IN-DEPTH ASSESSMENT OF THE ENERGY EFFICIENCY POTENTIAL IN CYPRUS

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Overview

This paper presents the draft results of the first in-depth study on the energy efficiency potential in the Republic of Cyprus. Different energy models were combined in order to conduct policy-relevant simulations and provide recommendations to national energy and economic authorities so that Cyprus can meet its energy efficiency decarbonisation targets in the frame of the EU energy and climate policies.

Methods

A final energy demand forecast model was employed, which was specifically developed for the energy system of Cyprus. The model calculates future annual energy consumption in each major economic sector of Cyprus (agriculture, cement industry, other industry, households, services, road passenger transport, road freight transport and air transport) as a function of future macroeconomic variables and energy prices. It also calculates fuel shares in each sector, depending on technology costs (investment, operation, maintenance and fuel costs), the penetration potential of various technologies and technical constraints for the uptake of new technologies, and allows computing future final energy consumption by sector and fuel.

A large part of the input data used in this top-down forecast model was derived from detailed simulations of building energy demand for a number of representative residential and commercial buildings, using the EnergyPlus model. In this way a reconciliation of engineering with economic calculations was achieved.

Three distinct scenarios were designed: a reference scenario, which incorporates all policies adopted until early 2016; a ‘realistic scenario’, which assumes the implementation of cost-optimal measures in all economic sectors under a modest deployment of financial resources; and a much more ambitious ‘maximum technical potential scenario’, which assumes an unprecedented mobilisation of financial and human resources that could lead to a deep renovation of all existing buildings and a substantial penetration of alternative fuels in transport.

Draft Results

After an interval between 2013-2018, where energy use patterns were affected by the significant economic downturn of years 2013-2015, it is projected that overall energy intensity in Cyprus will continue its downward trend in the coming decades, mainly as a result of improved energy performance of buildings in the residential and tertiary sector. Road transport, which currently accounts for 40% of final energy demand, is expected to demonstrate a decline in energy intensity too, but a slower pace since it exhibits great inertia and thus a shift towards more use of public transport modes will take a long time to materialise.

Compared to the evolution of the Reference Scenario, the Maximum Technical Potential Scenario foresees energy savings in the household sector that may reach 36% by 2030 and almost 55% by 2050. In the services sector, the corresponding savings are 32% in 2030 and 57% in 2050, whereas in industry they reach 20% by 2030 and 21.5% by 2050. Potential savings are markedly lower in agriculture as well as in road transport, where no significant behavioural or infrastructure changes have been assumed which might allow a better organisation of freight logistics, or an increased use of public transport modes.

Following a different trajectory, in line with the real-world financial and technical capacity of Cyprus, the Realistic Scenario foresees a small or modest improvement in the intensity of energy use. Compared to the

Reference Scenario, modest energy savings are projected in households (5.3% in 2030 and almost 17% in 2050), whereas the corresponding savings are somewhat higher in the service sector up to 2030 (around 6%) and increase gradually afterwards to reach 24% by 2050. Industrial energy savings are even lower – 3.3% by 2030 and 7% by 2050, focusing mainly on reduction in the consumption of electricity due to investments in automations and more efficient motors, compressed air systems and lighting.

With regard to the evolution of fuel shares, the Maximum Technical Potential Scenario, in line with what was outlined in the definition of its assumptions, projects that the shares of gas oil and biomass gradually diminish in the household and service sector, whereas electricity and LPG gain shares, although the use of these energy forms declines in absolute terms because of the strong implementation of energy efficient buildings, equipment and appliances. As a result, the only fossil fuel to be used in these two sectors by 2050 is projected to be LPG; all other energy needs of buildings and processes are projected to be covered by electricity and solar-generated heat – plus a very small fraction of biomass in the service sector. The share of electricity in total energy consumption declines between today and 2050, especially in the service sector; this is a result of the improvement in the energy efficiency of electric heating (heat pumps), lighting and appliances, which is expected to be considerably stronger than the improvements in LPG-fired boilers used for heating and hot water production. CNG-powered and electric vehicles are forecast to penetrate road transport, accounting for up to 20% of the sector's final energy demand in 2050.

On the other hand, in the Realistic Scenario the evolution of fuel shares is similar to that of the Reference Scenario, with a somewhat faster decline in the importance of gas oil and biomass (in the household sector) and gas oil and light fuel oil (in the service sector). Only in transport can one observe a significant difference between Reference and Realistic scenarios, due to the considerable penetration of CNG-powered vehicles in the latter scenario – which dominates among alternative fuels, thus leaving a lower share to electric vehicles.

Overall, according to the Realistic Scenario, Cypus will be able to meet its 2020 energy efficiency commitments with only a slight further tightening of relevant policies. However, meeting the 2030 objectives, which are currently under discussion at EU level, of a) reducing non-ETS emissions by 23% and b) improving energy efficiency by 27%, are extremely challenging without significant (but probably unrealistic) investments in deep renovations of all types of buildings.

Draft Conclusions

The most important finding of our analysis is that, under 'business-as-usual' conditions, Cyprus can modestly increase the energy productivity of its economy, especially in the household and service sectors which account for a large part (30%) of the country's final energy needs and for the major portion (80%) of electricity consumption. Even so, it will be technically difficult and costly to attain energy efficiency improvements of the order of 27-30% as currently discussed in the EU. Even more importantly, if the country is to achieve the broader EU decarbonisation goals for year 2030 and beyond, it cannot continue along a 'business-as-usual' path in improving the patterns of its energy system. In order to achieve a transition to a low-carbon economy, apart from improving the energy efficiency of buildings and reducing the carbon footprint of power generation, it will also be necessary to reduce the energy needs of road transport very substantially. Without a drastic implementation of policies that can reduce the energy intensity of motor vehicles and enable the penetration of low- or zero-carbon fuels, it is not possible for Cyprus to meet the EU's long-term decarbonisation target of 80-95% reduction in greenhouse gas emissions by 2050. An intensification of smart financial tools to enable energy efficiency investments, coupled with a green tax reform, that will gradually implement a carbon tax on non-ETS sectors and a reduction in the tax burden of labour as a compensation to consumers and firms, can facilitate the transition to a low-carbon economy.

References

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