THE ENERGY SYSTEM AND EMISSION REDUCTION MEASURES

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The Finnish climate and energy strategy must meet the challenges of climate change mitigation and adaptation, as well as the challenges arising from the changing economy. Traffic included, energy consumption is responsible for approximately 80 percent of Finland's GHG emissions. The demand for energy and its dependency on the economy have a profound effect on GHG emissions. The strategic targets can include, for instance, reducing GHG emissions and advancing the economic structural change to facilitate significant reductions during the next decade and achieve a low-carbon society by mid-century. Not only does this require zero-emission energy production, it also calls for more efficient use of resources where decreasing the consumption of primary energy is in a central position.

Energy production and consumption form a system linking different subsectors and energy resources to one another. For example, changes in the emission limitation measures of a single subsector often affect other subsectors and even emissions in other countries. Such connections can significantly weaken policy efficiency and cost-efficiency. Therefore, attention should be paid to the targets set for overall emission reductions as well as the cost-efficiency of the measures taken in different sectors and the impact on the structural reform.

It is important to strive towards a balanced whole of policy instruments where the significance of emissions trading would be central in its respective sector, and where non-emissions trading and LULUCF sectors would have the full advantage of cost-efficient, national policy measures. Measures advancing energy and material efficiency are also significant in the successful implementation of long-term structural reforms.

Finland should influence the EU's climate and energy policy so that emissions trading would actively guide states towards measures to tackle the challenges of climate change. A sufficiently high price for emissions trading would also give a signal to the economy that would encourage different industries to increase the consumption of renewable energy and improve energy efficiency. National incentives to reduce the use of fossil fuels should be allocated to the non-emissions trading sector to facilitate actual emissions reductions.

One of the aims of this report is to identify measures with complicated chains of effect which may impact the efficiency of the measures in reducing overall emissions. Due to limited resources, the work is limited to three central topics all of which have their own written report in addition to this summary.

The impact of increased forest bioenergy on overall emissions

The current subject matter of climate negotiations and climate policy has several open questions, most of which concern the use of bioenergy and carbon sinks in the ecosystem. Current procedures are also being criticised in scientific discussions.

In light of the current discussion, it is possible that the calculation rules concerning the use of bioenergy and biomass will be altered in international treaties, EU directives and other EU regulation. Therefore, it would be justified to prepare for such changes in Finland,

particularly as the long-term biomass cycles of forests are a central part of the base resources of Finnish industry and energy production.

Combined heat and power – heat pumps as part of the energy system of buildings

Combined heat and power (CHP) is a low-emission method of heat production for communities. It should be noted in assessments of the impact of CHP on emissions that within the Nordic and European markets, the alternative to CHP-produced electricity is usually provided by coal-fired power plants, where thermal energy is wasted. Based on hourly market examination, the consequences of an increase in CHP-produced heat or ground source pump heat were analysed, considering different power plants, different fuels and different scenarios. In Finland, heat pumps will produce fewer emissions than CHP municipal heating on the system level only once the price of emission allowance is raised to more than 50-100 euros per tonne of CO2, which could only result from a highly ambitious climate policy.

It is advisable to carefully expand the share of renewable energy in CHP production, while also keeping profitability within emission trading as a condition for the development. Besides efficient emission reductions, it is necessary to ensure sufficient, reliable, low-emission electricity production capacity in the planning of the Finnish energy system, particularly during winter. Moreover, it is recommended to invest in price elasticity in all sectors and to deliver the market price signals directly to consumers, perhaps even steepened.

Distributed energy systems of the built environment

Changes affecting energy use in the building stock are slow and have long-term consequences. First and foremost, changes carried out in the building stock must reduce primary energy consumption and, as a result, reduce emissions. This is important because renewable energy is also a natural resource that should be used sparingly.

In Finland, buildings, distributed energy production and our entire energy system must be observed and studied as a whole. Heat pumps and production methods based on biomass have the best prerequisites to be integrated into the distributed energy system of the built environment outside CHP-based municipal heating networks. However, solutions are needed for the development of climate-friendly heat pumps to minimise electricity consumption during winter. Using solar power in passively cooled buildings is recommended as it would ensure that energy production and consumption occur simultaneously.

The advantage of biobased, distributed energy production lies in its independence from weather. Distributed energy changes the cost optimal structure of energy production. Flexibility in particular will become more valuable with increased use of wind and solar electricity. Users, building management and maintenance have important roles in flexible consumption. Additionally, optimising the functionality of energy systems requires new storage technologies and hybrid systems comprising of different production methods. The use of renewable energy should be encouraged, and its small scale production should be enabled alongside distributed energy systems. Furthermore, these policies should take note of the overall operation of the Finnish energy system and aim to reduce emissions across the system.