Empirical Basis of Economic Impacts Impact on demand integration of renewables

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101000132.

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Multiple Impacts Calculation Tool

MICAT

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Scope of MI indicator

Definition

While the rise of renewable energy sources has helped reduce the carbon intensity of Europe's electricity grids, it also entails a higher volatility of electricity supply. Thus, potentials for demand-response are getting increasingly important. This indicator assesses how energy efficiency measures affect demand-response potentials and thereby, the impact on the integration of renewables in electricity grids.

Examples of effects of energy efficiency measures on demand-response potentials are increases in heat pumps and thermomodernisations, allowing to heat homes at times of low energy consumption, but also improvements of efficiency in industries willing to move their production from peak- to low-consumption periods.

Relevance on EU, national and/or local level

This impact is predominantly important on the national level, since the vast majority of electricity grids mainly operate nationally.

In light of the necessary investments in renewables across the bloc, this indicator might still be interesting on a European level to showcase the effect energy efficiency can have in integrating new renewables.

On the local level, this indicator is less relevant, although a flexible regional grid can prevent the need for redispatches and might in the future avert the necessity to throttle down residential end uses, such as electric vehicle charging.

Impact pathway figure

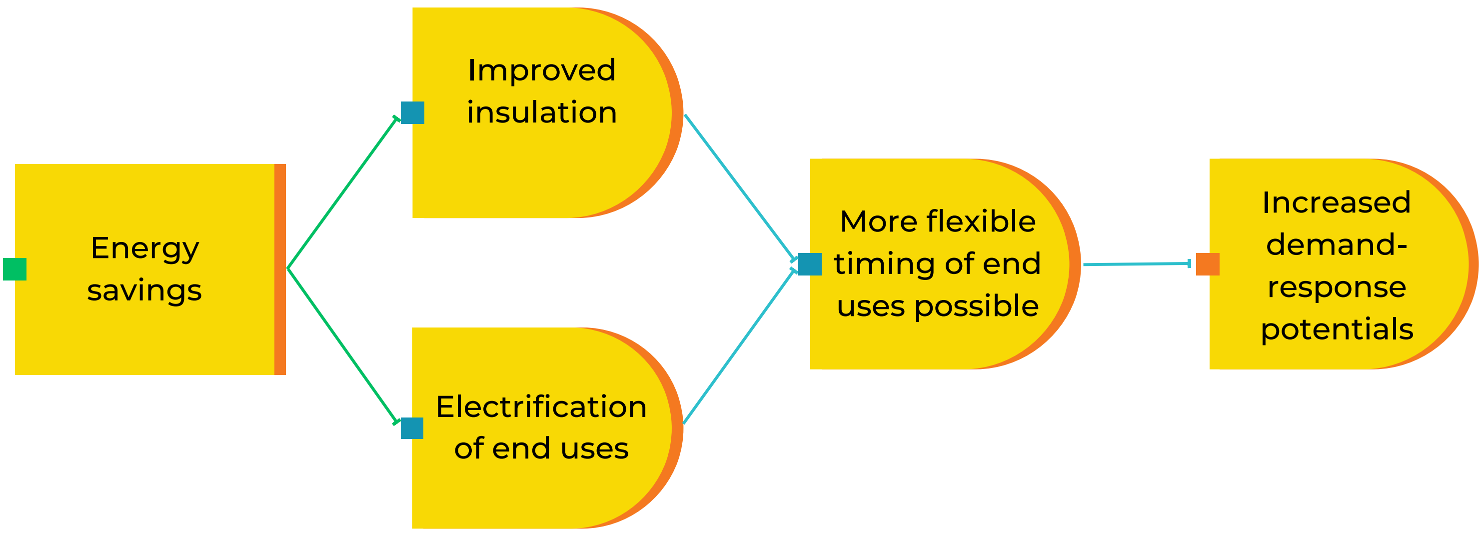

Figure 1 : Impact pathway for the impact on demand integration of renewables

Overlaps with other MI indicators and potential risk of double-counting

This indicator does not have any overlaps with other impacts. Thus, there is no risk of double counting.

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Quantification method

Description

In order to assess these changes in demand-response potentials $\Delta P_{DR,c,ss,u,t,y}$, additional as well as lost potentials are allocated to improvement actions across the different sectors. This is done by attributing every combination of (sub)sector and improvement action a coefficient $k_{DR,ss,u}$:

$$\Delta P_{DR,c,ss,u,t,y} = k_{DR,ss,u} \cdot \Delta E_{c,ss,u,y} \cdot s_{flex,t}$$

In this equation, $s_{flex,t}$ describes the feasibility of flexibilisation. In a second step, the "moved" electricity consumption can be calculated by accounting for the possible frequency f_t and time period Δt_t of demand-response measures, which are dependent on the technologies involved:

$$E_{DR,c,ss,u,t,y} = k_{DR,ss,u} \cdot \Delta P_{DR,c,ss,u,t,y} \cdot f_t \cdot \Delta t_t$$

Methodological challenges

Demand-response potentials are strongly linked to temporal patterns. However, the MICATool does not allow for such a fine-grained analysis. Thus, several values are averaged over a long period. Furthermore, the value of demand-response strongly differs between regions and timings, as the value is strongly linked to the alternative that is necessary, for instance the ramp-up of a power plant.

Data requirements

This indicator mainly looks at the energy savings generated in certain (sub-)sectors and improvement action to match them with probable implemented actions and how these might affect demand-response potentials. Such coefficients are calculated for all (sub-)sector-improvement action combination.

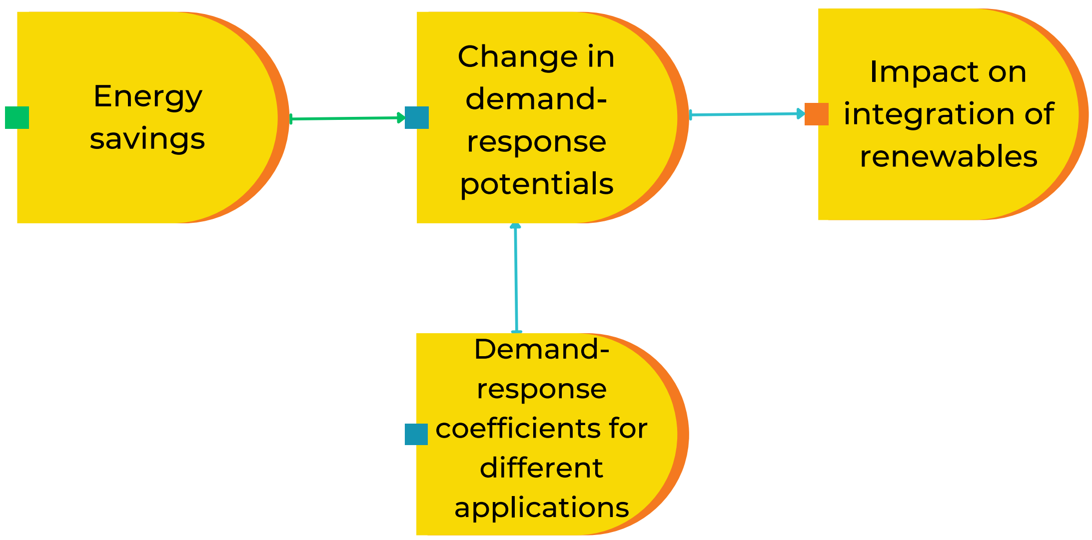

Figure 2 : Quantification of the impact on demand integration of renewables

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