Transition towards high share of renewables in Ukraine: linked energy system and CGE model approach

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In this paper, we provide an assessment of low-emission development scenarios for the Ukrainian economy, which faces significant economic and environmental challenges. We use the soft-linkage of the energy system TIMES-Ukraine and Ukrainian computable general equilibrium models, which allows us to estimate an economy wide and environmental implications of long-term energy policies. Using such approach, we provide an assessment of the Ukrainian low-carbon development strategy initiative (ULCDS scenario, consistent with 2oC target), as well as analyze more ambitious long-term environmental target (RE scenario), which includes transition towards 92% share of renewables in gross final energy consumption by 2050 (consistent with 1.5oC target).

According to our results, further maintenance of the existing highly inefficient energy system in the long-run is even more expensive than transition towards 92% renewables share. As in case of Business as Usual (BaU) path, fuel expenditures account for almost 86% of total system costs and represent the most attractive â€œlow hanging fruitsâ€• in terms of costs reduction. While both policy options show an improvement relative to the BaU path, only RE scenario provides sufficient national contribution in terms of limiting global warming well below 2oC. At the same time, key differences between ULCDS and RE scenarios, both in terms of policy measures and results, arise after 2035-2040, which enables the possibility of smooth transition from ULCDS to RE during this period.

With initially low level of energy efficiency in Ukraine, both low-emission development (LED) policies result in positive macroeconomic and sectoral effects, with better perspectives in case of RE scenario, which at the same time requires 3 times higher investments. According to our estimates, GDP may increase up to 7-10% by 2030 and 14-16% by 2050 in case of efficient implementation of LED policies. Households may also experience substantial real income growth â€“ up to 13-15% by 2050. In this context, Ukraine benefits from double dividends under both policy options, while RE scenario also provides an economically acceptable way of going from relative to absolute decoupling.

At the same time, existing institutional environment and inefficient market framework can pose significant risks for ULCDS and especially RE policies implementation. Our study identifies three sets of issues and corresponding recommendations that policy makers should focus on. First, under the current energy policy set up there is an inconsistency between targets of different strategic energy documents (e.g. Energy Strategy, Low-carbon Development Strategy etc). Solution of this problem requires both changes in the energy strategic planning set up, as well as social and political consensus around key strategic targets. Second, a number of additional incentives should be implemented in order to enable efficient market transformation. They include measures towards efficient pricing of fossil fuels, in particular price signals for industrial users (as today CO2 is priced at 0.01 EUR per ton), as well as more transparent and market-oriented approach to residential consumers. The former one includes move from uniform to targeted subsidies and elimination of cross subsidization in the electricity sector. Finally, in terms of market structure transformation, Ukraine should move to competitive energy markets (in particular, fully implement Third Energy Package), as well as proceed with further integration to the ENTSO-E. Both these steps should be used to expand institutional capacity for ULCDS scenario implementation in the mid-term and smooth transition to the RE path in the long-run.

On the methodological part, our paper complements existing literature on the top-down and bottom-up hybrid approach to the energy and environmental policies assessment, as we develop and implement the soft-linkage of the energy system TIMES-Ukraine model (bottom-up model) and dynamic computable general equilibrium model (top-down model). In terms of policy-related

contribution, our study represent the first attempt to justify the possibilities of transition towards high share of renewables in Ukraine (92% in gross final energy consumption) consistent with the international community efforts on limiting global warming to below 1.5oC.