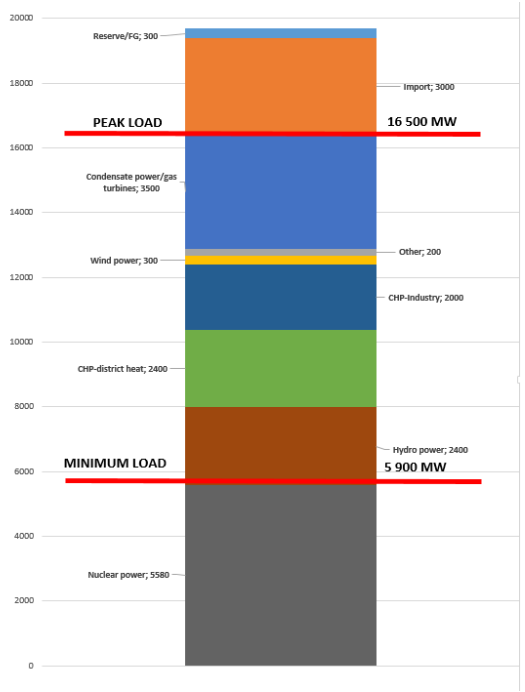
Capacity market to secure the peak loads in Finland

- Capacity market should be established to secure the necessary peak loads
  - Existing natural gas and coal production plants to be mothballed in synchrony with renewable energy capacity increase and utilized as part of capacity market
  - Costs estimated to be marginal
- Diverse local cost-efficient renewable energy portfolio should be secured by political decisions
  - Setting long-term (2030) and annual targets
  - Annual bidding process for renewable base, variable and security loads
  - Bidding of incentives to be based on produced electricity (MWh) to decrease renewable production cost
  - As wind supply increases, biomass has an increasing role to secure variable electricity supply

DIVERSE COST EFFICIENT ELECTRICITY PORTFOLIO WILL BE BASED ON A VARIETY OF LOCAL RENEWABLE ENERGY SOURCES

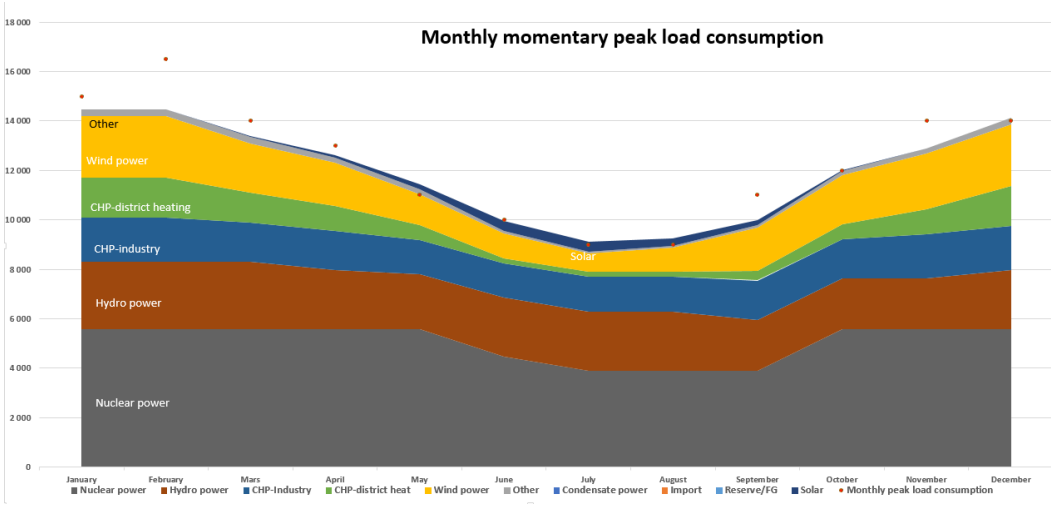
Peak load power capacity in Finland, year 2030

- Electricity production capacity will be able to produce annual energy (MWh) for the market, but in peak load periods, there is a need for peak load power
- Annually, these peak load periods last about 500–800 hours
- Peak load power would be condensate power, gas turbines or partly electricity import



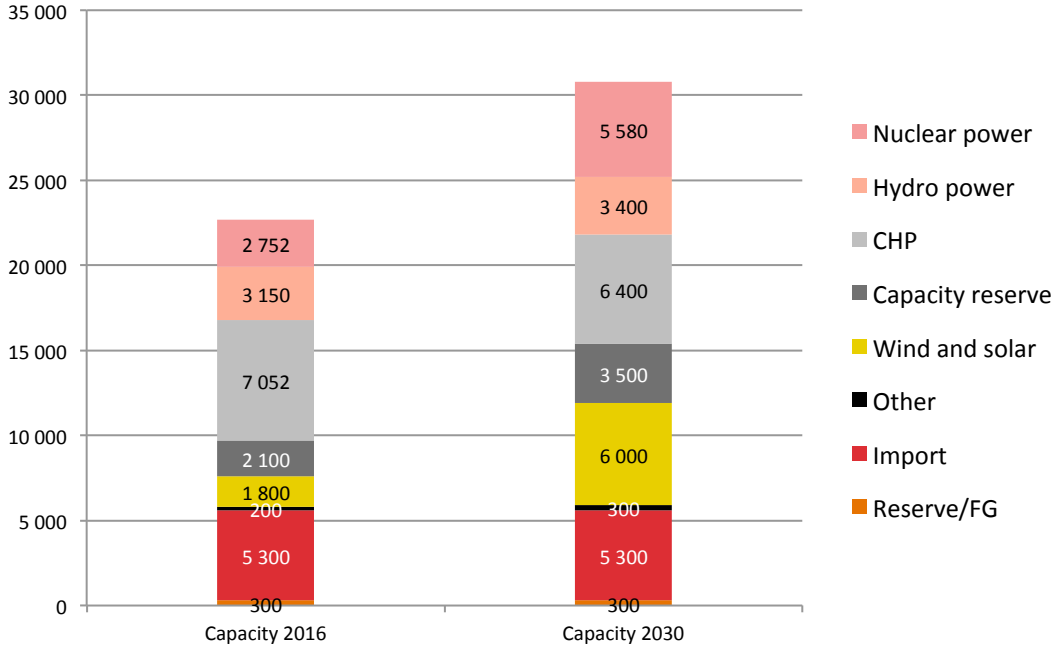
PREPAREDNESS FOR PEAK LOADS WITH A VARIETY OF ENERGY SOURCES ENABLES RUNNING THEM FLEXIBLY IN A COST EFFICIENT ORDER

Monthly momentary peak load consumption and average electricity production power in Finland, year 2030



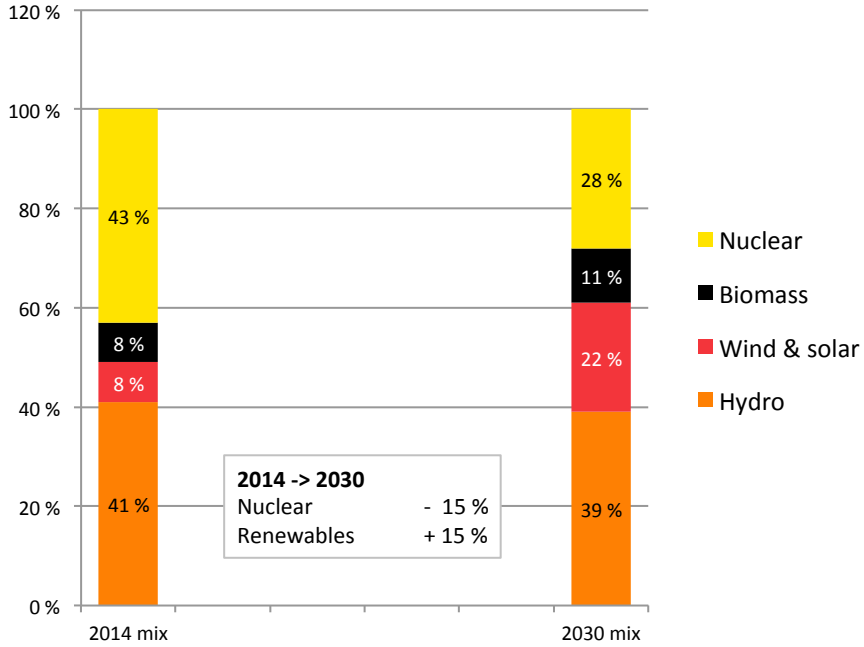
PEAK LOAD CONSUMPTION DELTA VS. DOMESTIC PRODUCTION WILL BE COVERED BY CAPACITY MARKET OR IMPORT

A capacity increase of 8,000 MW enables Finland to meet the renewable energy target



IT WILL ALSO ENSURE THE ENERGY SECURITY

Swedish electricity production is already fossil CO_2 free



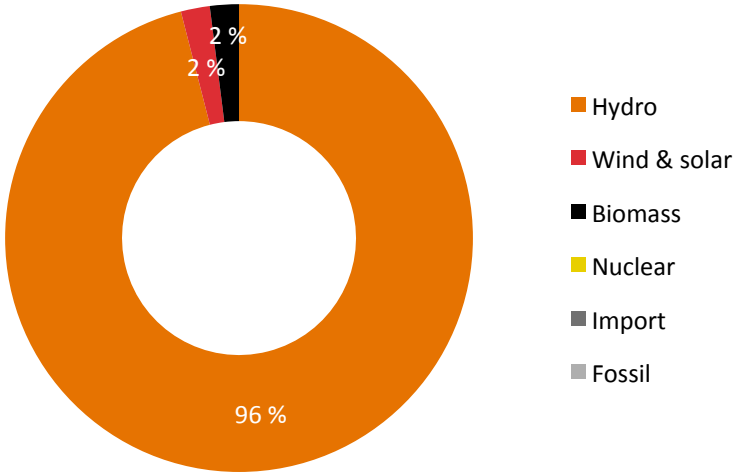
Nuclear future in Sweden is not clear

- reduction of 20 TWh after 2020 foreseen due to shut down of 3 plants,
- replaced primarily by wind and solar

SWEDEN WILL CONTINUE TO PRODUCE A SURPLUS OF ELECTRICITY AND BE AN EXPORT MARKET

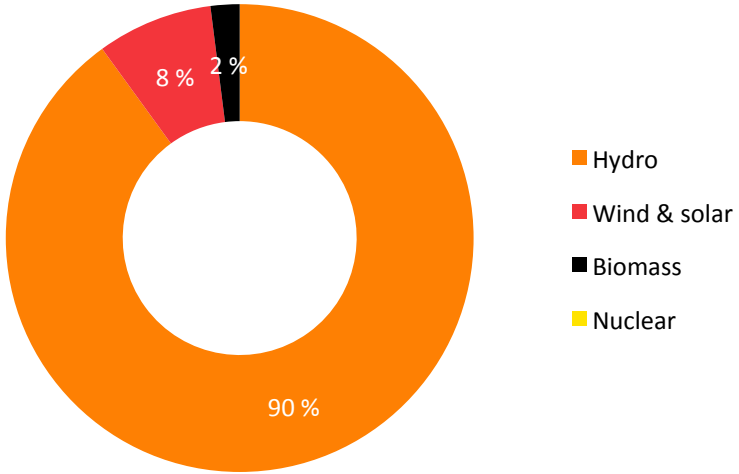
In Norway electricity is already renewable

2014 mix



141 TWh

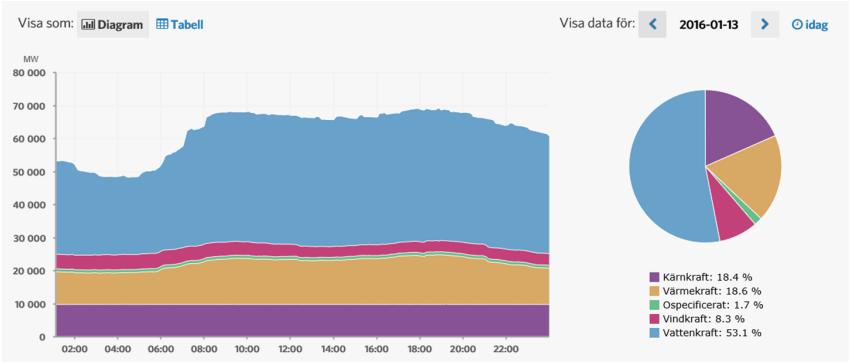
2030 Vision



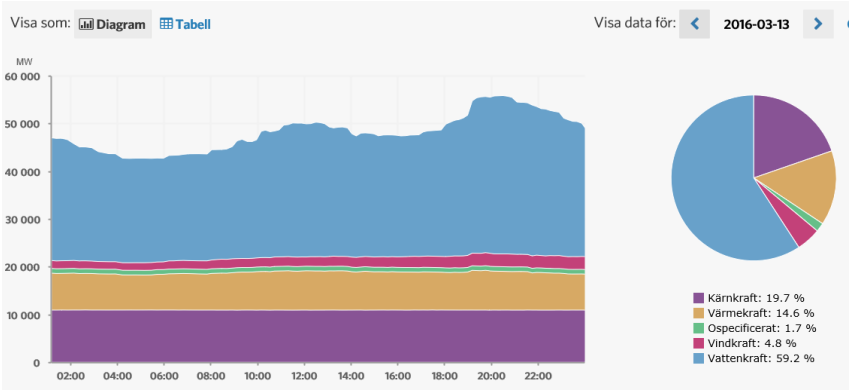
140–150 TWh

HIGH HYDRO AND WIND POTENTIAL ARE INCREASING EXPORT OPPORTUNITIES IN NORWAY

Hydro and nuclear power dominate electricity production (about 80%) in the Nordic electricity market



High consumption situation

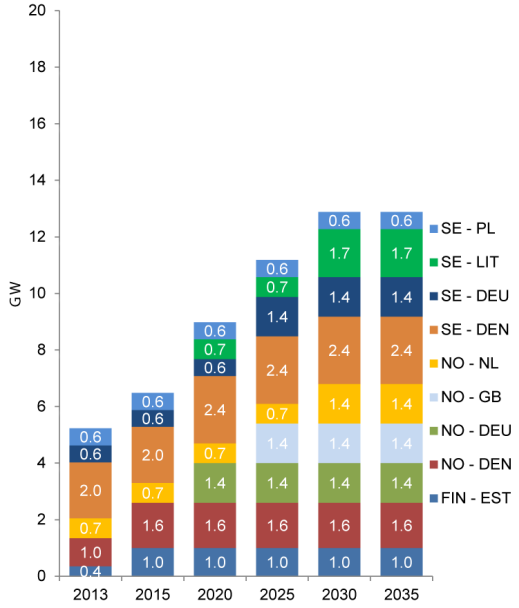


Normal consumption situation

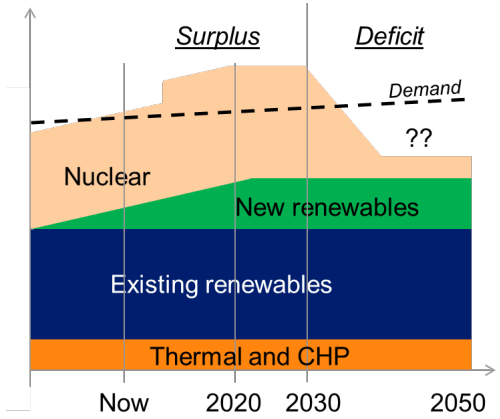
HYDRO DOMINANCE WILL INCREASE IN THE FUTURE AS A QUICKLY ADJUSTABLE REGULATING POWER FOR WIND, SOLAR AND FIXED NUCLEAR POWER

In the short- to medium-term, there will be an increasing surplus of electricity in the Nordics

Nordic grid connection plans

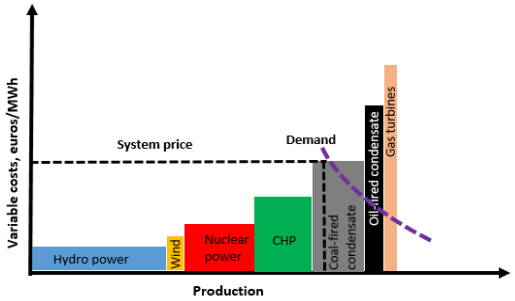


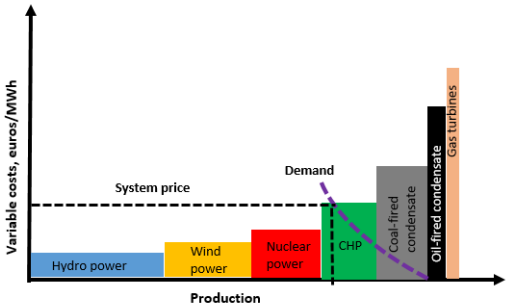
Simplified energy balance in NO-SE-FI



SWEDEN AND NORWAY WILL EXPAND GRID CONNECTIONS TO THE EUROPEAN MARKET

The use of renewable energy in electricity production is increasing due to its price competitiveness

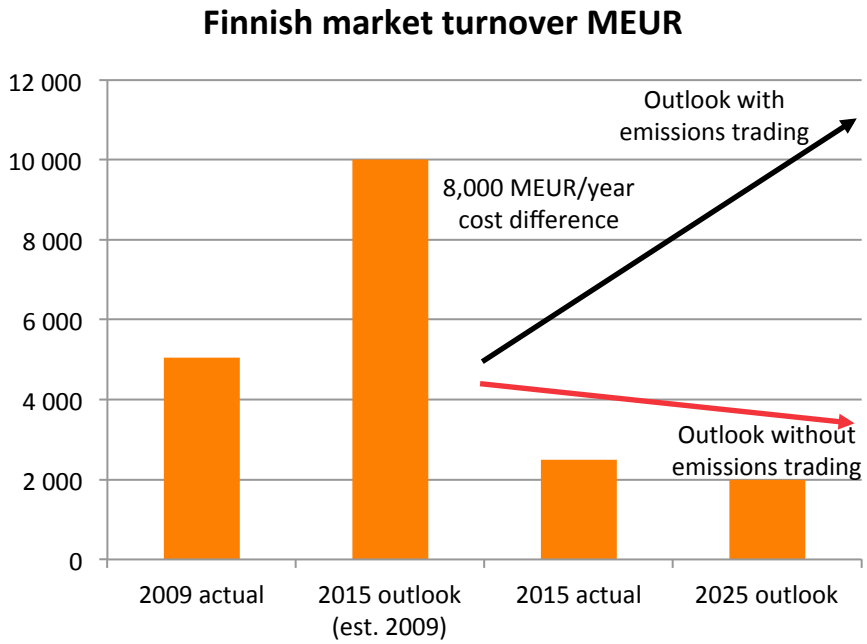




- Electricity price in Nord Pool market is based on the hourly offered supply prices
- Supply is brought to the market in a certain price order until the needed consumption demand is met
- The highest supply price required to meet the consumption demand is the market price for the whole electricity volume required

PLANTS USING MORE EXPENSIVE FOSSIL FUELS WILL INCREASINGLY MOVE TO THE CAPACITY MARKET AS ADJUSTING AND RESERVE POWER

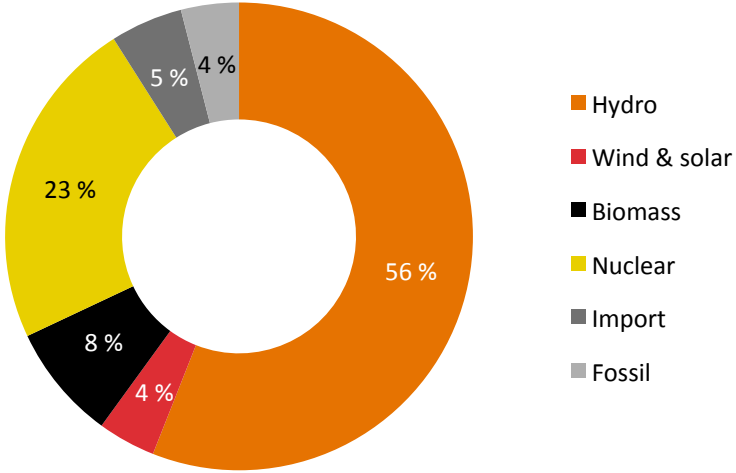
Electricity wholesale market has been changing dramatically since 2009 – Finnish example



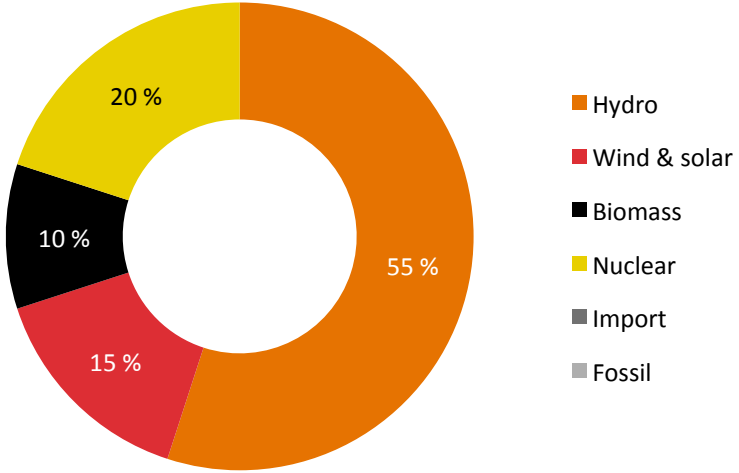
EMISSIONS TRADING INCREASES THE OVERALL COST OF ELECTRICITY AND DOES NOT LEAD TO RENEWABLE ENERGY INVESTMENTS IN THE NORDICS

Fossil energy will be minimized in Nordic electricity supply by 2030

2014



2030



WIND, SOLAR AND BIOMASS WILL INCREASE THEIR SHARE

Electricity market reform is unavoidable 1/2

- The targets of CO_2 emissions reduction and renewable energy strengthens the change in the power production structure
- The growth of renewable energy forces the current electricity market mechanism to change
  - Fixed running order of resources needs to become flexible to enhance the efficient use of the future energy portfolio
    - E.g. biomass capacity should be adjustable to better meet the variable need for electricity
- There is also an increasing need to maintain existing fossil electricity production capacity in the capacity market
  - For peak load and reserve use
  - To mitigate the effects of variable renewable electricity production and import disturbances

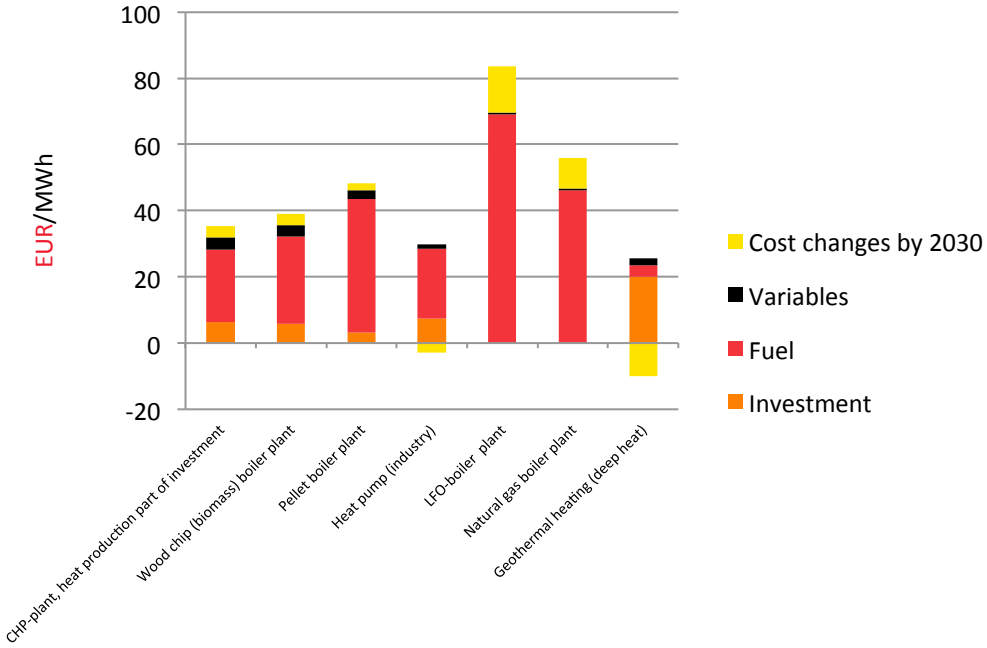
Electricity market reform is unavoidable 2/2

- The capacity market would guarantee electricity security without an excessive burden on electricity companies' balance sheet in changing future market situations
  - Securing reserve capacity could be established from existing gas turbine plants and coal condensate plants
- At the Nordic level there is also demand for
  - Increasing hydro power capacity
  - Increased transmission capacity to allow for flexible import and export in the region and to Europe
  - Different kinds of energy storage, such as pumped hydro and battery storages

NORDIC POWER PRODUCTION COULD EFFECTIVELY UTILIZE INCREASED TRANSMISSION CAPACITY

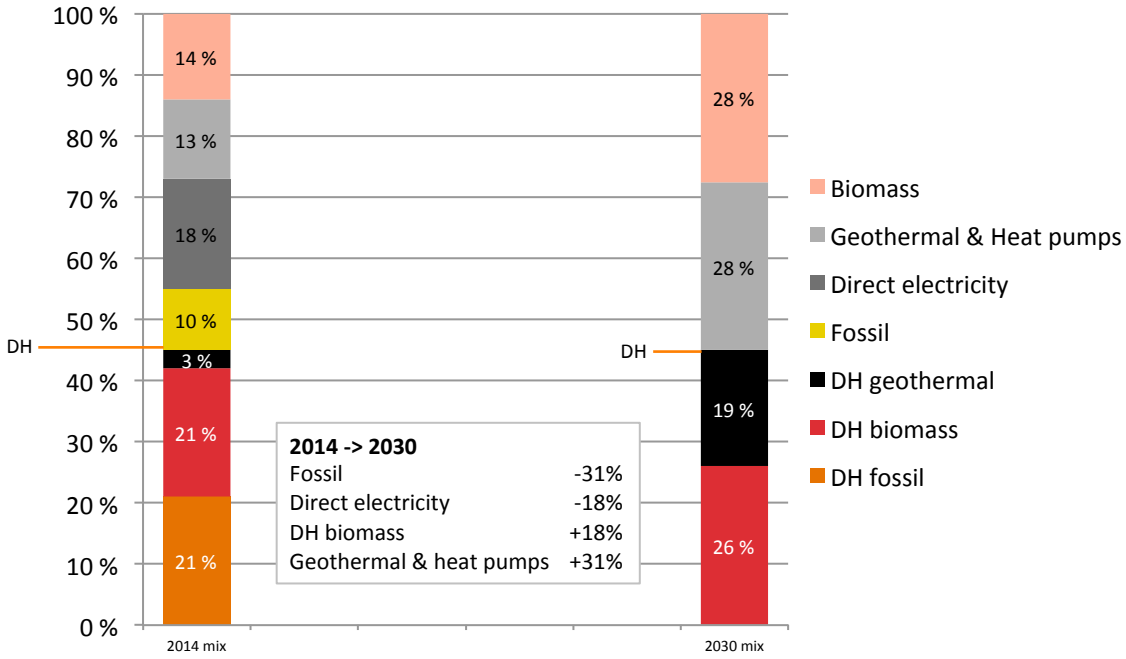
Heat Energy Outlook 2030

Competitiveness of renewable energy is improving in heating



GEOTHERMAL ENERGY AND BIOMASS ARE THE MOST COST EFFICIENT WAYS TO INCREASE RENEWABLE ENERGY IN HEATING

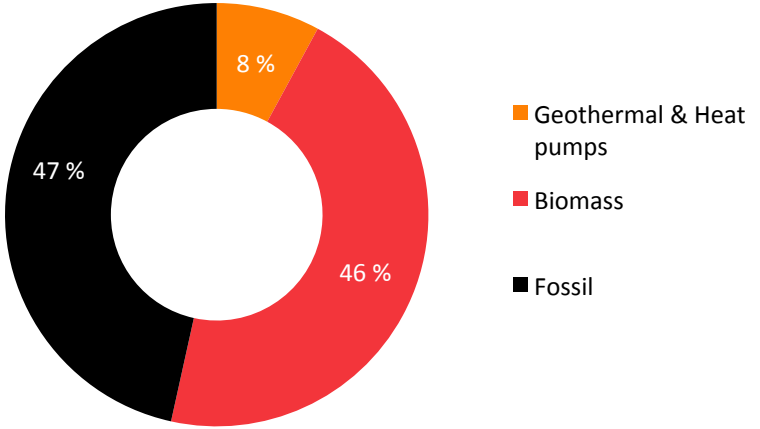
Fossil fuels and direct electric heating will be replaced by renewables in heating in Finland by 2030



FOSSIL FUELS REPLACEMENT WITH LOCAL RENEWABLE ENERGY OFFERS SIGNIFICANT BUSINESS AND EMPLOYMENT POTENTIAL

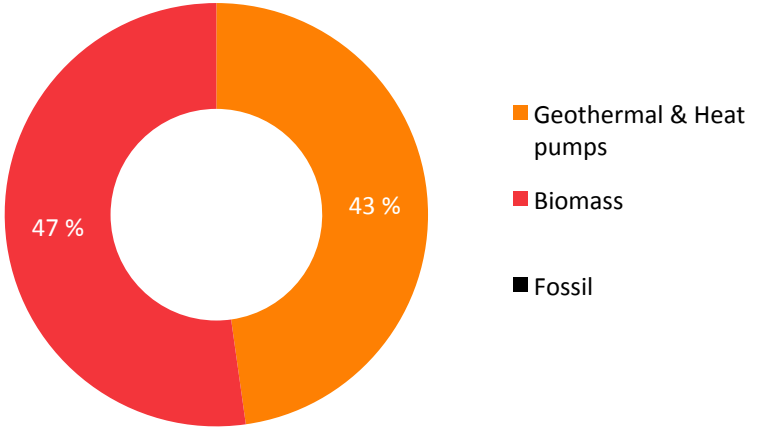
Fossil oil, coal and natural gas will be replaced by renewables in district heating in Finland

2013



35 TWh

2030 vision



35–40 TWh

FUTURE DISTRICT HEATING WILL BE BASED ON GEOTHERMAL AND HEAT PUMPS AND BIOMASS

Heating in Finland will face significant changes

In district heating, fossil energy will be replaced by

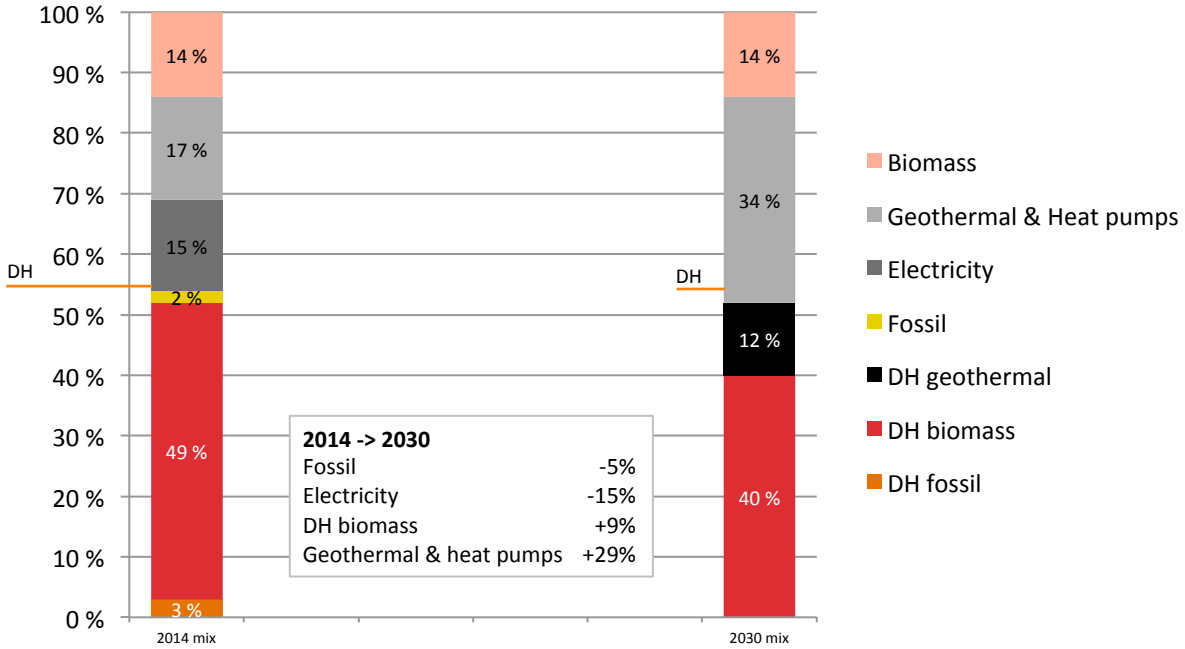
- Heat pumps and geothermal energy up to 12 TWh
  - Geothermal energy has the highest potential in existing 150 district heating networks producing base loads
    - 2030 potential estimate is 50*40 MW plants
  - New residential areas will use competitive local low-temperature small-scale heating and cooling networks provided by heat pumps
- Biomass up by 4 TWh
  - increasing role especially in peak load heat production

Outside district heating network, fossil fuels and direct electrical heating are estimated to be replaced by an increase of

- Biomass by 9 TWh
- Heat pump applications by 10 TWh
  - Total heat pump increase potential is estimated to be up to 15 TWh

GEOTHERMAL, HEAT PUMPS AND BIOMASS WILL REPLACE FOSSIL ENERGY IN HEATING IN FINLAND BY 2030

Heating in Sweden is already almost fossil-free



GEOTHERMAL ENERGY WILL ENTER THE SWEDISH HEATING MARKET BY 2020 AND THEN GROW TOWARDS 2030

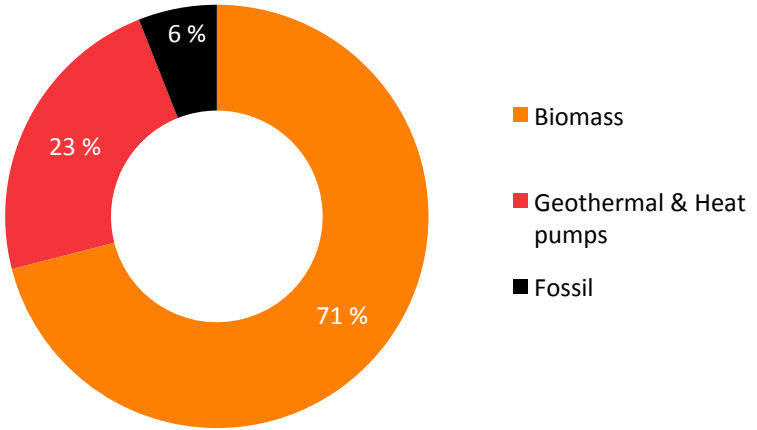
Geothermal energy has high potential in Sweden

- Geothermal energy use is estimated to increase 10 TWh by 2030
  - Fossil energy will be replaced by geothermal in district heating
  - Part of the biomass base load use will be converted to peak load use in district heating
- Political decisions are needed to improve the energy efficiency of direct electric heating in rural areas
  - The transition will mainly be seen towards local geothermal heating, air-water pumps, solar and wind solutions
- Heat pump potential is increasing due to the development of technologies and new business models

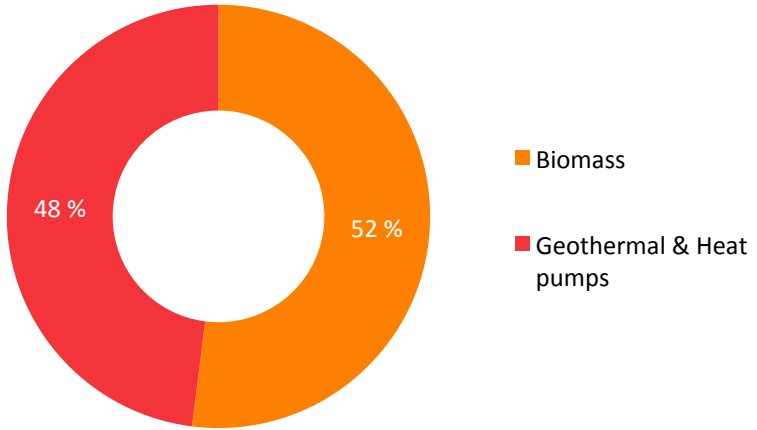
OTHER NEW HEATING SOLUTIONS ARE NOT FORESEEN TO PLAY AN IMPORTANT ROLE BY 2030

Fossil energy will be replaced by geothermal energy in district heating in Sweden

2014: 46 TWh

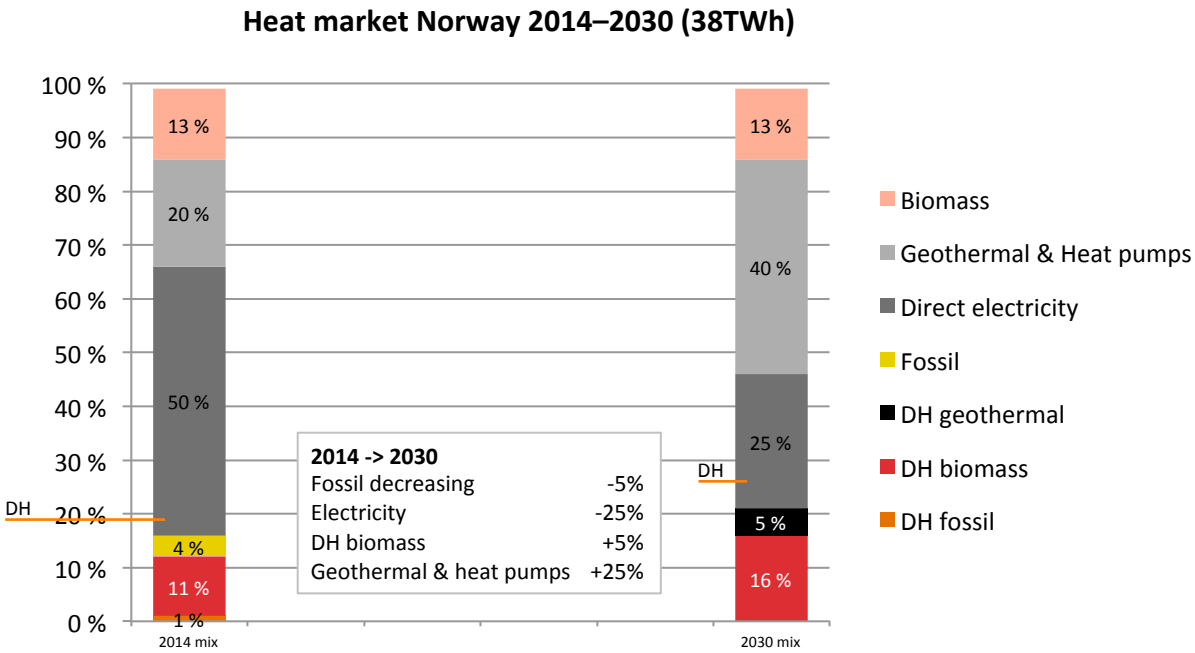


2030 Vision: 45–55 TWh



DISTRICT HEATING IS ESTIMATED TO KEEP ITS SHARE DUE TO THE GEOTHERMAL DEEP HEAT OFFERING INCREASED COST EFFICIENCY

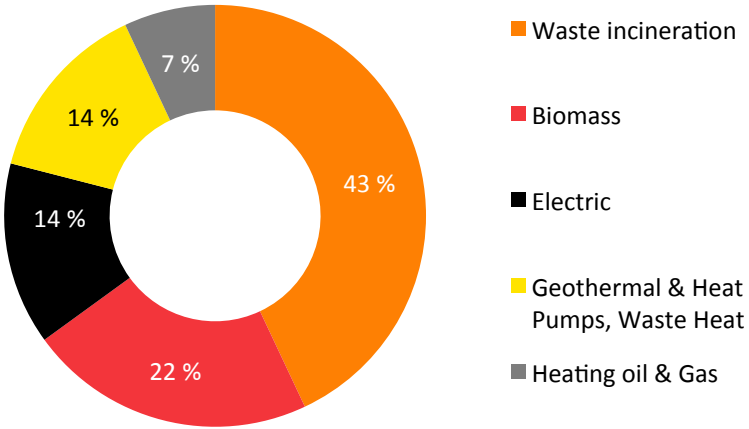
Heating in Norway is produced from electricity



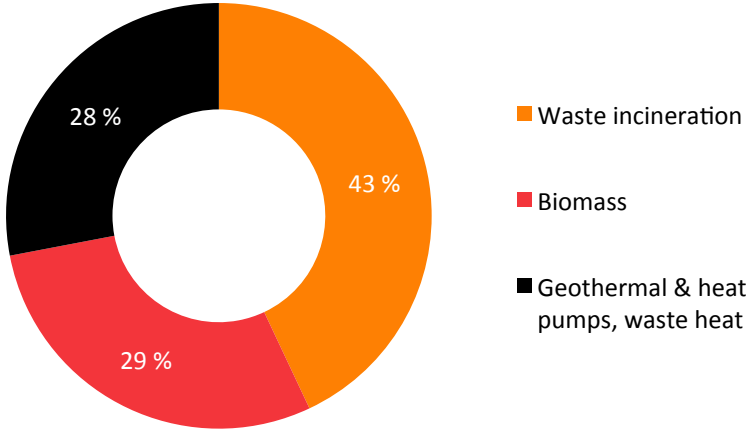
THE NORWEGIAN HEATING MARKET WILL FACE MINOR CHANGES

In Norway fossil energy will disappear and electricity use will decline in district heating

2014: 5,2 TWh



2030 Vision: 7 TWh



TRANSITION FROM FOSSIL ENERGY AND DIRECT ELECTRIC HEATING TO HEAT PUMPS WILL BE THE DOMINANT TRENDS BY 2030.

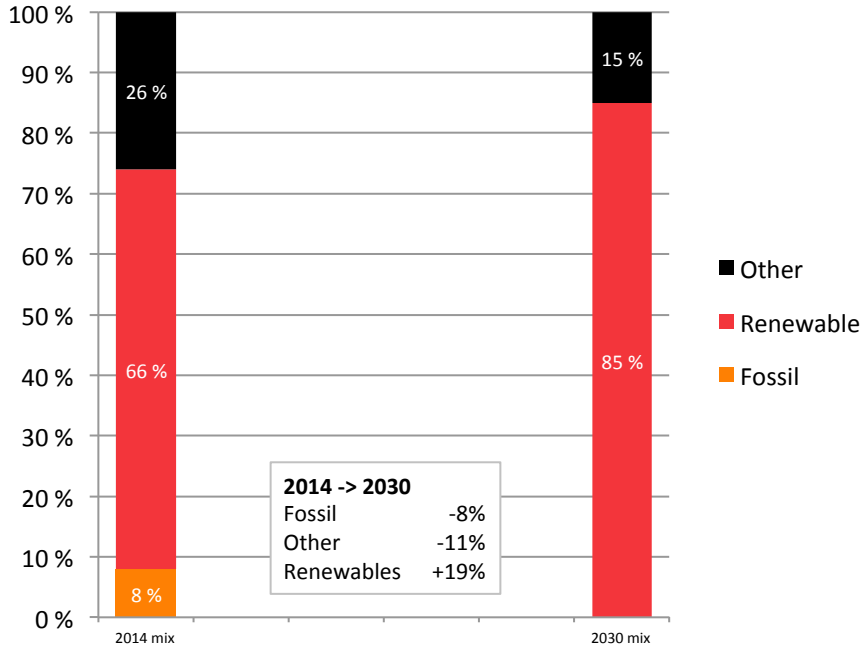
Heating market in Norway will remain electricity driven

- Relatively slow growth in district heating will continue in Norway as the main population centers are already realized, and new buildings coming onto the grid are very energy efficient
- Fossil fuels will disappear as an energy source in household heating
- Electricity will remain the dominant energy carrier and the attractiveness of alternatives will be limited by electricity surplus up to 2030
  - Separate incentives to increase the energy efficiency of direct electric heating will be required
- District heating has historically been driven by municipal waste management
  - The value and smarter use of waste could significantly decrease its use in heating, which will require new renewable sources

IMPROVED ENERGY EFFICIENCY REQUIREMENTS WILL LEAD TO INCREASED USE OF HEAT PUMP SOLUTIONS

Nordic Energy Outlook 2030 Summary electricity + heat

85% of electricity and heat 2030 in the Nordics will be renewable

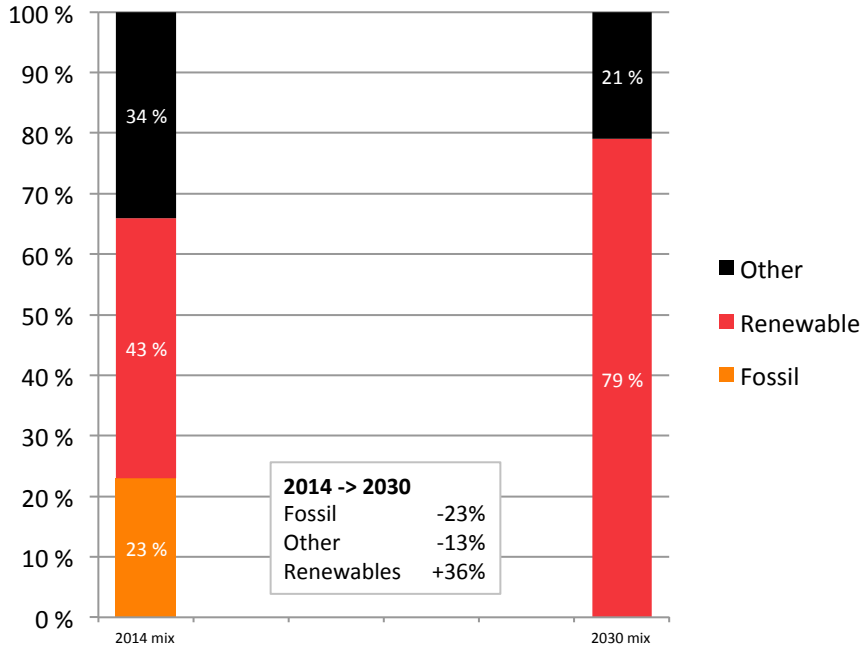


Main reasons for the transition:

- Climate change mitigation (+1.5 degree target)
- Cost effectiveness of renewable energy
- Enhanced energy security
- Trade balance improvement
- Positive employment effect

ENERGY INDUSTRY TRANSITION TO RENEWABLES IS DRIVEN BY POLITICAL DECISIONS

Renewable energy share in Finland is estimated to double by 2030 (electricity, heat)



FOSSIL ENERGY WILL BE REPLACED BY RENEWABLES IN THE ELECTRICITY AND HEAT MARKET

Fossil energy will be replaced by renewables in power and heat production in Finland by 2030 1/2

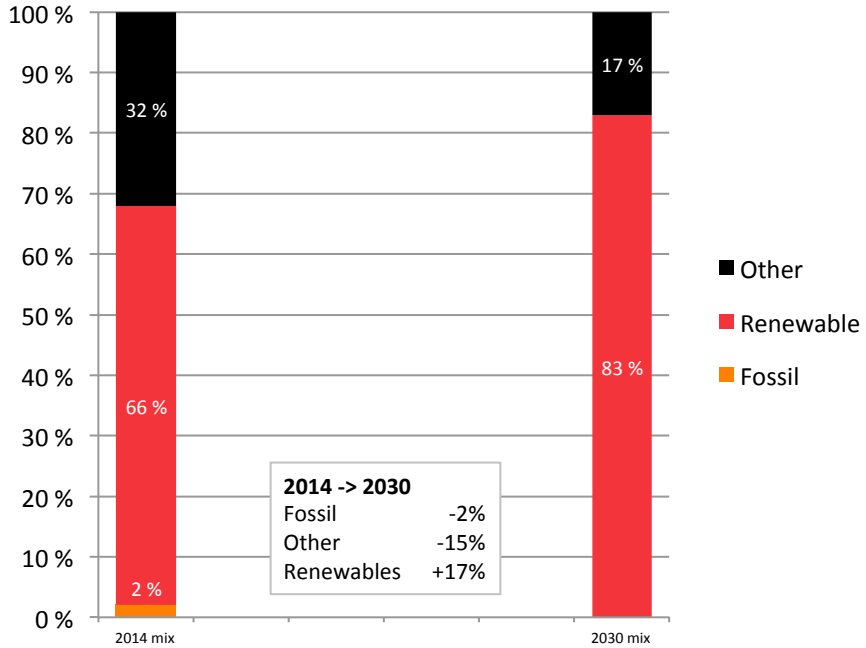
- Finland should move from import to export parity in electricity production
  - Security of supply, export opportunities and transition from imported fossil energy to renewables will be the key drivers
  - As emission trade does not lead to local investments, separate long-term political decisions regarding the production pallette and a cost efficient support system are needed already today
- The transition from fossil fuels to renewables in the heat sector should be secured by increasing fossil energy taxes
  - Separate incentives to increase the energy efficiency of direct electric heating will be required

Fossil energy will be replaced by renewables in power and heat production in Finland by 2030 2/2

- The value of wood biomass should be upgraded to more valuable biofuels, biochemicals, and balancing power production
- Biomass, wind and geothermal offer the most cost efficient renewable increase potential in Finland
- Investment support to R&D and demonstrations of new solutions should continue as a local focus area

USE OF BIOMASS, WIND, SOLAR AND GEOTHERMAL WILL INCREASE SIGNIFICANTLY

Renewable energy share in Sweden continues to grow up to 2030 (electricity, heat)



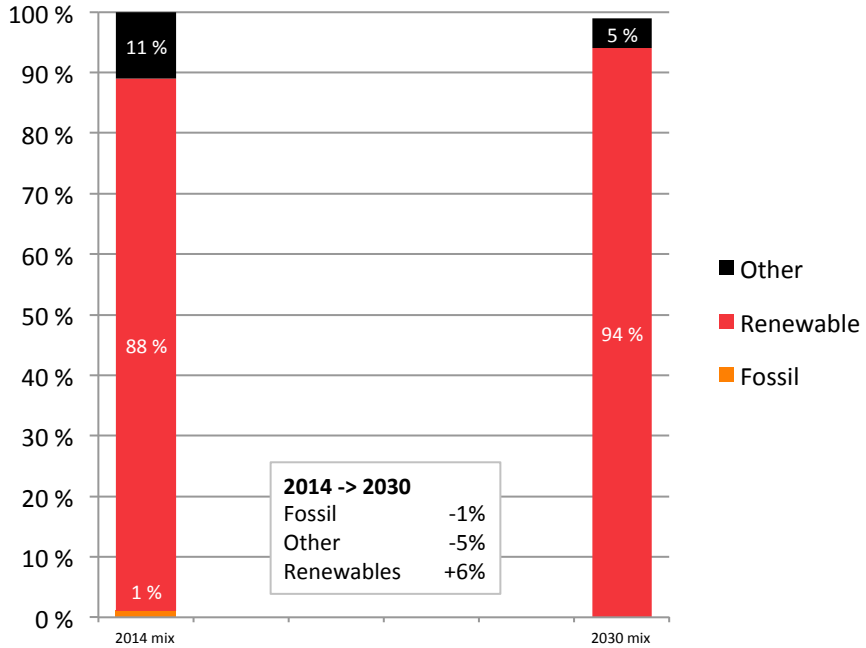
FOSSIL ENERGY WILL BE REPLACED BY RENEWABLES IN THE HEAT MARKET

A reduction in nuclear power in Sweden leads to increased renewables in power production

- The main focus area in electricity production is to maintain capacity security combined with a decrease of the nuclear capacity
  - As Sweden will continue to be an electricity exporter, long-term political decisions about the energy palette and future incentives to reach the target should be decided already today
  - Increasing wind power production will be the most cost efficient way to replace the reduction in nuclear power
  - Solar PV (converting solar energy into direct current electricity) will be a limited opportunity but most likely one focus area of government subsidies
- Geothermal and heat pumps will increase their share in heat production
  - Separate incentives to increase the energy efficiency of direct electric heating will be required
- Incentives for R&D and demonstrations of new solutions should be increased
- Biomass, wind and geothermal offer the most cost efficient renewable increase potential in Sweden

USE OF BIOMASS, WIND AND GEOTHERMAL WILL INCREASE

In Norway, power and heat production is renewable already today



REDUCTION OF FOSSIL ENERGY WILL EQUAL THE INCREASE IN RENEWABLES

Norway has the largest potential in the Nordics in hydro, wind and conventional balancing power storage capacity

- Hydro and wind power potential will lead to increased investments in international transmission capacity
- Separate incentives to increase energy efficiency of direct electric heating will be required
- Heating and cooling will be mainly electric, with pockets of central heating

THE MAIN DRIVER OF RENEWABLE INVESTMENTS IS THE BALANCING POWER EXPORT

Renewable business potential in the Nordics varies…

Finland	2014 share	2030 share	Change by 2030
Renewable	43%	79%	96%
Fossil	23%	0%	-100%
Other	34%	21%	-34%

Sweden	2014 share	2030 share	Change by 2030
Renewable	66%	83%	26%
Fossil	2%	0%	-100%
Other	32%	17%	-47%

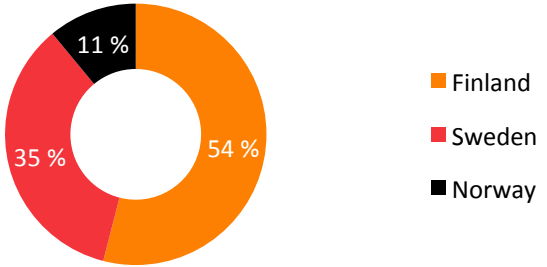
Norway	2014 share	2030 share	Change by 2030
Renewable	88%	94%	8%
Fossil	1%	0%	-100%
Other	11%	6%	-47%

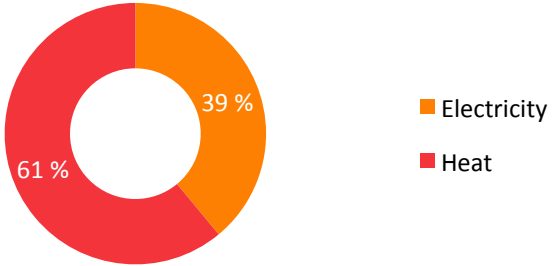
Renewable potential

65+ TWh

43+ TWh

13+ TWh





… FROM COUNTRY TO COUNTRY AND SECTOR BY SECTOR.

Total Nordic renewable annual increase 120 TWh by 2030…

- The overall electricity and heat market in the Nordic countries is estimated to be stable
  - Local electricity consumption (2014–360 TWh) is estimated to be stable, while a possible increase is affected by increased energy efficiency
    - Total electricity supply is estimated to be 350–400 TWh
    - Nordic market has high potential to increase the cost-efficient export production of wind and hydro electricity
    - Grid connections are needed to utilize north Nordic hydro and wind resources
  - Heat consumption (2014–230 TWh) is estimated to be stable, while energy efficiency investments have a potential decreasing effect
    - Total heat consumption is estimated to be 210–240 TWh
    - Geothermal energy will have an increasing role in changing direct heating to more cost efficient solutions and in improving energy efficiency
    - Remaining fossil energy in district heating networks is converted to renewables, using geothermal, waste and biomass as the main renewable sources

… IS ESTIMATED TO OFFER UP TO A EUR 40 BN INVESTMENT OPPORTUNITY

Renewable investments require a long-term, stable Nordic political investment environment 1/2

Incentives to replace fossil energy should be cost efficient and technology neutral

As emissions trading does not lead to local investments, separate long-term political decisions about the production pallette and a cost efficient support system are needed already today

- Power
  - A sliding premium based on the auction of cost per produced MWh leads to the most cost-efficient local and technology neutral production of defined renewable capacity and portfolio

Renewable investments require a long-term, stable Nordic political investment environment 2/2

- Heat
  - Long-term stable outlook for increasing fossil energy taxes leads to a cost-efficient and technology neutral transition to energy efficient renewable heat production
    - Separate incentives to increase the energy efficiency of direct electric heating will be required
- R&D
  - Separate investment support based on the auction system leads to the cost-efficient development of new renewable business models and technologies

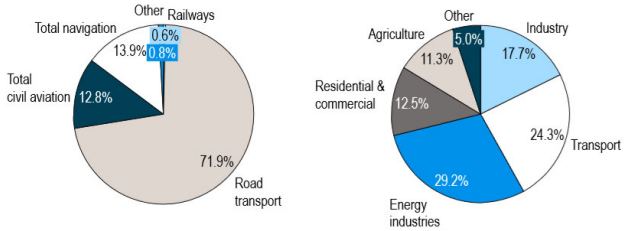
POLITICAL DECISIONS FOR 2030 RENEWABLE ENERGY PALETTE AND INCENTIVES ARE NEEDED ALREADY TODAY

Nordic Energy Outlook 2030: Road Transport

Transport is responsible for almost 25% of GHG emissions in the EU

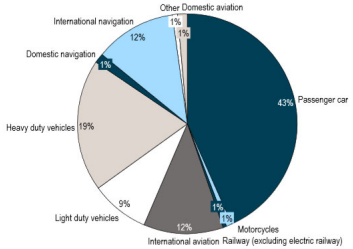
- Road transport corresponds appr. 70% of the total transport GHG emission in the EU
- Due to the difficulty, cost and urgency of decarbonisation measures, it should not left to be handled by market-based mechanisms such as Emission Trading System (ETS)
  - ETS will contribute to sectors with lowest costs to decarbonize first, thus it would easily delay transport decarbonizing measures by 15–25 years
- Urgent transport decarbonization measures are imperative, which require the use of existing infrastructure to begin with the existing vehicle fleet

Road transport GHG in the EU by vehicle segment, 2012 [%]



Source: European Commission

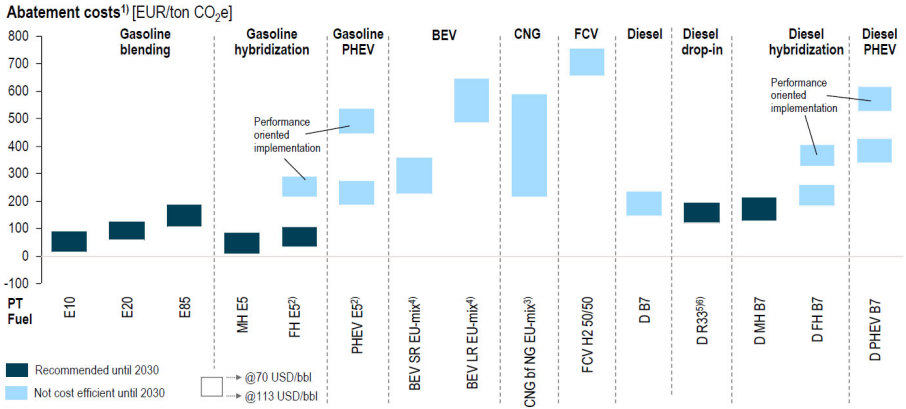
GHG emissions by transportation mode in EU28 by sector in 2013 (%)



Source: Transport emissions rising (EEA, 2015b)

Advanced biofuels decarbonise cost effectively

WTW GHG abatement costs for society, new C-segment PC 2030 [EUR/ton CO_2e]

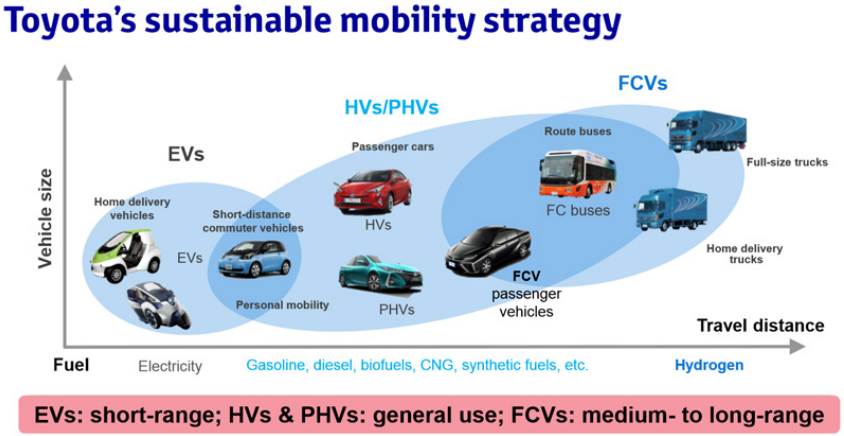


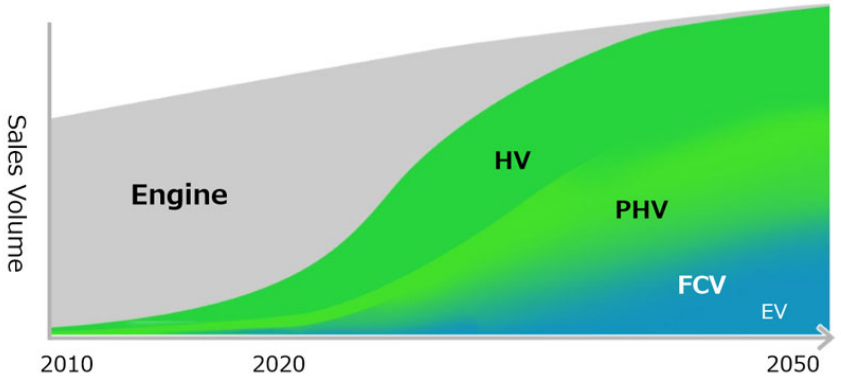
1) Compared to optimized Gasoline powertrain 2030 using E5, all technologies with 250,000 km lifetime mileage 2) 30% e-driving, higher e-driving share reduces abatement costs
3) Large range between scenarios driven by decoupling effect of natural gas price 4) Risk of higher abatement costs due to need of second battery over lifetime,
SR – short range with 35 kWh battery capacity, LR – long range with 65 kWh battery capacity, both using 2030 EU mix electricity, 5) Diesel fuel with 7% FAME and 26% HVO
6) Abatement cost in existing vehicle: -67 EUR/ton CO_2 (high oil price), 7 EUR/ton CO_2 (low oil price)

HYBRIDISATION COMBINED WITH ADVANCED BIOFUELS HAS MOST REALISTIC CO_2 ABATEMENT POTENTIAL BY 2030

SOURCE: Integrated Fuels and Vehicles Roadmap to 2030+, Roland Berger

Different powertrains for different needs



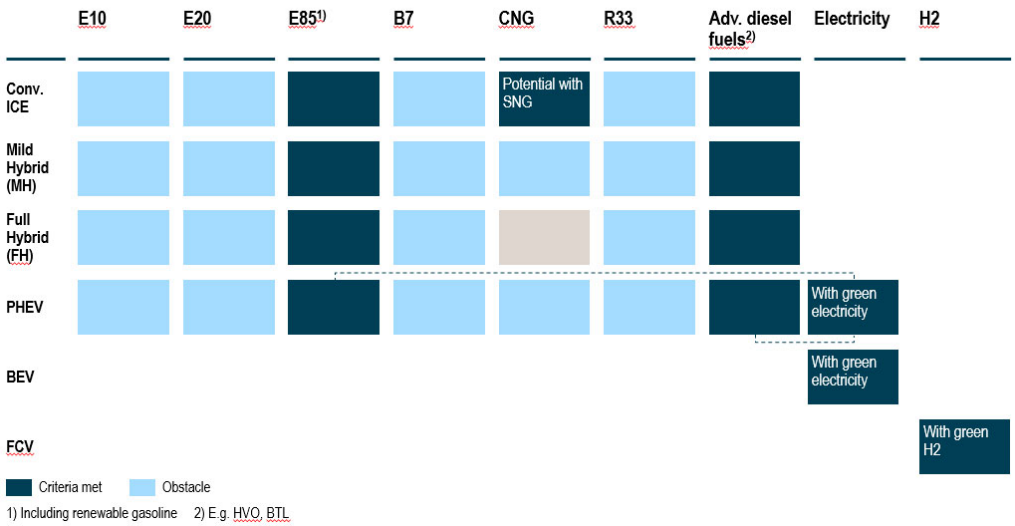


WITH DIFFERENT TIMELINES FOR MARKET PENETRATION

SOURCE: Toyota

An integrated approach of technologies and fuel types will allow for ultra low carbon emissions in road transport sector

Evaluation of paths/technologies PC for optimal pathway 2030+



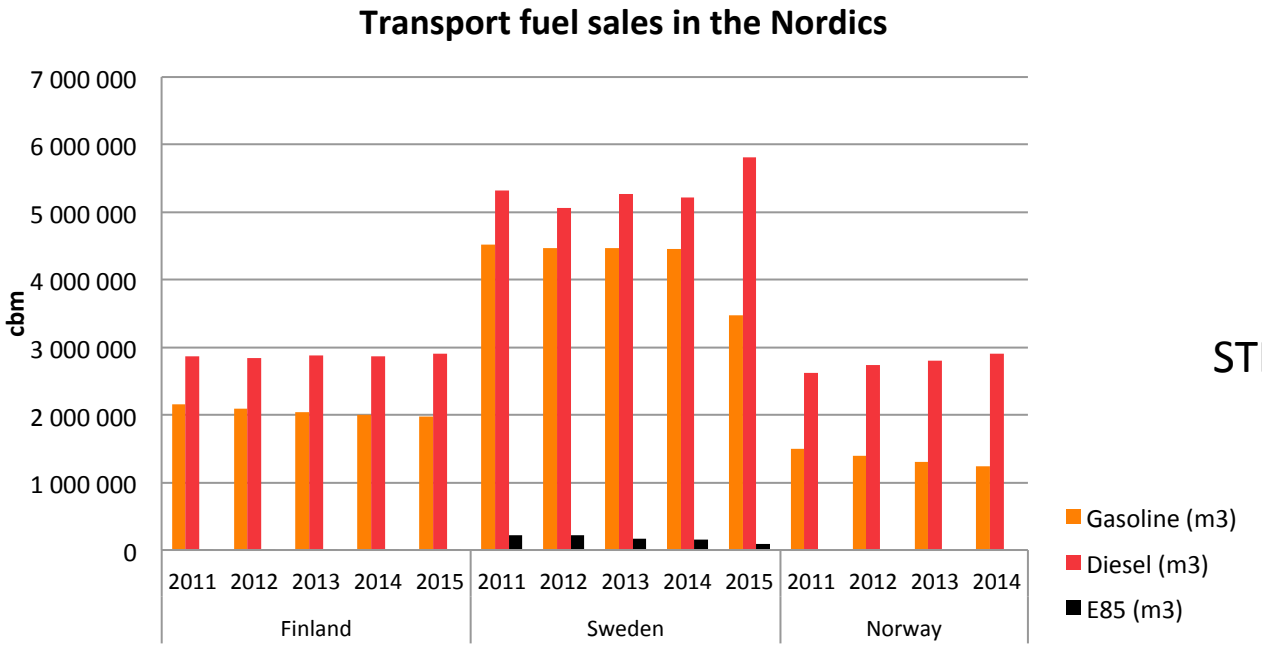
HIGH BLENDS OF ADVANCED BIOFUELS WITH HYBRIDIZATION PLAY MAJOR ROLE IN ULTRA LOW CARBON SOLUTIONS BEYOND 2030

SOURCE: Integrated Fuels and Vehicles Roadmap to 2030+, Roland Berger

Blending walls cap the intake of advanced biofuels

Biocomponent	Standard or specification	Blend wall	Vehicles	Fuel infrastructure
HVO/BTL low blends	EN 590 Diesel	Drop-in EN 590 up to density hurdle (tens of % points)	Entire diesel fleet	Current diesel infra
FAME	EN 590 Diesel	Max 7% in diesel (B7)	Entire diesel fleet	Current diesel infra
Ethanol low blends (E5, E10)	EN 228 gasoline	Max 10% in gasoline	Entire gasoline fleet	Current gasoline infra
Ethanol mid blend (E20)	Standardisation initiated in CEN	Max 20% in gasoline	Only E20 compatible vehicles or FFV	Current gasoline infra, but may require investments (eg. corrosion)
FAME	prEN 16734 B10 EN 16709 B30	Max 10% or 30% in diesel (winter properties not sufficient)	Only B10 or B30 compatible vehicles	Specific infra required
High Blends				
HVO/BTL 100%	EN 15940 paraffinic diesel	No blend wall: 100% as such	Separately certified diesel vehicles	Specific infra required
ED95	Mothballed in CEN	Ethanol max 95%	Specifically manufactured diesel engines; not compatible with diesel	Specific infra required
Ethanol high blend E85	TS 15293	Ethanol max 85%	FlexiFuel Vehicles (FFV, also compatible with gasoline)	Specific infra required
FAME B100	EN 14214	100% (winter properties not sufficient)	Specifically manufactured diesel engines	Specific infra required
(Bio)methane		Not blended	CNG-vehicles; PC typically bi-fuel system with separate gasoline tank	Specific infra for gaseous fuels required

Nordic gasoline volume continues to decline



WHEREAS DIESEL IS
STILL SLIGHTLY GROWING

Overall Nordic demand for liquid fuels will decrease

- Overall energy efficiency is estimated to cut road transport energy demand by 20–25% by 2030 vs. 2014 level (*
  - Key driver is the 95 g/km target by 2020 which is pushing car manufacturers (OEM) to invest in electrification, hybridization and in internal combustion engine (ICE) energy efficiency improvements
  - Battery Electric Vehicles (BEV) remain relatively expensive slowing down the e-mobility penetration pace compared to what is generally believed
  - Mild hybrid (MH) and full hybrid (FH) vehicles (gasoline and electricity) are cost effectively abating CO_2 emissions
  - Plug-in Hybrid (PHEV) is relatively more expensive than MH and FH, thus is more appealing with high annual mileage in urban areas (maximizing the share of e-driving)
  - In Norway e-mobility is assumed to grow fastest in the Nordics through widely accepted political targets and aggressive incentive schemes
- Gasoline demand will continue to decrease up to 25–35% by 2030 vs. 2014 level
  - Gasoline powertrain remains the most cost effective option offering a good platform for increasing the share of advanced biofuels
  - European standard of E20 is expected in 2025
  - E-mobility is slowly replacing gasoline powertrain especially due to the typically shorter annual mileage of gasoline cars

BUT THE INTERNAL COMBUSTION ENGINE WILL STILL BE DOMINANT POWERTRAIN IN 2030 AND BEYOND

*) Integrated Fuels and Vehicles Roadmap to 2030+, Roland Berger & own assessment

Nordic diesel demand declines in the passenger car segment

- Demand for diesel is estimated to grow for some years before it starts to decrease cumulatively up to 10–15% by 2030 vs. 2014. The entire decline is expected in passenger cars (PC) ~-25%, whereas commercial diesel in HD and LD segments is expected to be flat or to slightly decline
  - Tightening EURO 6 emission regulation for Diesel vehicles results in higher vehicle prices (eg. installations of urea-SCR and low and high EGR) that will cause a shift gasoline vehicles in small diesel cars, especially in the A (e.g. VW Up!) and B (e.g. VW Polo) segments
  - Diesel will also lose ground in the C (e.g. VW Golf) and D (VW Passat) segments through hybridisation.
- Due to the slow renewal pace of the car fleet, advanced liquid biofuels offer the most viable decarbonisation business opportunity up to 2030 and even beyond, though highly impacted by political decisions.

HOWEVER, COMMERCIAL TRANSPORT REMAINS DEPENDENT ON DIESEL

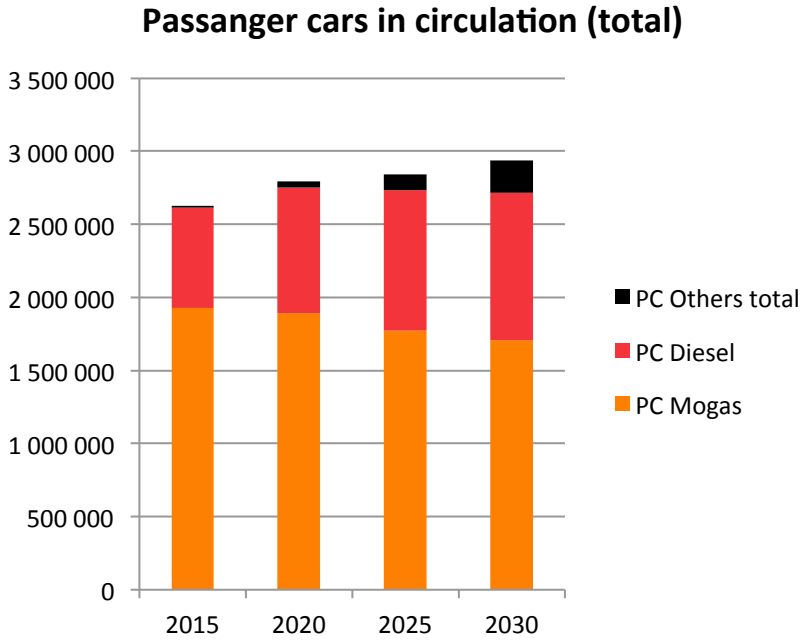
Finland: A good combination of mandate and tax structure

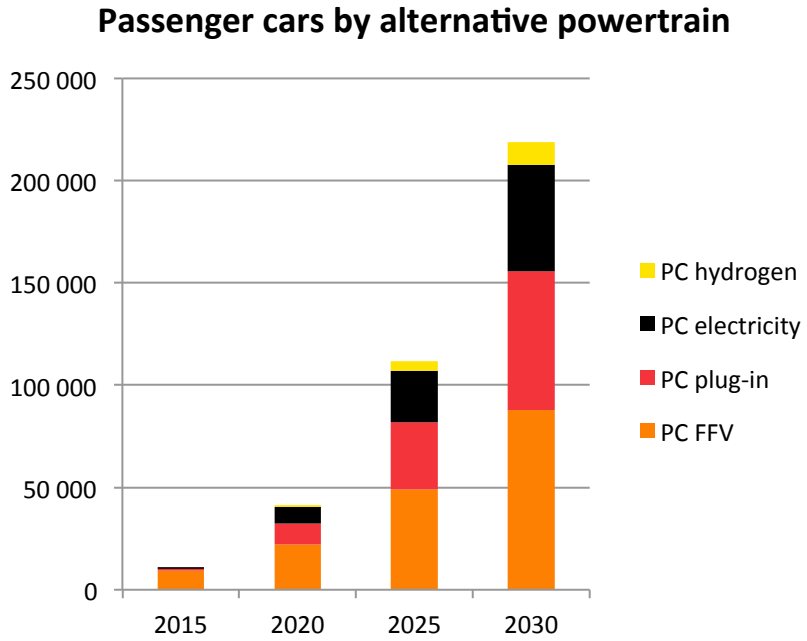
- The biofuels mandate increases up to 20% energy by 2020 with double counting allowed (2015: 10%)
- The technology neutral taxation model includes all liquid fuels with same principles, but giving excessive benefits to CNG and electricity
- Excise tax has two components: Energy component and CO_2 component
  - Secures tax income regardless of changes in the product mix
  - Energy tax for Gasoline 1.6 snt/MJ and Diesel 0.88 snt/MJ
  - CO_2 tax is EUR 58/t CO_2

Product	Product category	Energy content tax (c/l)	CO_2 Tax (c/l)	Energy Security Supply fee (c/l)	Total (c/l)
Motor Gasoline cents/litre	10	51.20	16.25	0.68	68.13
Small engine gasoline cents/litre	11	31.20	16.25	0.68	4.13
Bioethanol cents/litre	20	33.60	10.67	0.68	44.95
Bioethanol R cents/litre	21	33.60	5.33	0.68	39.61
Bioethanol T cents/litre	22	33.60	0.00	0.68	34.28

BUT ALL FUELS SHOULD BE TAXED ON AN EQUAL BASIS

Number of PC's is expected to grow slightly





SOURCE: St1 own estimate

Advanced biofuels increase has neutral to positive effect on GDP

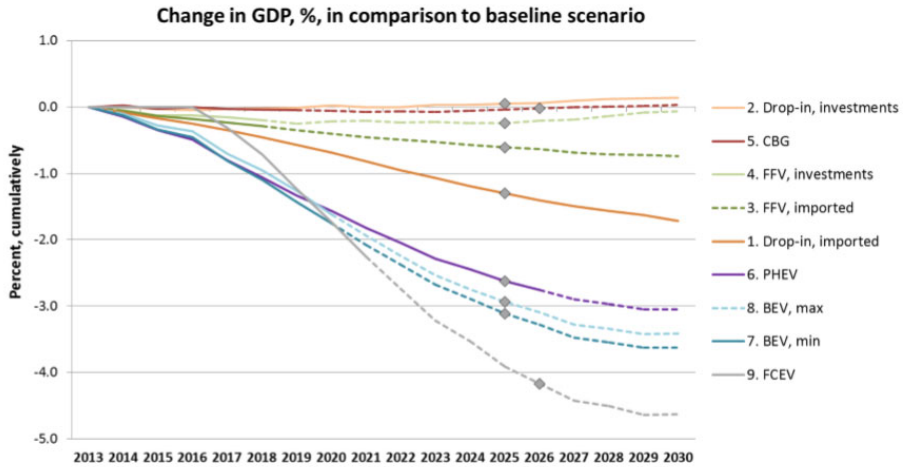
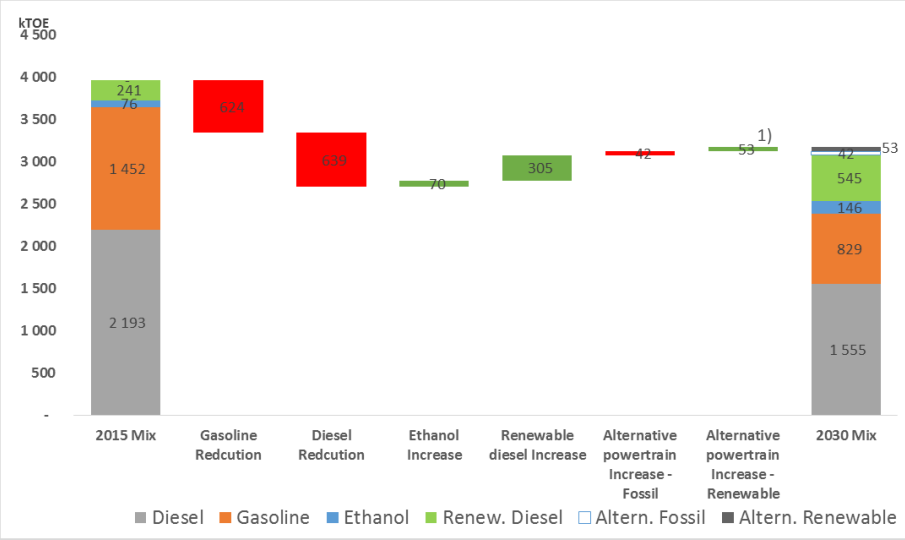


Chart 1: GDP effects of different scenarios[7] (♦ =30 per cent reduction obtained).

ALTERNATIVE POWERTRAIN SCENARIOS RESULT IN NEGATIVE GDP DEVELOPMENT

VTT Research Report VTT-R-00752-15

Domestic biofuels' increase of 400 kTOE/a will be triggered by 40% mandate with double counting



INCENTIVISED BY INVESTMENT SUPPORT PROGRAM

1) Renewable energy share in alternative powertrain vehicles (e.g. electricity, gas)

Finland 2030 renewable energy target in transport among the highest in the EU

40% renewable energy by 2030 in transport and the reduction of fossil oil-based energy by 50%

- Increase Renewable energy mandate up to 40% by 2030
  - Binding mandate to advanced biofuels and renewable alternative energy carriers of min 33% (16,5% real) + max 7% for 1G biofuels
  - + 1% increase per year up to 2025 (2025: 7%+9%x2) and +2–3% per year after that (2030: 7%+16,5%x2)
  - Local E20 standard to be implemented by 2020 and E30 by 2030
  - Accept FFV conversions to Euro 4/5 cars
  - Domestic investment on domestic feed-stocks needs to be ensured by carefully designed investment grant program

TRIGGERING DOMESTIC INVESTMENTS IS THE KEY MOTIVE FOR SETTING THE TARGET

Finland 2030 renewable target among the highest in the EU

- Double counting has to be included in national legislation by 2020 – beyond EU targets
  - No change to the existing raw materials for double counting (e.g. waste, residues and residual wood). National freedom to operate beyond EU target (10% in 2020). Double counting should also be set on renewable alternative energy carriers (electricity, gas etc.)
  - EU GHG-reduction target and sustainability criteria to be met
- Fuels and vehicle taxation changes
  - Increase fossil CO_2 tax up to EUR 100/CO_2 ton by 2025
  - Reduction of biofuels' share from fossil CO_2 to be taken into account in car taxation
  - Diesel to be fully taxed also on energy
  - Same fossil and biofuels taxation including CNG, BNG, LNG and transport electricity
  - Seek to remove the EU minimum fuel tax level from advanced biofuels

REQUIRES BLENDING MANDATE, DOUBLE COUNTING AND INCREASED CO_2 TAX

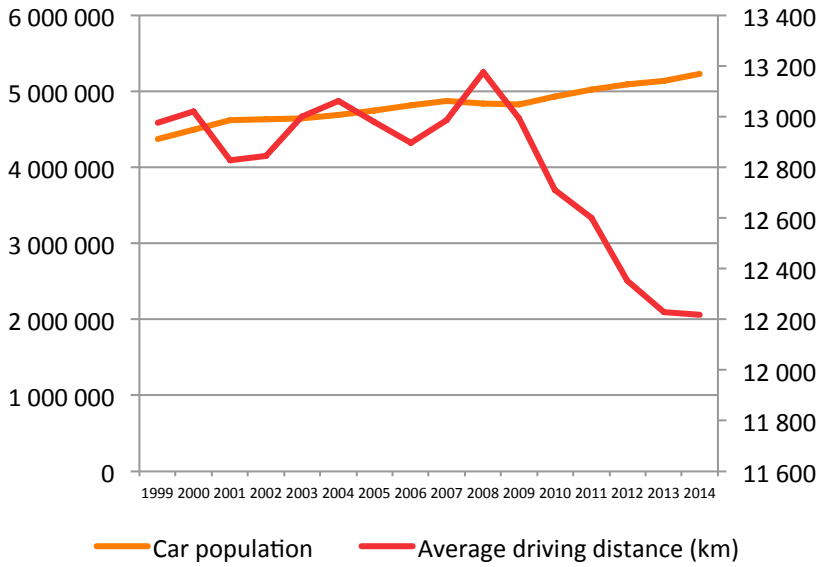
Sweden: Tax exemptions effective in the short term but do not trigger investments in new capacity

- Tax exemptions for biofuels :
  - Taxation includes energy tax & CO_2 tax
  - No mandate structure introduced so far
- Separate tax incentives for different low blend biofuels
  - Ethanol: reduced energy tax 74%, CO_2 tax 100% exemption, no volume limits
  - ETBE (biopart): both taxes 100% exemption
  - RME/FAME: reduced energy tax 8%, CO_2 tax 100% exemption
- For high-blends:
  - E85: reduced energy tax 73%, CO_2 tax 100% exemption
  - ED95: full tax exemption
  - B100: reduced energy tax 50%, CO_2 tax 100% exemption
  - HVO: 100% full tax exemption

Product	Energy tax (SEK/m³)	CO_2 tax (SEK/m³)	Total (SEK/m³)
Mogas	3.720	2.590	6.310
Diesel	2.355	3.204	5.559

Car pool in Sweden is estimated to increase but average driving distance continues to decrease

Car population-Average driving distance



Proposed shift to Bonus–Malus earliest in 2017

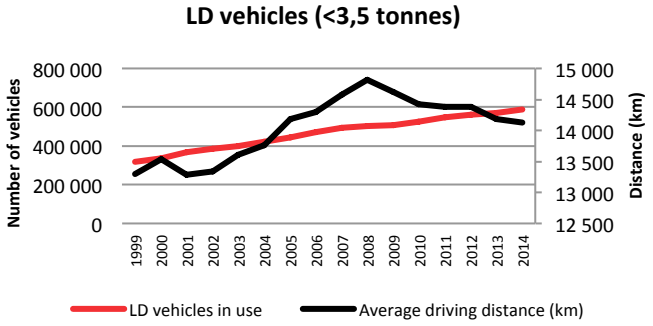
Level	Bonus/malus SEK	2017–2019 g CO_2/km	2020–2022 g CO_2/km	Description
A Bonus	50,000	0–29	0–20	BEV, FCEV
B Bonus	25,000	30–60	21–50	PHEV >50 km cert. range, biogas
C Bonus	10,000	61–80	51–70	FFV och Biogas, PHEV< 50 km
D (Neutral)	+/-0	81–120	71–100	Fuel efficient
E Malus	-10,000	121–160	101–130	Bad fuel efficient
F Malus	-25,000	161–200	131–170	Fuel gussler
G Malus	-50,000	201–	170–	Fuel guzzler

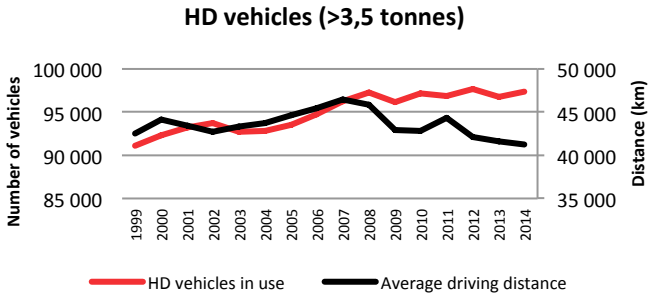
Bonus-Malus to push down average consumption

- The number of passenger cars in traffic is estimated to grow to 5 million by 2030 (4,7 in 2015)
- Expected growth together with company car fleets offers the main channel for increased alternative powertrain penetration
- The proposed Bonus-Malus is likely to push down the average fuel consumption and promote PHEV
- Gasoline is expected to remain strong as main/secondary fuel in PHEV
- Promotes diesel over gasoline vehicles due to its lower GHG intensity per kilometer driven
- Car pooling and congestion fees may result in peak car by 2030

BUT DOES NOT YET INCENTIVISE FOR INCREASED ADVANCED BIOFUELS UPTAKE

High blend solutions imperative in commercial fleets due to lack of feasible alternatives





Light Duty vehicles (<3,5 t):

- Significant increase in the number of vehicles (eg. due to increase JIT deliveries)
- Local transports shifting increasingly to alternatives

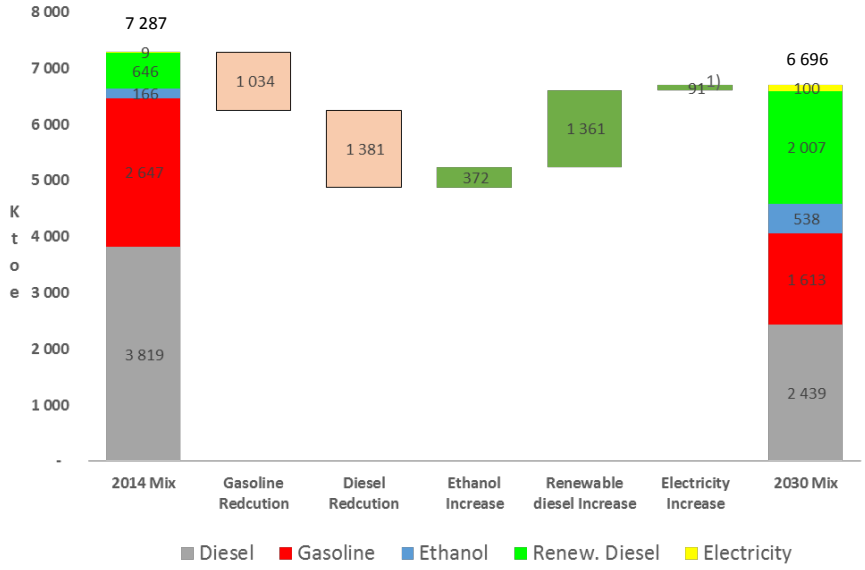
Heavy Duty vehicles (>3,5 t):

- Moderate increase in the number of vehicles (eg. due to increased international competition)
- Limited possibility to shift to alternative power trains
- Drop-in fuels will be key for both short and long haul

Fossil Independent Transport (FFF) 2030 sets ambitious target but without concrete measures

- Significance E85 is fading due to limited FFV offering and uncertainty around tax legislation
- There is a limitation (density in “drivmedelslagen”) in the amount of blend on diesel of 50%, which will probably be reached early in the period up to 2030
- No binding plans in place to further increase the share of biocomponents up to 2030
- We anticipate the following measures to be introduced:
  - Bonus-Malus on cars is likely to be introduced in 2017
  - Road tax on HD road transportation estimated to be introduced in the second half of the period
  - HVO 100 will be a significant contributor in the diesel pool in the short to medium term due to the blend wall in gasoline
  - GHG or energy based renewable energy quota obligation likely to be introduced by 2019
  - Large scale shift from E5 to E10 by 2019, and from E10 to E20 by 2025
- We assume to reach of a 41% biofuels share (volume) at 2030. However, it will fall short vs. FFF 2030 target due to vague political actions and lack of mid- & long-term incentives

Long-term policies are required to trigger domestic investments and to reach FFF targets



BINDING BLENDING MANDATE SET ON OIL COMPANIES WITH DOUBLE COUNTING HAS PROVEN TO BE EFFECTIVE TOOLBOX TO TRIGGER INVESTMENTS!

1) Renewable energy share in alternative powertrain vehichles (eg. electricity, gas)

Increase in domestically produced biofuels require binding blending mandate

A renewable energy mandate of 15% (energy) in 2019 and increase it to 30-35% in 2030

- Binding mandate of min 23–28% + max 7% for 1G biofuels. One pool for all fuels
- Increase mandate by 1–3% per year
- Local E20 standard to be implemented by 2020 and E30 by 2030
- EU GHG-reduction target and sustainability criteria to be met

Clear and long term taxation with two components: Taxes on energy and CO_2

- Set fossil CO_2 tax to EUR 100/CO_2 ton by 2025

Additional support/incentive programs from government needed

- Domestic investment on domestic feed-stocks ensured by carefully designed investment grant program

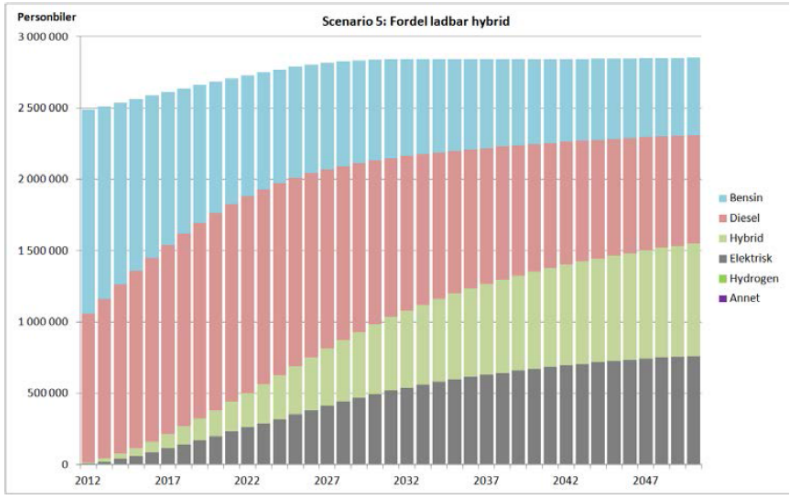
Norway: New hybrid system of tax exemption and mandate cannot be reappraised on effectiveness yet

- New mandate was introduced 1.10.2015
  - 5.5% volume mandate
  - Tax exemptions for volumes beyond mandate
- Expected introduction of significant volumes of HVO into Norway
- Potential for higher ethanol contents in gasoline, but no real development yet

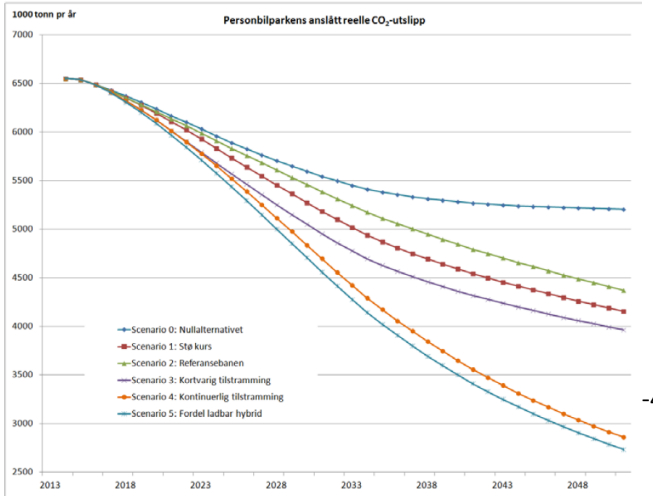
NOK/L	Road Use	CO_2	Total
Diesel	3.44	1.12	4.56
Biodiesel	3.44	0	3.44
if above mandated volume	0	0	0
Gasoline	4.99	0.97	5.96
Ethanol	4.99	0	4.99
if above mandated volume	0	0	0

Electric vehicles are estimated to grow significantly in Norway by 2030

Car Fleet Composition 2030



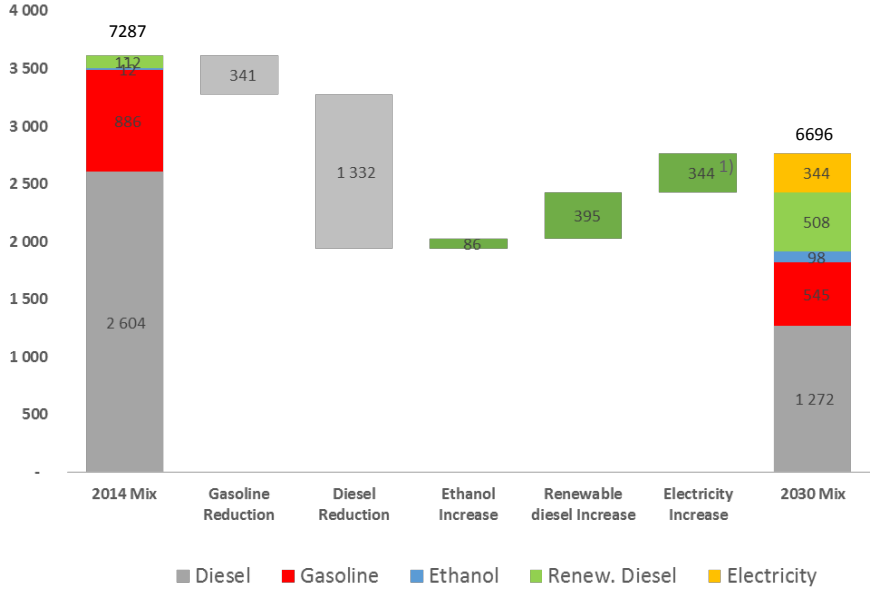
Emissions 2030



-40%

HOWEVER, THE INTERNAL COMBUSTION ENGINE IS STILL EXPECTED TO BE DOMINANT IN 2030

Heavy incentivization of e-mobility is expected to replace 1,100 KTOE of fossil by 2030



BALANCE OF 500 KTOE NEED TO BE COVERED BY ADVANCED BIOFUELS

1) Renewable energy share

Advanced biofuels blending mandate of 30% is imperative to reach 40% GHG target

A renewable energy mandate of 10% in 2020, to be increased to 25–30% in 2030

- Binding mandate of min 18–23% + max 7% for 1G biofuels. One pool for all fuels
- Increase mandate by 1–3% per year
- Local E20 standard to be implemented earliest possible and E30 by 2030
- EU GHG-reduction target and sustainability criteria to be met locally for non-ETS sector

Clear and long term taxation with two components: taxes on energy and CO_2

- Set fossil CO_2 tax to EUR 100/CO_2 ton by 2025

Domestic investment on domestic feed-stocks ensured by carefully designed investment grant program

- Secure Norway's supply of advanced Biofuels. Potential shortage of advanced biofuels is a risk
- Incentivized local production of advanced biofuels, including drop-in variants is cheaper than winning the "regulatory" arbitrage game and better industrial policy
- Incentivized research into ways of leveraging electricity surplus and available feedstock to produce drop-in bio fuels

Blending mandates trigger domestic investments

	Finnish System	Swedish System	Norwegian system
Pros	+ Investment security through clear mandate structure and long term view + Supports increasing low carbon fuel alternatives in fuel blending	+ Ensures a lot of biofuels volume into the system + Market can pay a lot for existing fuels	+ Guaranteed volume of biofuels + Supports going higher blends than mandated volume
Cons	– Not all transport energies are included in the system e.g. Gaseous fuels	– Not predictable – No Investment security due lack of long term vision – Cost for society	– Not predictable, subject to change 2017 – Cost for society

AND BALANCED TAX STRUCTURE INCENTIVIZES THE MARKET UPTAKE

Common Nordic approach would speed up the overall decarbonization effort

Long-term view for decarbonization in the policies is imperative – preferably at the Nordic level

- New investments in sustainable, domestic and competitive production capacity are needed. Just shifting existing production volumes to the highest paying market(s) is both short-sighted and counter productive
- Investments need a 10–15 years market view for them to be made
- Combined Nordic market is big enough to make significant investments for renewable energy (e.g. advanced ethanol and other large biorefineries, such as BtL plants)
- To enable a liquid market for advanced biofuels there is a need for synchronizing cross-border ticket/certificate systems
- Harmonizing the Nordic transport system would enable internal market and investments

A renewable energy mandate of 10-20% in 2020, to be increased to 25–40% in 2030 (country levels may be different)

- Maximum 7% cap for 1G biofuels. One pool for all fuels
- Increase mandate by 1–3% per year
- Local E20 standard to be implemented earliest possible and E30 by 2030
- Keep double counting in markets where it's used today. Consider introducing it to other markets.

RIGHT SET OF POLICIES TRIGGERS INVESTMENTS IN LOCAL PRODUCTION OF ADVANCED BIOFUELS

Common Nordic CO_2 price of EUR 100/t enables price differentation

Set a common CO_2 price of 100 €/t CO_2 in 2020 and seek to harmonise the fuel tax structure

- Create energy and CO_2 -based taxation for all transport fuels (liquid, gaseous, electricity etc.)
- This will ensure the most cost effective choices made for decarbonization of transport

High blend markets should be developed in a coordinated way, e.g.

- Apply whell-to-wheel methodology in vehicle CO_2 emissions certification. This offers OEM's incentive to produce and sell FFV's in the Nordics
- ED95 and HVO100 markets through local interpretation of minimum tax regulation
- Accept FFV conversions up to Euro 4/5 cars

PRICE DIFFERENTIATION ENSURES MARKET UPTAKE OF HIGHER LEVELS OF RENEWABLE ENERGY IN TRANSPORT

St1 role in the Nordics

St1 map

ST1

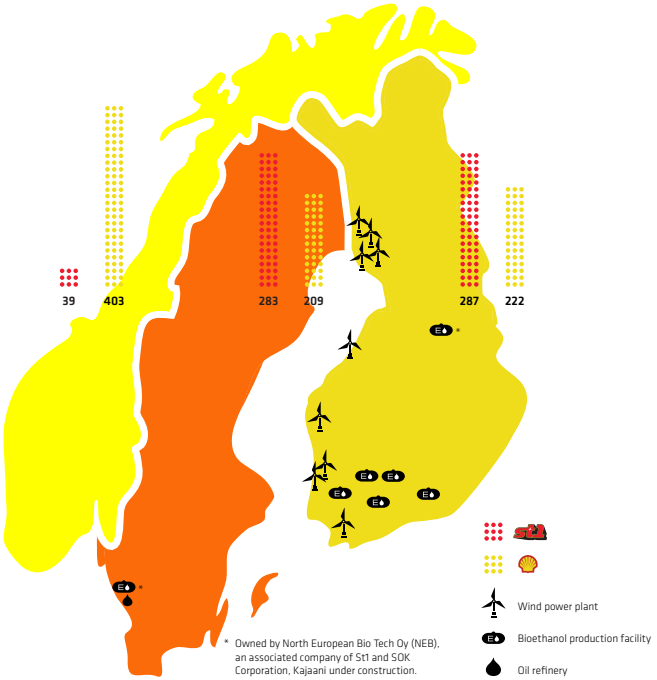
Operates in Finland, Sweden and Norway. Company's headquarters in Helsinki.

STATION NETWORK

Total of ca. 1500 St1- and Shell-sites in Finland, Sweden and in Norway.

ENERGY PRODUCTION

Ethanol plants producing waste-based advanced ethanol, industrial wind power plants and oil refinery in Sweden.



* Owned by North European Bio Tech Oy (NEB), an associated company of St1 and SOK Corporation, Kajaani under construction.

MARKET SHARE

FINLAND

Petrol	22.0%
Diesel	19.1%
Light fuel oil	22.2%

SWEDEN

Petrol	21.7%
Diesel	15.5%
Light fuel oil	29.8%

NORWAY

Petrol	28.9%
Diesel	24.4%
Light fuel oil	14.7%

KEY FIGURES 2015

ST1 NORDIC
Net Sales, Meur

3,602.4

ST1 GROUP
Net Sales, Meur

2,245.2

VISION:

"TO BE THE LEADING PRODUCER AND SELLER OF CO_2 -AWARE ENERGY."

$E = St^1$

Vision

Our goal is to

- Develop and commercialize functional and environmentally sustainable solutions
- Deliver these solutions profitably

Each solution must be

- Technically ready for use today
- Ecologically and ethically sustainable
- Logistically feasible

Renewable energy – production of bioethanol

St1 Biofuels Oy

- Company's own, patented biowaste-based ethanol production technology results in the cleanest transportation fuel biocomponent in the world when comparing life cycle emissions
- Produces bioethanol in 5 plants using residues from the food industry and municipal and industrial biowaste as feedstock
- Develops waste-to-ethanol technology
- Designs and constructs turnkey-ethanol production plants
- Offers life cycle services to the delivered plants
- Operates ethanol plants and fuel terminals in Finland
- First Etanolix® outside Finland built and integrated into St1 Refinery in Gothenburg

Strong R&D investment in cellulosic-based raw material multiplies ethanol production from feedstock outside the food chain.

- The first Cellunolix®-plant under construction in Kajaani

Windpower

TuuliWatti Oy is a joint venture by St1 and S-Voima – the leading operator in industrial wind power in Finland

- ~35% of Finland's windpower production in 2015

TuuliWatti's significant 500 MW investment program will bring wind power capacity to numerous areas in Finland

- 300 MW already in production or under construction
- Several new projects in project development phase

TuuliWatti invests in strong know-how and the latest wind power technology

- Projects are developed together with pro-wind power municipality

"WIND IS A FREE, UNLIMITED RESOURCE. RENEWABLE DOMESTIC WIND POWER STRENGTHENS FINLAND'S ENERGY SELF-SUFFIENCY AND AT THE SAME TIME, DISPLACES FOSSIL ENERGY PRODUCTION – DECREASING SIGNIFICANTLY BOTH CARBON DIOXIDE AND PARTICLE EMISSIONS."

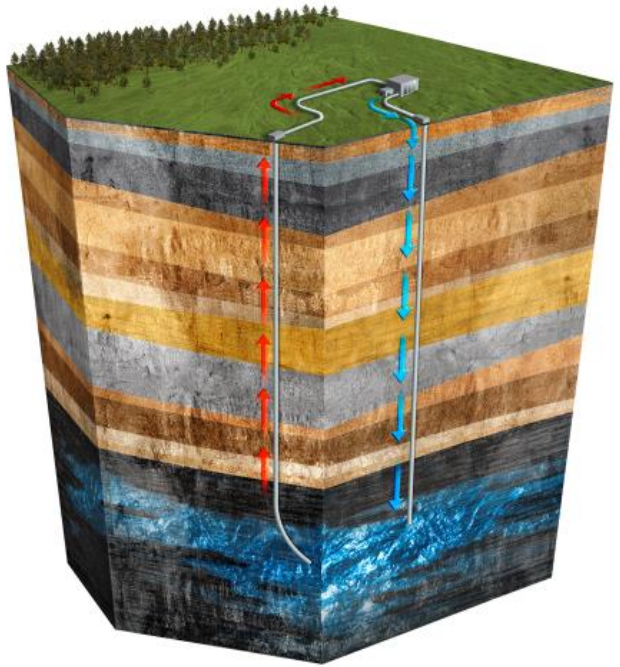
TuuliWatti investment program of 650 MEUR

Windpark	Finished	Plants
Pori Tahkoluoto	2010	1
Simo 1	2013	6
Ii 1	2013	8
Tervola 1	2013	10
Simo 2	2013	4
Ii 2	2013	3
Pori Peittoo	2014	12
Tornio	2014	8
Märynummi	2015	2
Kalajoki 1 + 2	2015	22
Siikainen	2015	8
Kalajoki 3	2017	6
Raahe	2017	13
Simo 3	2017	27
Total # of plants		**131**
MW total		**470**
MWh/year		**1 437 900**

Equals	
Of Finland's 2020 windpower target	24%
Electricity consumption of number of flats	650,000
Energy bill decrease per year	86.3 MEUR
Energy bill decrease life cycle	1,724.5 MEUR
CO_2 decrease	1 M ton/year

An example of piloting new solutions

- St1 is constructing a geothermal heat pilot plant, estimated to be completed in 2017
- Geothermal energy will be produced by drilling two wells several kilometers deep into the ground
- Water is fed into one of the wells. As the water warms up in the ground, it rises through the other well
- At the heat plant, the heated water goes through a heat exchanger and then into the district heating network
- The water becomes so hot in the process that it can be used directly in the district heat production without any heat pumps
- The heat generated by the plant will be sold to Fortum's district heating network, and it can cover up to 10% of Espoo's district heating needs



Renewable energy – St1 Local energy

St1 Local energy (St1 Lähienergia Oy)

- Plans and delivers heating plants based on local energy source (scale from 5 to 500 kW)
  - Deliveries of heating plants on a turnkey contract, a life cycle model contract or a contract based on use of the energy
  - Also owns heating plants and makes contracts to deliver energy
  - The sales, installation and maintenance of the heating plants executed by own personnel in the Uusimaa district and elsewhere by means of the reseller network

St1 Local heating plant

- Heats the property without fossil CO_2-emissions and cheaper than systems based on fossil fuel, traditional district heat, or direct electric heating
- Utilizes local energy from ground, air, exhaust and sun, using ground source heating wells, heating pumps, exchangers and solar panels
- Heating plants are optimized to consume electricity based on wind power production and the stock exchange price of electricity

In executing St1 strategy, we convert traditional business earnings to renewable investments and R&D step by step

- St1 sees the Nordics as one market area
  - To be able to increase relative competitiveness in the Nordics, the Nordic countries should develop common mandates, incentives and taxation to promote renewable energy production and R&D
- The Nordics is a market that offers high unused potential to create, demonstrate and execute new renewable solutions, which will have global business potential
- Renewable energy has high potential to maintain, secure and strengthen Nordic welfare society

Since 2010 St1 has invested EUR 400 M€ into renewable energy and R&D

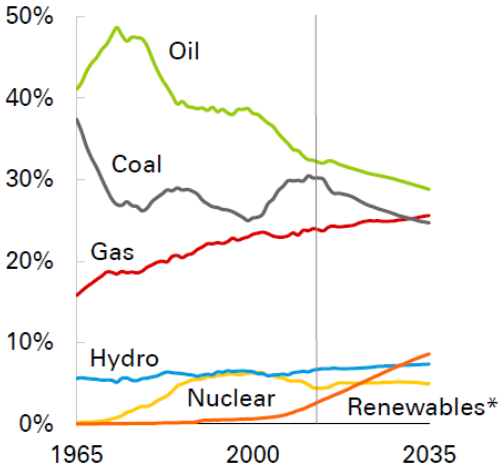
- St1 has invested in, developed and demonstrated renewable energy production, technology development and know-how, so far mostly in Finland
  - This will generate similar kinds of investments in the other Nordic countries, such as at the already existing Etanolix® plant in the Gothenburg Refinery
- St1 also invests considerably in the Nordic network modernization and in improvements in the refinery and development of traditional fuels to reduce emissions
- Our carbon hand print exceeds our carbon foot print
  - The level of our wind power production enables us to compensate for the fossil emissions of the energy we need for the functions of our both sister groups
- On our way to becoming the leading producer and seller of CO_2-aware energy, we will support and welcome all new customers, ideas and innovations to work together to reduce fossil emissions

St1 Energy Outlook – appendix

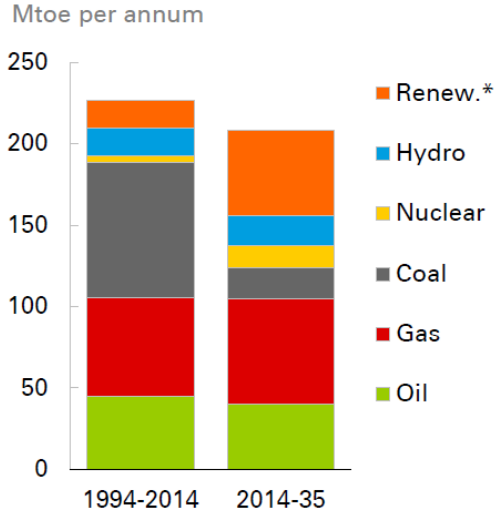
Base case: Primary energy

The fuel mix is set to change significantly…

Shares of primary energy



Annual demand growth by fuel



*Includes biofuels

2016 Energy Outlook

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Base case: Primary energy

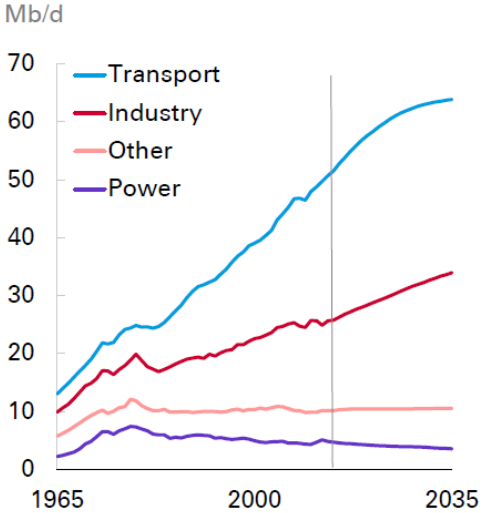
...although oil and gas remain key sources of energy growth

- Fossil fuels remain the dominant source of energy powering the global economy, providing around 60% of the growth in energy and accounting for almost 80% of total energy supply in 2035 (down from 86% in 2014).
- Gas is the fastest growing fossil fuel (1.8% p.a.), with its share in primary energy gradually increasing. Oil grows steadily (0.9% p.a.), although the trend decline in its share continues.
- The combined increase of oil and gas over the Outlook is similar to the past 20 years.
- In contrast, coal suffers a sharp reversal in its fortunes. After gaining share since 2000, the growth of coal is projected to slow sharply (0.5% p.a.), such that by 2035 the share of coal in primary energy is at an all-time low, with gas replacing it as the second-largest fuel source.
- Among non-fossil fuels, renewables (including biofuels) grow rapidly (6.6% p.a.), causing their share in primary energy to rise from around 3% today to 9% by 2035.

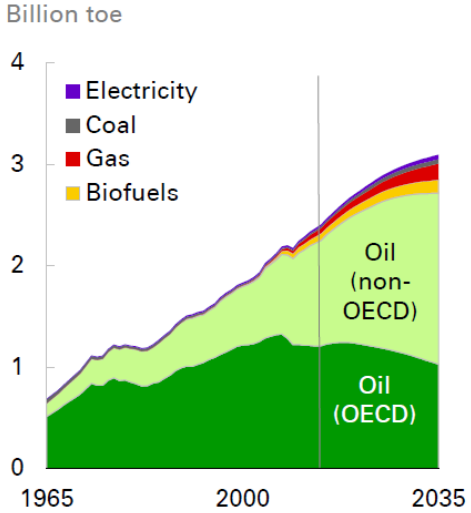
Base case: Fuel by fuel detail

Growth in liquids demand is driven by transport and industry…

Liquids demand by sector



Transport demand by fuel



2016 Energy Outlook

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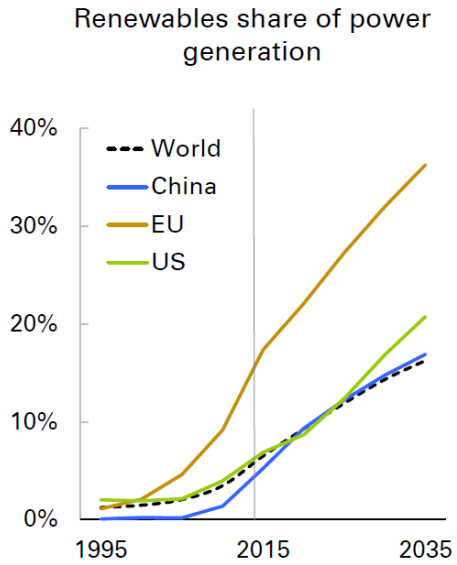
Base case: Fuel by fuel detail

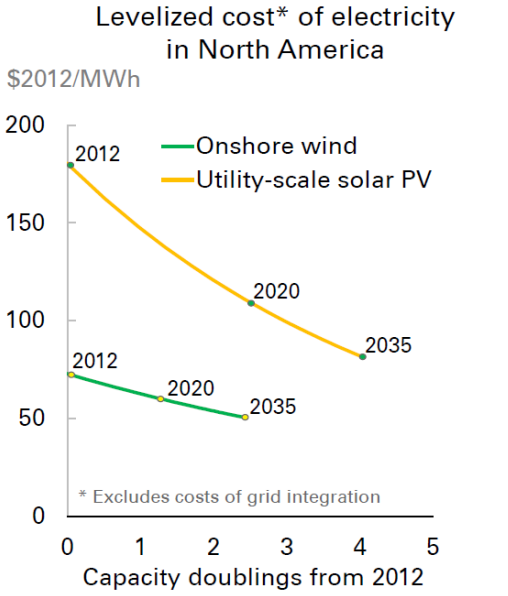
...helped by limited competition from alternative fuels

- The growth in the global consumption of liquid fuels is driven by transport and industry, with transport accounting for almost two-thirds of the increase.
- The growth in transport demand reflects rapid increases in vehicle ownership in emerging economies, partially offset by sustained gains in vehicle efficiency, which slow the sector's growth post-2025.
- Transport fuel continues to be dominated by oil (88% in 2035). The share of non-oil alternatives increases from 7% in 2014 to 12% in 2035, with natural gas the fastest growing transport fuel (6.3% p.a.).
- The other major source of demand growth for liquid fuels is industrial use, especially in petrochemicals, which is the fastest growing source of demand.
- Growth in industrial use of oil is aided by the relatively limited scope for efficiency gains and fuel switching. Moreover, over 40% of oil used in industry is not combusted and so is less affected by climate policies.

Base case: Fuel by fuel detail

Renewables continue to grow rapidly…





2016 Energy Outlook

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Base case: Fuel by fuel detail

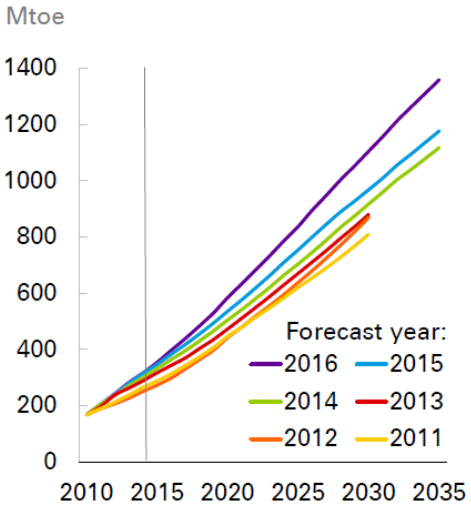
...supported by significant cost reductions

- Renewables are projected to be the fastest growing fuel (6.6% p.a.), almost quadrupling over the Outlook.
- Renewables account for over a third of the growth in power generation, causing their share of global power to increase to 16% by 2035.
- The EU continues to lead the way in the use of renewable power. However, in terms of volume growth to 2035 the EU is surpassed by the US, and China adds more than the EU and US combined.
- By 2035, the penetration of renewables in some OECD markets is expected to reach levels where the challenge of integrating intermittent sources into the power grid becomes an increasing constraint: for example, renewables are expected to account for more than a third of EU power generation by 2035.
- The rapid growth in renewables is supported by the expected pace of cost reductions: the costs of onshore wind and utility-scale solar PV are likely to fall by around 25% and 40% over the next 20 years.

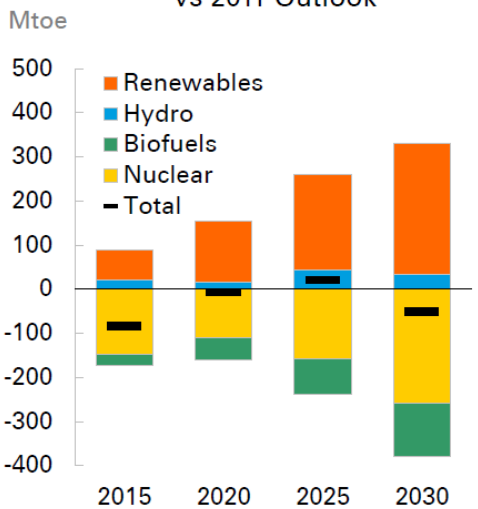
Base case: Main changes

Renewables have been revised up repeatedly...

Renewable power forecasts



Revisions to non-fossil fuels vs 2011 Outlook



Note: Projected growth from each Outlook applied to latest 2010 data

2016 Energy Outlook

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Base case: Main changes

...while other non-fossil fuels have been revised down

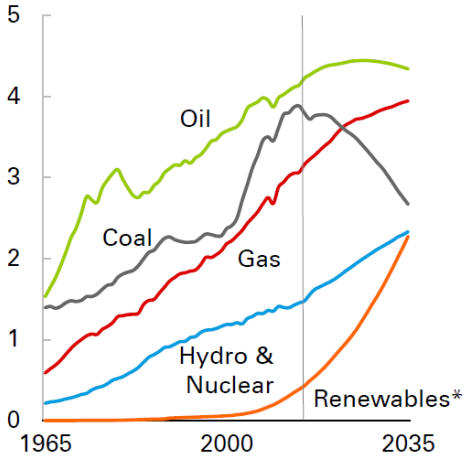
- Renewable power has been revised up every year for the past five years: renewables in 2030 are projected to be around 35% higher than expected in 2011. The upward revision in this year's Outlook is the largest to date.
- These upward revisions reflect both higher-than-forecast outturns in recent years, and our increasing confidence in future growth. Faster-than-expected cost reductions, more rapid deployment (particularly in the non-OECD), and widening policy support have all contributed to the reassessment of future growth prospects.
- Despite these upward revisions to renewable power, the expected level of total non-fossil fuels in 2030 is actually a little lower than in the 2011 Outlook, reflecting weaker prospects for nuclear energy and biofuels.
- The downward revision to nuclear energy followed the Fukushima accident, as many countries scaled back their planned use of nuclear energy. The lower profile for biofuels reflects both slower-than-expected technological progress on advanced biofuels and weaker adoption in transport fuel.

Faster transition

The faster transition has a significant impact…

Consumption by fuel

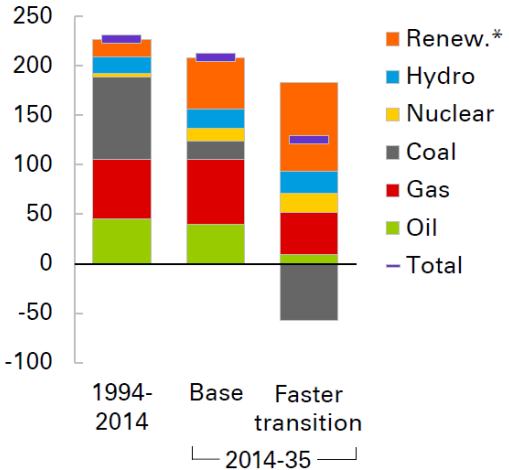
Billion toe



*Includes biofuels

Annual demand growth by fuel

Mtoe per annum



2016 Energy Outlook

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Faster transition

...on both overall energy demand and the fuel mix

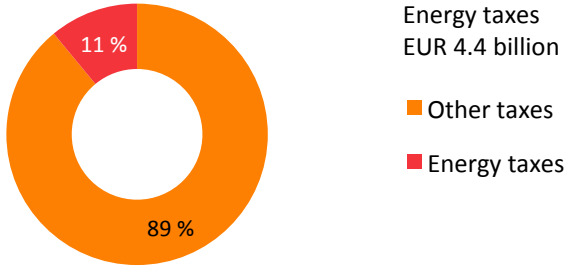
- Total energy demand still grows in the 'faster transition' case, but at a reduced pace (0.9% p.a. versus 1.4% p.a. in the base case).
- Non-fossil fuels supply all of the increase in energy. Fossil fuels decline slightly, with the share of fossil fuels in total energy falling from 86% today to around 70% by 2035.
- Natural gas and oil still increase in the 'faster transition' case, accounting for a little over half of total energy supplies in 2035, although oil demand is declining by the second half of the Outlook. Coal consumption suffers the most, falling by more than 30% to its lowest level since 2002.
- The big winner in the 'faster transition' case is renewables, with an almost six-fold increase in output (nearly 9% p.a.) and a 15% share of energy by 2035. The rate at which renewables gain share from 2020 to 2035 matches oil's gain over the 15 years of 1908-23 – years that included the Texas oil boom, the discovery of oil in the Middle East, the British Navy switching to oil, and the Model T Ford starting mass motorization.

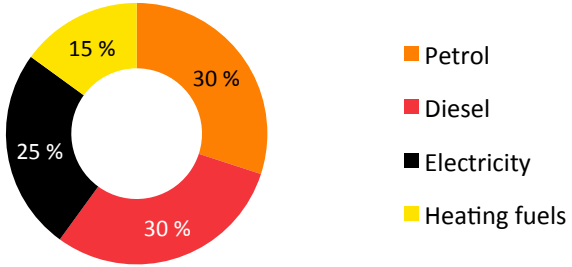
Tax revenue vs. energy taxes in Finland

Central government tax revenue in 2015 was EUR 40 billion

- Energy taxes EUR 4.4 billion (11% of all taxes), which consist of
  - Petrol and diesel > EUR 2.6 billion i.e. 60% of energy taxes
  - Heating fuels (NG, coal, peat, heating oils) > EUR 0.7 billion, i.e. 15% of energy taxes
  - Electricity > EUR 1.2 billion i.e. 25% of energy taxes

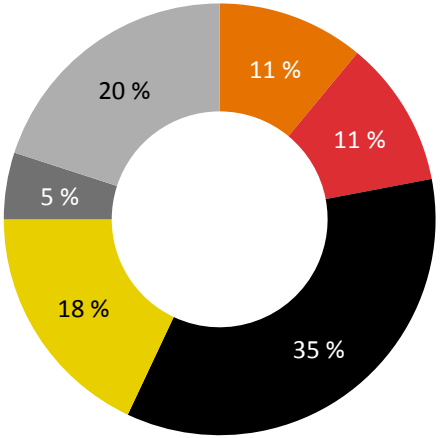
ENERGY TAXES HAVE A KEY ROLE IN FINANCING WELFARE SOCIETY





Tax revenue in the transport sector in 2015 in Finland

EUR 7.9 billion



- Vehicle registration tax; 0.9 bln
- Annual vehicle tax; 0.9 bln
- Fuel taxes in transport sector; 2.7 bln
- VAT on fuel; 1.4 bln
- Taxes on vehicle insurances; 0.4 billion
- VAT on vehicles, services,spare parts; 1.6 billion

ENERGY AND TRANSPORT RELATED TAX REVENUE'S SHARE IN FINLAND IS EUR 10 BN = 25%

Tax revenue vs. energy taxes in Sweden

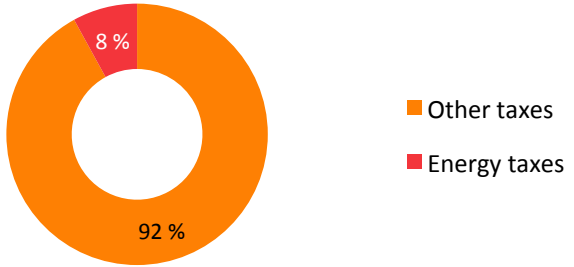
Central government tax revenue in 2014 was EUR 85 billion.

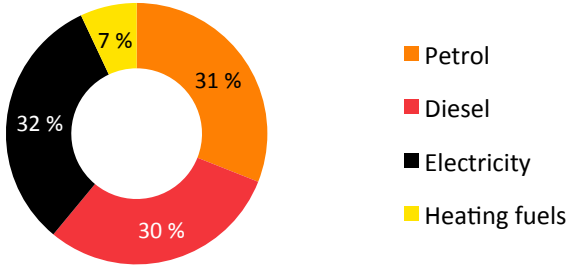
- Energy taxes was EUR 6.6 billion = 8% of all taxes

Energy taxes EUR 6.6 billion consist of

- Petrol EUR 2.0 billion = 31% of energy taxes
- Diesel EUR 2.3 billion = 30% of energy taxes
- Electricity EUR 2.0 billion = 32% of energy taxes
- Heating fuels EUR 0.3 billion = 7% of energy taxes

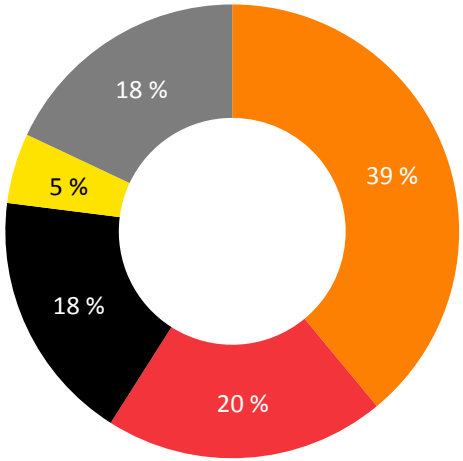
ENERGY TAXES PLAY A KEY ROLE IN FINANCING THE WELFARE SOCIETY





Tax revenue in the transport sector 2014 Sweden

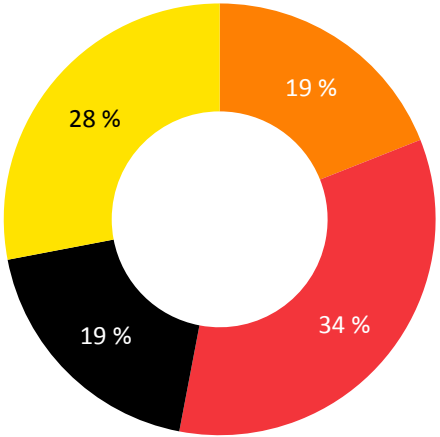
EUR 10.1 billion



- Fuel taxes 3.9 bln
- Vat on fuel 2.0 bln
- Tax on road traffic 1.8 bln
- Other 0.5 bln
- VAT on car sales and other (est.) 1.9 bln

ENERGY AND TRANSPORT RELATED TAX REVENUE'S SHARE IN SWEDEN IS EUR 12 BN = 15%

Tax revenue vs. energy taxes in Norway

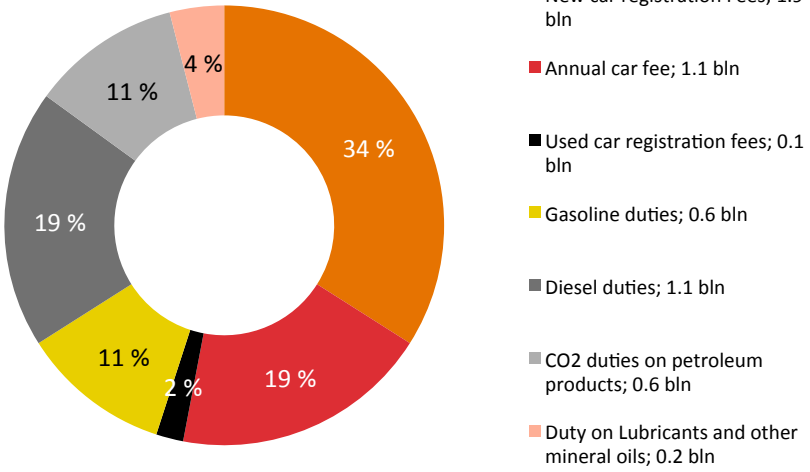


- Gasoline duties; 0.6 bln
- Diesel duties; 1.1 bln
- CO2 duties on petroleum products; 0.6 bln
- Electricity consumption taxes; 0.9 bln

DIRECT ENERGY TAXES PLAY A MINOR ROLE IN THE TOTAL NORWEGIAN TAX REVENUE, DUE TO SIGNIFICANT TAXES FROM THE OIL PRODUCING INDUSTRY

Energy taxes EUR 3.2 billion
Tax revenue in 2015 was EUR 106 billion

Tax revenue in the Norwegian transport sector 2015 EUR 5.6 billion (excl. VAT)



DIRECT ENERGY AND TRANSPORT RELATED TAX REVENUE'S SHARE IN NORWAY IS EUR 6.5 BN = 6%

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North European Oil Trade Oy

Fingrid Oyj

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