



Session 16, 26 September 2025

How to estimate energy savings and other gains from application of the Energy Efficiency First Principle

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The Wuppertal Institute for Climate, Environment and Energy



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- › Energy, Transport and Climate Policy
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What is the energy efficiency first principle (EU context)?

- **The EU definition: Governance regulation, Art. 2 (18)**
 - ‘energy efficiency first’ means taking utmost account
 - in energy planning, and in policy and investment decisions,
 - of alternative cost-efficient energy efficiency measures to make energy demand and energy supply more efficient,
 - in particular by means of cost-effective end-use energy savings, demand response initiatives and more efficient conversion, transmission and distribution of energy,
 - whilst still achieving the objectives of those decisions

What is the energy efficiency first principle (EU context) (2)?

- **The policy requirement for EU Member States: EED Art. 3 (1)**
 - In accordance with the energy efficiency first principle, Member States shall ensure that energy efficiency solutions, including demand-side resources and system flexibilities,
 - are assessed in planning, policy and major investment decisions of a value of more than EUR 100 000 000 each or EUR 175 000 000 for transport infrastructure projects,
 - relating to the following sectors
 - (a) energy systems; and
 - (b) non-energy sectors,where those sectors have an impact on energy consumption and energy efficiency such as buildings, transport, water, information and communications technology (ICT), agriculture and financial sectors.

Objective of this paper

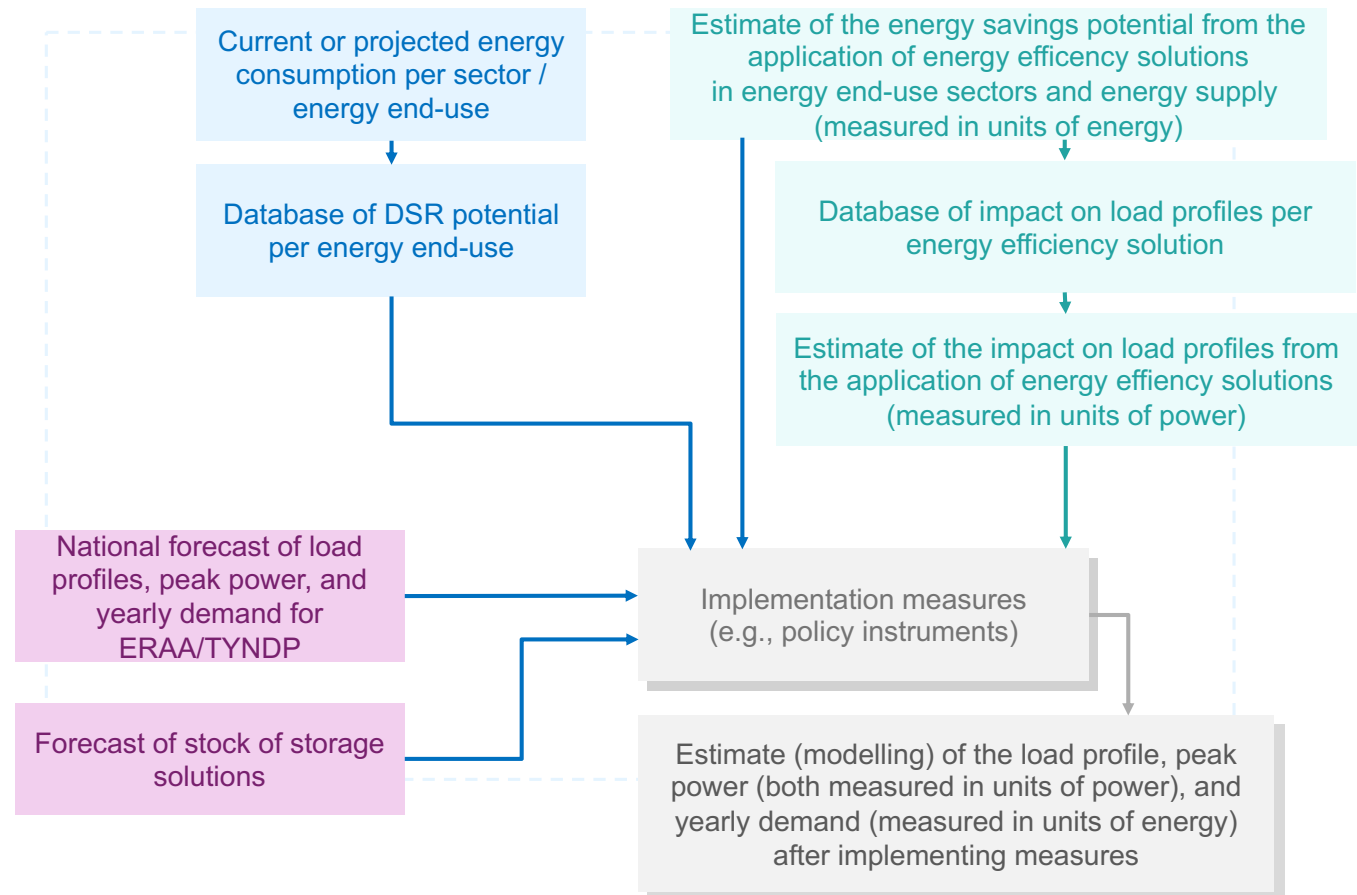
- Develop and discuss **methods** for estimating the energy savings and other energy efficiency gains from application of the energy efficiency first (**EE1st**) principle
- Methodology to provide a **pragmatic, comparable, yet flexible** set of methods and steps
- **Distinction** between energy sector and energy end-use sectors
- Paper is based on a study performed for the European Commission in the context of developing **guidance** to the EU Member States on how to apply the principle
- aims to discuss the **wider application** of the methodology

› **Results:**

- 1) the **methods** developed for estimating the energy savings and other energy efficiency gains,
 - 2) an **application** for estimating energy savings potentials in energy end-use sectors across EU
- › Note: ‘other energy efficiency gains’ include a better match of the load profiles of energy supply and demand as well as further multiple impacts of energy efficiency

Energy sector

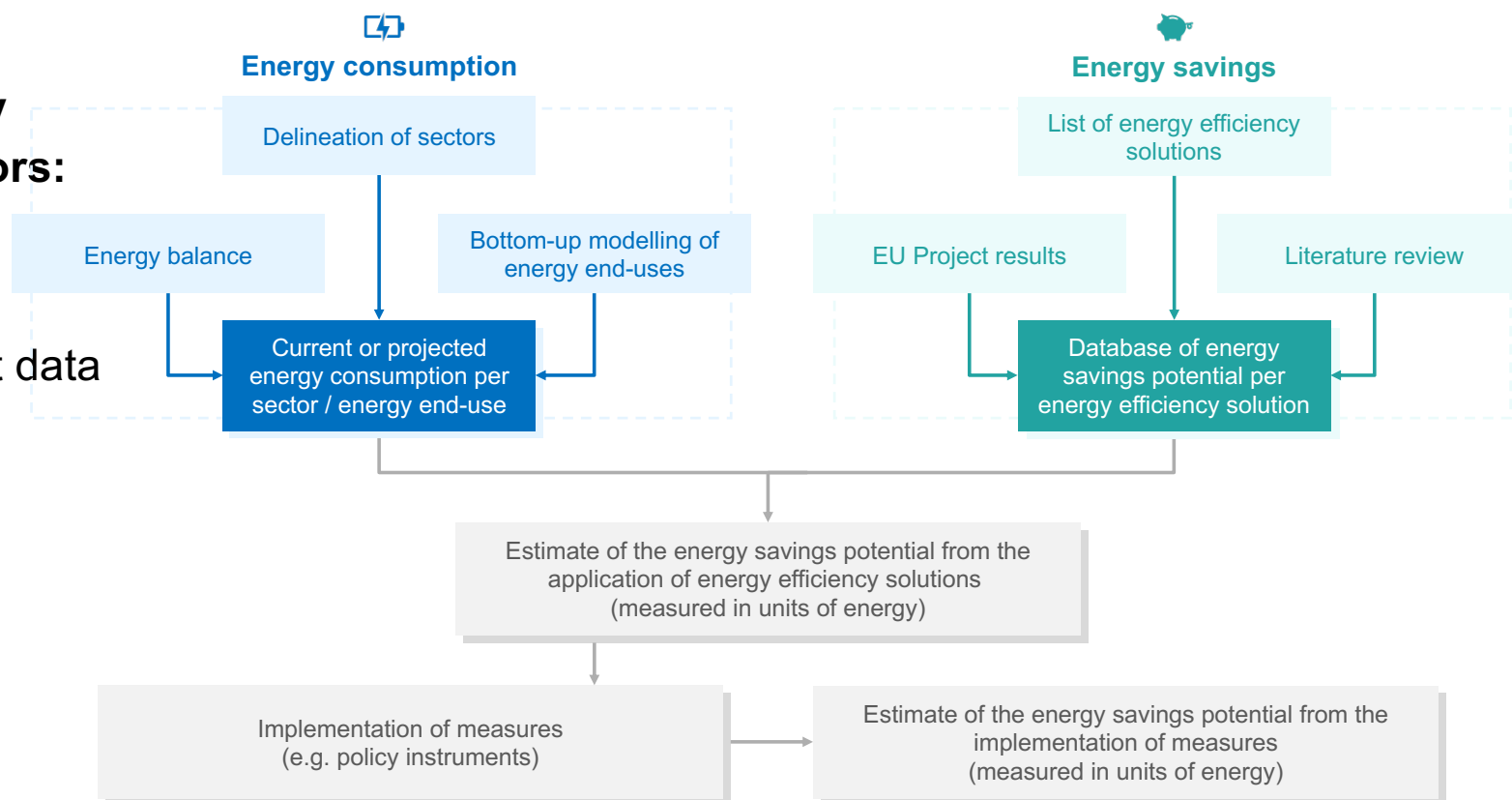
Overarching methodology for the energy sector (example: electricity):
Enhancing the European Resource Adequacy Assessment (ERAA) methodology through application of the EE1st principle



Energy end-use sectors

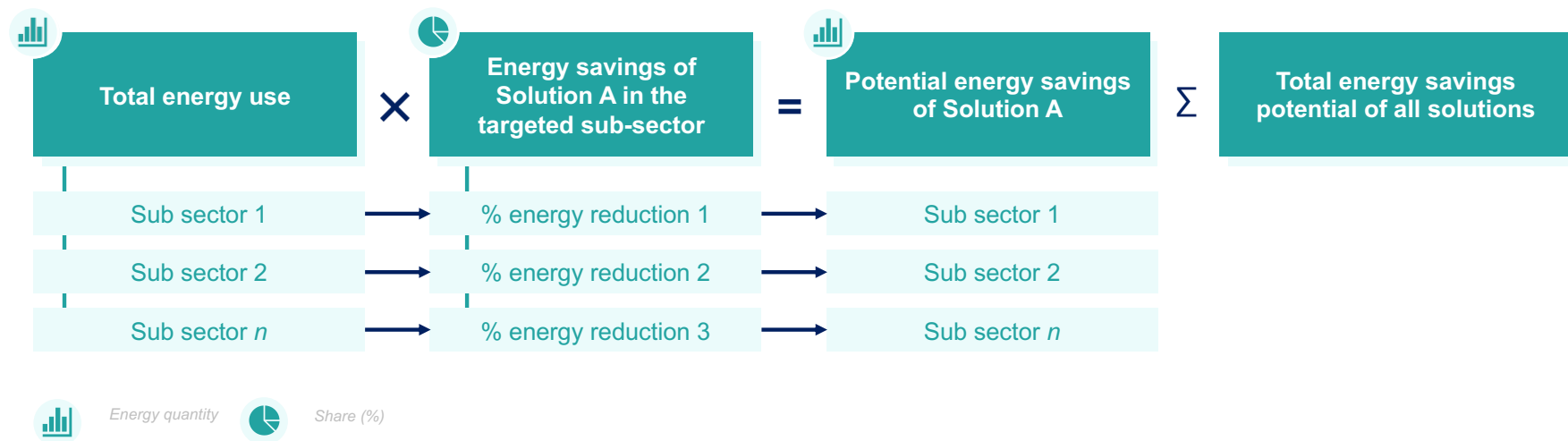
Overarching methodology for the energy end-use sectors:

Using Eurostat data
and literature



Energy end-use sectors

- Steps for estimating the savings in a sector

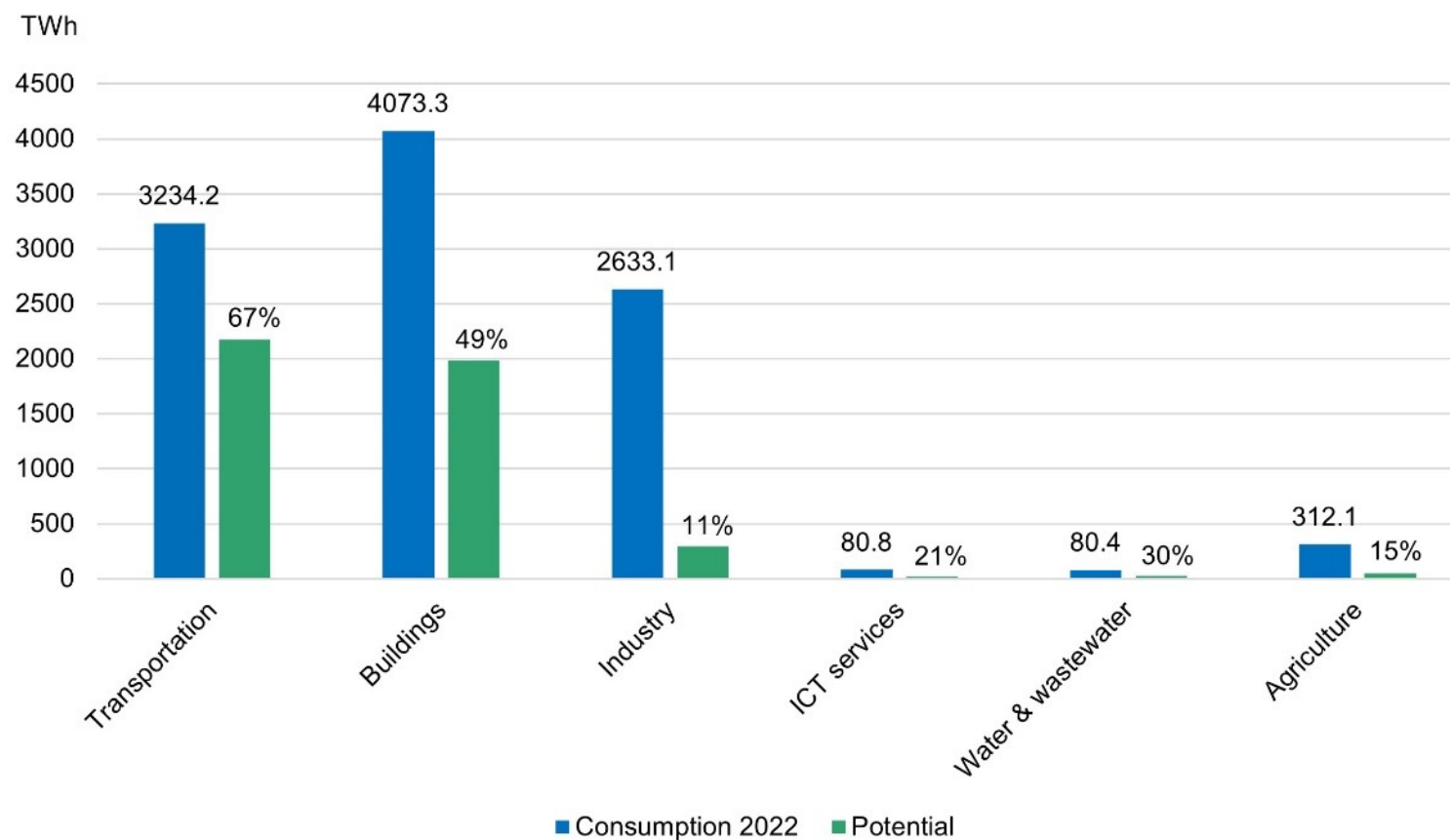


Energy end-use sectors

- **Example: The transport sector in the EU-27**

Solution	Target	Assumption: energy savings potential	Energy savings potential [TWh/yr]
Urban / spatial planning (e.g., densification, superblocks)	Road / Mainly passenger transport	20%	397.0
Public transportation (e.g., mass transit, on-demand services)	Road/ Passenger transport	15%	297.8
Cycling and pedestrian infrastructure (e.g., bike lanes, bike-sharing systems)	Road/ Passenger transport	10%	198.5
Transport demand management (e.g., road pricing)	Road/ Passenger and freight transport	Included in other solutions	
Mobility management (e.g., car-sharing programs)	Road/ Passenger transport	15%	297.8
Electrification of transport (e.g., electric vehicles)	Road/ Passenger transport	20%	397.0
Incentivising the purchase of smaller, low-weight vehicles	Road/ Passenger transport	included in “electrification of transport”	
Shifting freight to other modes of transportation than road	Road/ Freight transport	5%	53.4
Systemic improvements in road freight (incl. electrification)	Road/ Freight transport	50%	533.8
Total		67 % (weighted)	2,175.4

Overview of sectoral results for the EU-27



**level of energy
efficiency
solutions – not
considering
effectiveness of
policy measures**

Discussion: reasons for wide variation in sectoral potential (%)

- **Factors that may cause variation**
 1. **Completeness** of the energy efficiency solutions analyse: *e.g. material efficiency and circular economy in industry not included*
 2. Extent to which **overlaps** between energy efficiency solutions have been taken into account: *All our analysis gave due consideration*
 3. Character of the potential found in the literature: technical or cost-effective? And if cost-effective, taking which perspective (private investor or societal), and including multiple impacts or not?
 4. Conservativeness of the savings estimates – even for the same type of character of the potential
- *For 3. and 4., see next page*

Discussion: reasons for wide variation in sectoral potential (%)

- **Character and conservativeness of the energy savings potentials included in the analysis**

Sector	Character of energy savings potential	Conservativeness of energy savings potential
Transportation	Partly technical, partly cost-effective/EE1st analysis	Aiming for completeness
Buildings	EE1st scenario analysis or other cost-effective	Somewhat conservative; scenario ends in 2050, further building shell renovation and corresponding energy savings possible afterwards
Industry	Cost-effective	Very conservative
Information and communications technology services	Cost-effective	Somewhat conservative
Water and wastewater	Partly technical, partly cost-effective/EE1st analysis.	Conservative
Agriculture	Partly technical, partly cost-effective/EE1st analysis	Conservative

► *Source: own assessment of the sources used*

- **Strengths**

- Use of **Eurostat data** with minimal sectoral adjustments both reduces efforts and supports comparability in estimation of current sectoral energy consumption
- Possibility to either use **current consumption or a forecast** as the basis provides flexibility
- Use of results on energy savings **potentials** by sector and Member State from **EU-funded projects on EE1st** principle should reduce effort and support a minimum level of comparability between Member States for each sector
- For energy sector, starting from **ERAA methodology** enhances acceptance and reduces efforts

- **Limitations**

- Using **current energy consumption** may be over-simplified
- Wide **variation** in potential **between sectors**
- Analysis between **NECPs and ERAA** not yet fully consistent with each other and EE1st principle
- Effectiveness and potential impact of **policy measures** not yet included in analysis

Policy recommendations to improve the analysis and impact of applying the EE1st principle

- **Analysis**

- *EU Member States will need **further analysis** to evaluate the economic viability of energy efficiency solutions according to the EE1st principle, including multiple impacts*
- *More harmonised principles for the **CBA method** and its input parameters*
- ***Impact of policies and measures:** more research to derive average figures of achievable shares of the cost-effective energy savings potential related to end uses and energy efficiency solutions*
- *=> Establish a **repository of ex-post evaluation results** in the EU or possibly worldwide*

- **Impact**

- *Make analysis between **NECPs and ERAA** fully consistent with each other and EE1st principle*
- *Application of the EE1st principle in planning, policy, and major investment decisions will **support attainment of national targets** by implementing more energy savings in practice*
- *EED Article 4 and 8 targets are set at overall national level but not for each sector. Application of the EE1st principle can **support the allocation of these targets** to sectors, sub-sectors, end uses, and corresponding energy efficiency solutions and measures*

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**Thank you very much
for your attention**

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