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What are favourable policies to increase RES-H and energy efficiency in the EU building stock?

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Overview

With the renewable energy directive (2009/28/EC), the energy performance of buildings directive (recast) (2010/31/EU) and the energy efficiency directive(2012/27(EU) the EU imposed a set of requirements and targets for increasing the share of renewable heating (RES-H) and for higher energy performance of buildings. In particular the EPBD (recast) leaves many questions open regarding the detailed definition of nearly-zero-energy-buildings (nZEBs) and the policies to reach a higher share of nZEBs both in the field of new building construction and building renovation. Most member states implemented policy instruments in this area already in recent years and decades. Still, it remains open whether these instruments are in line and effective enough to reach corresponding policy targets. Thus, the question arises: What are favourable policies to increase RES-H and energy efficiency in the EU building stock? In this context, we suggest to measure "favourable" in terms of three criteria: (1) Policies should be effective in terms of the achievement of certain targets, (2) policies should be cost-efficient, (3) policies should be in line with long-term targets.

From this starting point, the following additional questions arise:

- What are reasonable mixes of technologies (e.g. RES vs. energy efficiency) to be supported by policies?
- How should policy packages take into account the status quo of markets in different countries?
- What are potential impacts of policy sets on energy demand, RES-H share, policy costs until 2030?

The work presented in this paper is based on the project ENTRANZE (Policies to enforce the transition to nearly-zero-energy buildings in the EU-28, www.entranze.eu), supported by the EC under the IEE programme.

Methods

To deal with the questions described above, we carried out the following steps:

- Set up a consistent dataset on the existing building stock for EU28 on a country level. This dataset includes geometry data, U-values of building components, heating, hot water and cooling systems data. The data is based on the ENTRANZE database (www.entranze.eu), which again is based on a compilation of data from Odyssee, BPIE (e.g. Economidou et al., 2011) Eurostat and national statistics.
- Collect cost data for different technologies and measures for RES-H and efficiency improvement. This involves investment in different heating technologies (for various scale) as well as renovation activities.
- This dataset is integrated in the techno-economic building stock model Invert/EE-Lab (see e.g. Müller, 2012, Müller et al., 2010, Kranzl et al., 2013). The basic idea of the model is to describe the building stock, heating, cooling and hot water systems on highly disaggregated level, calculate related energy needs and delivered energy, determine reinvestment cycles and new investment of building components and technologies and simulate the decisions of various agents (i.e. owner types) in case that an investment decision is due for a specific building segment.
- The bottom-up calculations of energy demand for space heating and hot water are calibrated for the base year to statistical data based on Odyssee. Deviations, which for most countries are below 5-10% will be properly documented. Based on this starting point calibration, the simulation outcomes regarding building renovation, demolition and construction as well as heating system replacement are calibrated to a historical base period as far as data on country level are available.
- Collect information on existing policy sets (building codes, financial incentives, training, information and accompanying measures), see Atanasiu et al., (2013)
- Develop new and innovative policy sets for selected EU Member States together with policy makers in various iterative discussions. For this purpose, we carried out policy discussion processes in selected countries (AT, BG, CZ, DE, ES, FI, FR, IT, RO). In this process we followed the approach to define consistent and well-harmonised policy packages instead of the investigation of single measures.
- The potential impact of these policy sets was simulated in scenarios until 2030 with the model Invert/EE-Lab, taking into account two energy price scenarios. Sensitivity analyses are added, in particular regarding support levels for different technologies, RES-H/C and renovation measures.
- The policy scenarios were compared in terms of RES-H share, reduced final energy consumption, policy program costs, net costs / benefits of policy measures.
- Finally, we derive conclusions and recommendations regarding the proper selection and design of policy instruments for various conditions and countries.

Relevant system boundaries are:

- The paper covers new and existing buildings. However, in terms of efficiency measures there is a clear focus on renovation of existing buildings.

- In principle, all EU28 countries are covered in this paper. Detailed policy investigations as well as cost data collection focused on selected countries (AT, BG, CZ, DE, ES, FI, FR, IT, RO).

Results

Figure 1 shows exemplary results of policy scenarios for the final energy demand by energy carriers for the case of France and Romania. In both countries, policy set 1 reflects the current state of policies (Atanasiu et al., 2013). Policy set 2 and 3 are different in both countries according to the national discussion process. In France, policy set 2 reflects energy taxation on fossil fuels and biomass where the revenues are redirected to budgets for subsidy programs in the building sector. However, the energy taxation has only limited impact and since the subsidy levels were not increased, the higher budgets show no strong impact. Policy set 3 is an ambitious package of regulatory instruments (obligation for building renovation in case of building sale or change of tenant, more stringent building codes) combined with economic incentives and information and training. It leads to a strong increase of the renovation rate and thus reduces final energy demand by more than 40% up to 2030. For Romania, policy set 2 and 3 reflect gradual increases of the levels of building codes, investment subsidies and information and training activities. This results – in the most ambitious level – in energy savings of about 25% until 2030.

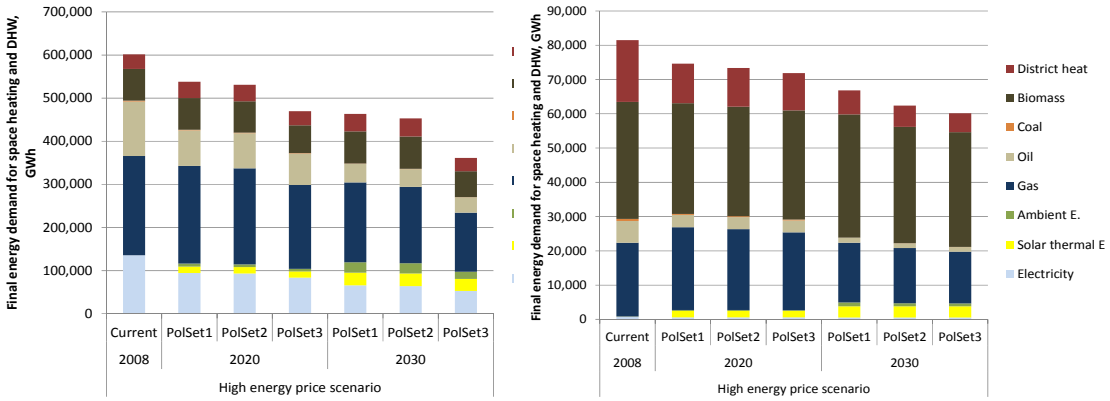

Figure 1. Impact of policy scenarios on final energy demand for the case of France (left) and Romania (right).

The full paper will relate these data to economic results of the scenarios like energy cost reductions, investments and policy programme costs, discuss country differences in more detail and provide results from other selected countries as well as for aggregate EU28.

Conclusions

The results lead to the preliminary conclusions, that only policy packages including regulatory aspects are sufficiently effective to achieve ambitious targets. However, it should be taken into account that the selection of policy measures has to correspond to the development of markets, availability of sound and high quality equipment at affordable prices and correspondingly trained staff. This aspect will be elaborated in the full paper. Moreover, the conclusions in the full paper will refer to the differences between countries and they will take into account economic indicators of renovation activities and policy instruments.

References

Atanasiu, B., Maio, J., Staniaszek, D., Kouloumpi, I., 2013. Building policies and programs in the EU-27 -EU overview and nine factsheets on ENTRANZE countries. Deliverables D5.1 and D5.2 of WP5 from Entranze Project.

Economidou, M., Atanasiu, B., Despret, C., Maio, J., Nolte, I., Rapf, O., 2011. Europe's buildings under the microscope. A country-by-country review of the energy performance of buildings. Buildings Performance Institute Europe (BPIE).

Kranzl, L., Hummel, M., Müller, A., Steinbach, J., 2013. Renewable heating: Perspectives and the impact of policy instruments. Energy Policy. doi:10.1016/j.enpol.2013.03.050

Müller, A., 2012. Stochastic Building Simulation, working paper. Available at http://www.msarshallplan.at/images/papers_scholarship/2012/Mueller.pdf., Berkely.

Müller, A., Biermayr, P., Kranzl, L., Haas, R., Altenburger, F., Weiss, W., Bergmann, I., Friedl, G., Haslinger, W., Heimrath, R., Ohnmacht, R., 2010. Heizen 2050: Systeme zur Wärmebereitstellung und Raumklimatisierung im österreichischen Gebäudebestand: Technologische Anforderungen bis zum Jahr 2050. Gefördert vom Klima- und Energiefonds.

Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC

Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings

Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/