



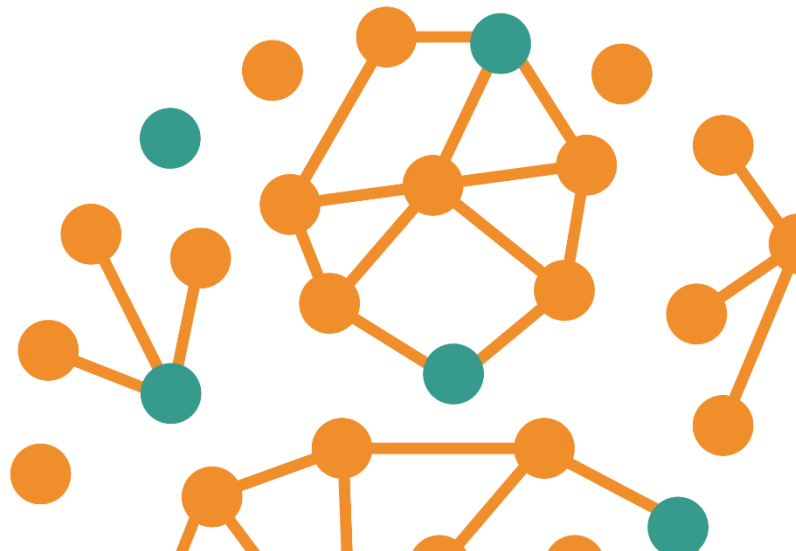
## D5.1 • Report on feedback and recommendations from policy consultations based on results from the work of the Policy Advisory Group



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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101000136.



## D5.1 • REFEREE POLICY ADVISORY GROUP REPORT

### Abstract

The REFEREE Policy Advisory Group (PAG) was established to brainstorm, peer review and give feedback on the development of the REFEREE policy-support system, elaborated in WP3 and WP4.

This report presents the PAG process, the content of the discussions, how PAG members' inputs were taken into account in the project.

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**Version •**

Final version

**Quality review •**

Stefano Faberi, ISINNOVA

**Date •**

25.04.2024

**Grant Agreement N° •**

101000136

**Starting date •**

01.10.2020

**Duration •**

42 months

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# 1 Purpose, functioning and contributions of the Policy Advisory Group

## 1.1 Introduction and contents of the document.

A key component of the REFEREE project has been represented by the Policy Advisory Group (PAG): a group of stakeholders working at both the national and local levels in both energy and non-energy policy departments that have been entrusted with the task of brainstorming, peer review, and giving feedback on the development of the REFEREE policy-assessment tool. From the beginning of the project, it was indeed considered that it was necessary and appropriate to match the design assumptions and, later, the stages of development of the tool with the requirements of its potential users.

To this end, at the start of the project activities, a wide number of stakeholders were invited to join the PAG by proactively participating in a series of workshops to be held during the project to provide their point of view on the subsequent development of the tool. Thirty-two experts eventually agreed to support the project and their presence was rather continuous, at least in the first two to three years of activity. Section 1.2 of this chapter illustrates in detail who were the stakeholders that accepted to join the PAG while section 1.3 describes how the participatory process was organised throughout the project.

The contribution of these stakeholders to the REFEREE project was undoubtedly important and useful, especially in the early stages of the project development, having provided remarkable inputs to the setting of the key components of the REFEREE tool. Nonetheless, not all of their requests could be implemented, since it was necessary to strike a balance between the demands of potential users and the constraints given by both the data requirement and the architecture of the models forming the core of the REFEREE tool for the provision of the multiple benefits of energy efficiency measures. The description of the PAG members' contributions to the project, as well as the overview of requests that could not be implemented, is provided in more detail in section 1.4.

Finally, the in-depth description of the contents and organisation of the PAG workshops, of the discussion carried out, and of contributions provided by the stakeholders in each of them, is provided in chapters 2-6.



## 1.2 Composition

The REFEREE consortium identified possible members of the Policy Advisory Group according to different criteria to reflect the cross-cutting and silo-breaking nature of the REFEREE project. At the same time, high levels of expertise were needed due to the complexity of the tool itself and the modelling process.

In this vein, the REFEREE consortium strived to select experts from different sectors (e.g. energy, health, housing, chemical industry, transport) and areas of expertise (e.g. financing, social, R&I, air pollution), and representing different types of organisation (e.g. public institution, academia, business, energy agency, civil society organisation). Finally, the REFEREE Policy Advisory Group was to respect gender balance. Geographical diversity was also a secondary criterion.

Over the course of the project, new members were invited to match the needs of the development process, with a significant enlargement of the PAG during the fourth meeting in September 2023 in Brussels. The perspective was also to engage a wider numbers of stakeholders, not only for their insights, but also to prepare the dissemination phase.

In the end, the REFEREE Policy Advisory Group was composed of 32 active members (see table below), who took part between 1 and 4 of the 5 PAG meetings organised between March 2021 and April 2024. 17 of these members were woman and 15 were men. Countries represented included Italy, France, Spain, Germany, Belgium, Bulgaria, Greece but also the United Kingdom and China.

The organisations represented can be classified in the following categories:

- National energy agencies (6 members from 3 agencies)
- National and local authorities (6 members from 4 authorities – 1 national 3 regional and local)
- Associations and federations (6 members from 6 organisations)
- Universities and public research institutions (6 members from 5 institutions)
- Think tanks and academic associations (4 members from 3 organisations)
- Consultancies (1 member from 1 organisation)
- Energy companies (1 member from 1 organisation)



Organisation	Name	Position
ADEME (French Energy Agency)	Didier BOSSEBOEUF	Scientific and technical advisor
ADEME (French Energy Agency)	Thérèse KREITZ	Resp for int affaire, expert white goods
ADEME (French Energy Agency)	Lucie BIORET	Economist
Area Metropolitana de Barcelona	Gil MORALES	Head of Office Energy Transition
BPIE (Buildings Performance Institute Europe)	Judit KOCKAT	Executive Director
CAN Europe	Verena BAX	Energy Savings Policy Coordinator
CNR IMAA (Institute of Methodologies for Environmental Analysis)	Luigi SANTOPIETRO	Researcher
CNR-IMAA institute	Carmelina COSMI	Researcher
CRES (Greek energy agency)	Argyro GIAKOUMI	Energy Policy Analyst
CRES (Greek energy agency)	Iatridis MINAS	Energy Policy Analyst
Diputació de Barcelona	Parpal NÚRIA	Environmental Program Manager
European Federation of Intelligent Energy Efficiency Services (EFIEES)	Eline BLANCHARD	Head of Policy
EIT Urban Mobility	Pierre SERKINE	Public Affairs and Stakeholder Relations Officer
Emilia Romagna Region	Apollonia TIZIANA DE NITTIS	Expert
Emilia Romagna Region	Claudia ROMANO	Project Manager
Emilia Romagna Region	Attilio RAIMONDI	Senior expert
ENEA (Italian Energy Agency)	Alessandro FEDERICI	Head of Monitoring Energy Policies for Energy Efficiency Laboratory





ENEA (Italian Energy Agency)	Salvatore TAMBURRINO	Researcher
ENEA (Italian Energy Agency)	Maurizio MATERA	Research Fellow
EptaPrime - financial advisory consultancy	Gianpiero PODDIGHE	Founder
EVN Bulgaria	Anna DIMITROVA	Head Of Department, Energy Policy
FEDARENE	Florine SERRAULT	Policy officer
FIRE (Italian Federation for the Rational Use of Energy)	Dario DI SANTO	Managing Director
German Federal Ministry for Economic Affairs and Energy	Florian KNOBLOCH	Policy Advisor
IKEM ( Institute for Climate Protection, Energy and Mobility)	Bénédicte MARTIN	Team Lead Energy Law
IKEM ( Institute for Climate Protection, Energy and Mobility)	Aleksandra NOVIKOVA	Team Lead
Macao University	Aileen LAM	Lecturer
Municipality of Gabrovo	Koleva DESISLAVA	Senior Expert
CLER – Rénovons	Danyel DUBREUIL	Coordinator
Royal Society of Chemistry	Tanya SHERIDAN	Policy and Evidence Manager
University of Liege	Nathalie SIMONIS	Student
University of Exeter	Jean-Francois MERCURE	Senior Lecturer

*Table 1 Final list of members of the REFEREE Policy Advisory Group*



### 1.3 The organization of the participatory process

The Policy Advisory Group met five times between March 2021 and April 2024, four times online and one time in person in Brussels. In addition to presenting the project, the progress made, and ultimately the final tool, the main aims of the PAG meetings were the following:

- First PAG meeting: presenting the project and collecting preliminary ideas for the upcoming modelling and tool design;
- Second PAG meeting: determining the necessary contextual information, potential policy options and the final outcomes of the tool;
- Third PAG meeting: choosing the different reference scenarios and the different EU policies to be incorporated into the reference scenarios;
- Fourth PAG meeting: presenting a working prototype of the tool to the enlarged PAG members and gathering insights about the national and local tools, including on the user interface;
- Fifth PAG meeting: presenting the final tool and accompanying guidance materials, and identifying avenues for improvements regarding the guidance process.

### 1.4 Overall conclusions

The contribution of the Policy Advisory Group proved to be crucial to (i) make collective decisions based on different expectations about the use of the REFEREE tool, which had a direct impact on the modelling work, (ii) improving the REFEREE prototype and interface to ensure the most useful and user-friendly experience (iii) designing appropriate guidance materials. In addition, PAG members also played the role of multiplier for the REFEREE tool, gaining experience on how to use the tool and eager to share their knowledge with their network and use it in their work.

More specifically the points on which the PAG members were consulted have been:

- ❖ the **outputs** of the tool and the way they would be presented;
- ❖ the **policies** that the tool can process;
- ❖ the **reference scenarios** against which their own policy simulations would be compared;
- ❖ the **guidance** to be provided, including the contextual information; and
- ❖ the **user interface**.



The summaries of these contributions are described below.

Most of the **outputs** that the PAG members identified as essential and prioritised throughout the PAG process appear in the final tool. This includes:

- ❖ Energy dependence (Final output: Fuel imports as share of gross output).
- ❖ Industrial productivity (Five final outputs: Gross value added; Energy intensity; Energy cost Impact, International competitiveness, Labour productivity).
- ❖ Employment (Final output: Employment).
- ❖ Social impacts (Five final outputs: Demand for skills by type of occupation, Demand, for skills by skill level, Share of energy consumption by quintile, Increase of available income per capita\* and Increase of available local aggregated income\* - (the last two\* being available for the local tool).
- ❖ Impacts on public budgets (Final outcome: Public budget as share of GDP).

It is worth noting that one of the indicators that was ranked high by the PAG members was the indicator on material use. This indicator was initially inserted in the REFEREE prototype but had then to be dropped from the final tool due to critical issues regarding long-term projections. Finally, while PAG members were keen to see sub-indicators related to social impacts, especially related to energy poverty and overall impacts on vulnerable groups, it was in the end not possible to add them to the Referee tool for lack of reliable data.

In addition to the type of indicators to be provided, it was also discussed how these results could be provided to end users. To this end, the consortium proposed four different options: KPIs contextualisation with policy targets, Cost-Benefit Analysis, Stakeholder Analysis and Spatial impact analysis. After in-depth discussions, the PAG members stressed that the first option, namely, policy target, was critical for policymakers. In contrast, the other options were deemed useful, but potentially secondary. This was once again decisive for the development of the tool since this option was the one ultimately chosen.

The REFEREE consortium received extensive feedback from its PAG members regarding the different **policy options** that the tool would be about to simulate. However, it must also be said that this was the argument where the constraints given by the availability of data and the logic of the models used by the tool to provide, in particular, the non-energy impacts, prevented many of the suggestions from the PAG from either being further explored or being included in the final REFEREE tool. For instance, while there was a strong interest in including supporting policy measures such as communication and information campaigns, training, support for low-income households in accessing information

as well as guidance on investment choices for households, difficulties in quantifying the impacts of such policies and lack of data discarded them early on from being included in the REFEREE tool. In addition, while some policy options proposed by the PAG were first considered directly implementable by CE modelling team (e.g. white certificates, ESCO financing), they ended up not making it into the final prototype due to the inability of the modelling framework to accurately capture the dynamics involved. Finally, although PAG members outlined the usefulness of increasing the level of sectorial breakdown of the different policy options (e.g. cars, trucks, motorcycles and buses instead of just vehicles), the technology-specific nature of the model, primarily focusing on core technology, as well as insufficient data (for instance between houses and flats) made it impossible to implement the received feedback.

The PAG members were also heavily involved in the definition of the **reference scenarios** and the policies that should be included in them. In this case, in-depth discussions were needed to explain this concept of reference scenarios, which ultimately led to the decision to include an additional section to the guidance material of the national REFEREE tool dedicated to these scenarios. In addition, comments from PAG members regarding the fourth reference scenario and the difficulty of setting a fixed fossil fuel price until 2050 led the modelling team to propose five different alternatives at 100, 150, 200, 250 and 300 €/ton CO<sub>2</sub> (in 2022 prices).

Throughout the project, the PAG helped identify the points deserving of additional explanations for the end users of the tool, which was reflected in the development of comprehensive and high-quality **guidance** materials for the national and local tools. For instance, from the very beginning, the PAG was consulted on the contextual information that needed to be provided to the users. PAG members endorsed the proposed options and explicitly asked for additional contextual information on climate and building status (eg, heating and cooling degree day). This was fully taken on board by the CE modelling team, which added four sections in its interactive guidance dashboard regarding i) Heating Degree Days ii) Cooling Degree Days iii) Country renovation rate and iv) the EU average building's renovation rate.

Finally, PAG members were consulted throughout the REFEREE project about the **interface** of the tool and their suggestions helped improve the user experience of the REFEREE tool.



## 2 First PAG meeting – 25 March 2021

### 2.1 Participants

The list of participants for this meeting can be found in Annex 1.

### 2.2 Agenda of the meeting

The first PAG meeting aimed to present the project, introduce the consortium and the PAG members, understand PAG members' general expectations and already begin to gather insights and preferences regarding the indicators provided in the results – which have a direct impact on the modelling work to be carried out – and regarding the general shape that the REFEREE tool would take.

Therefore, the meeting was divided in four different sessions. The first two sessions focused on general introductions (see 2.3) and the presentation of the first concept of the REFEREE tool (see 2.4) respectively. The third session (see 2.5) was held in smaller groups via breakout rooms to allow for more in-depth discussions about PAG members' opinions regarding the final indicators and the general design of the tool. The fourth session (see 2.6) brought back the PAG members and the consortium in a plenary session to convey the outcomes of the discussions. Finally, the meeting concluded with a review of the next steps.

The agenda of the meeting was as follows (see Table 2):

Timing	What	How	Who
<b>1. Plenary – Project and tool presentation (10.00 – 11.05)</b>			
10:00	<b>Presentation</b> of REFEREE project	Slides presentation	Stefano Faberi (ISINNOVA)
10:05	Participants <b>presentations</b>	Introduction Round	Radostina Primova (CSD)
10:20	Participants <b>expectations</b>	Small survey on Slido	Camille Defard (JDI)
10:25	REFEREE <b>modelling</b>	Slides presentation	Jon Stenning (CE)
10:35		Q&A	
10:45	REFEREE <b>Policy-Support system</b>	Slides presentation	Oriol Biosca (MCRIT)
10:50		Q&A	

10:55	Introduction to <b>group discussion</b>	Slides and Mural overview	Stefano Faberi (ISINNOVA) Giorgia Galvini (ISINNOVA)
11:05	<i>10' Break</i>		
<b>2. Breakout rooms - Group discussion on Mural (11.15 – 11.55)</b>			
11:15-11:35	<b>Modelling Framework</b> 1. Out of a list from the literature review, rank impacts of energy efficiency in order of importance for you. 2. Could you rank the impacts based on the need for further evidence to support your decisions ?		Group1] Jon Stenning, Radostina Primova Group2] Matteo Caspani (CE), Camille Defard Group3] Ornella Dellaccio (CE), Stefano Faberi
11:35-11:55	<b>Decision support tool interface</b> 1. Which <b>topics</b> are of your most concern? 2. How would you <b>imagine</b> the REFEREE policy-support tool?		Group1] Oriol Boscal, Radostina Primova Group2] Harold de Castillo (MCRIT), Camille Defard Group3] Albert Sole (MCRIT), Stefano Faberi
11:55	<i>10' Break</i>		
<b>3. Plenary – Discussion outputs (12.05 – 12.30)</b>			
12:05	Wrap-up group discussion (7' minutes per group)		Radostina Primova (CSD) Camille Defard (JDI) Stefano Faberi (ISINNOVA)
12:25	Conclusion and next steps (Timing and topic of next PAG meeting)		Stefano Faberi (ISINNOVA)

Table 2 Agenda of the first PAG meeting

### 2.3 Session 1: Welcome, participants' presentation and opening of the meeting

The meeting opened with the greeting of the coordinator, who welcomed the present stakeholders and explained the purpose and importance of their participation in the entire project economy. The coordinator then focused on the



purpose and expectations of the first workshop and then gave the floor to the members of the consortium to present themselves. Finally, the coordinator illustrated the objectives and the structure of the REFEREE project and then passed the floor to the stakeholders allowing them to present themselves and their background. Finally, a SLI.do survey was conducted to find out the expectations of PAG members with respect to REFEREE. Results are displayed below (Figure 1). It shows that increasing awareness of energy efficiency multiple benefits was the priority objective of PAG members.

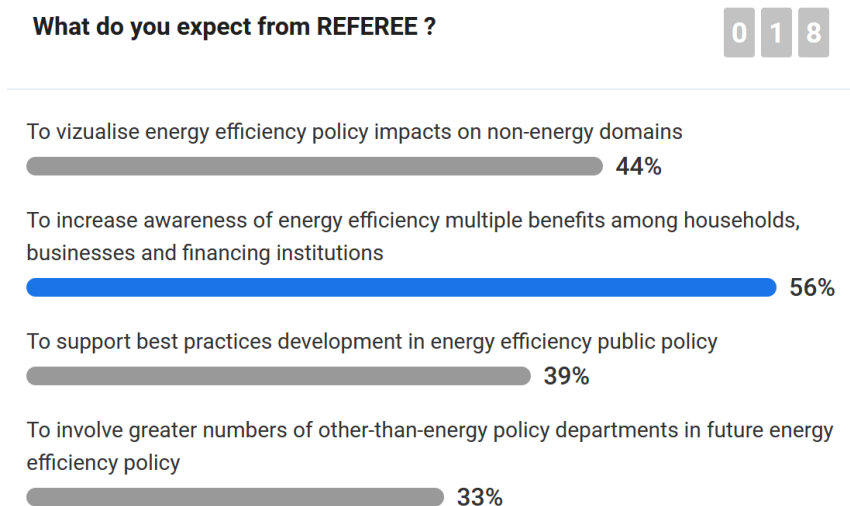


Figure 1. Survey results from PAG members' expectations towards REFEREE

## 2.4 Session 2: Rationale and architecture of the REFEREE tool

In this second session, Jon Stenning from Cambridge Econometrics (CE) first explained the main conceptual criteria on which the tool is based and then went on to illustrate the architecture of the Policy Assessment Tool as it was conceived at the beginning of the project.

The key points raised by CE are described as follows.

### The main design criteria:

REFEREE uses the existing evidence base to extend and improve existing approaches to provide an integrated method to assess the co-benefits of energy efficiency. From the scientific point of view, **the quantification of the multiple impacts of energy efficiency policy involves a scientific challenge linked to how**

**technology is expected to deploy because of the social, economic and environmental impact of policy.**

To face this challenge CE will develop a set of models like the new technology diffusion models, based upon the Future Technology Transformation (FTT) framework, in order to integrate them with the E3ME model, creating an enhanced version of E3ME.

A user-friendly REFEREE Policy-Assessment tool will include a simplified version of E3ME (E3ME lite) tailored for **evaluating the impacts of energy efficiency policy scenarios designed by users.**

#### The REFEREE Policy Assessment Tool:

The tool will be based on an **E3ME-lite version** to carry out interactive runs for assessing simplified energy efficiency policies considering the next two features:

- departing from policy meaningful questions
- presenting results in terms of policy-relevant outcomes

REFEREE Policy-Support system will be designed as a **"user-centric" tool**, in contrast to the "model-centric" and scientific character of the E3ME. REFEREE will be modular, scalable, and with a user interface easy to be customised for different types of policy users.

Jon then stressed that the contribution of the PAG will be critical to develop the tool. Regular interaction with PAG members will ensure the tool development aligns with users' expectations and needs. At the time of this presentation finalization of the tool was envisaged by the end of 2022.

Finally, Jon concluded his speech by adding that 30 existing Decision Support Systems have been reviewed and classified according to seven sectors (air quality, urban mobility, housing, buildings, industry, logistics, energy and urban infrastructure) and three levels of action (from micro to national) (Figure 2). REFEREE's proposed approach is to cover all these sectors and levels of action (Figure 3).





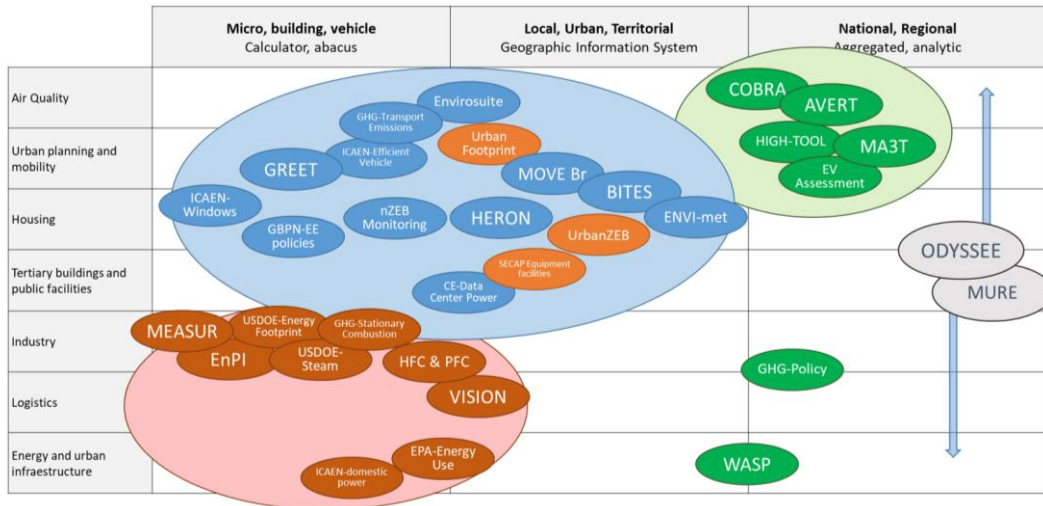


Figure 2. Decision Support Tools Review

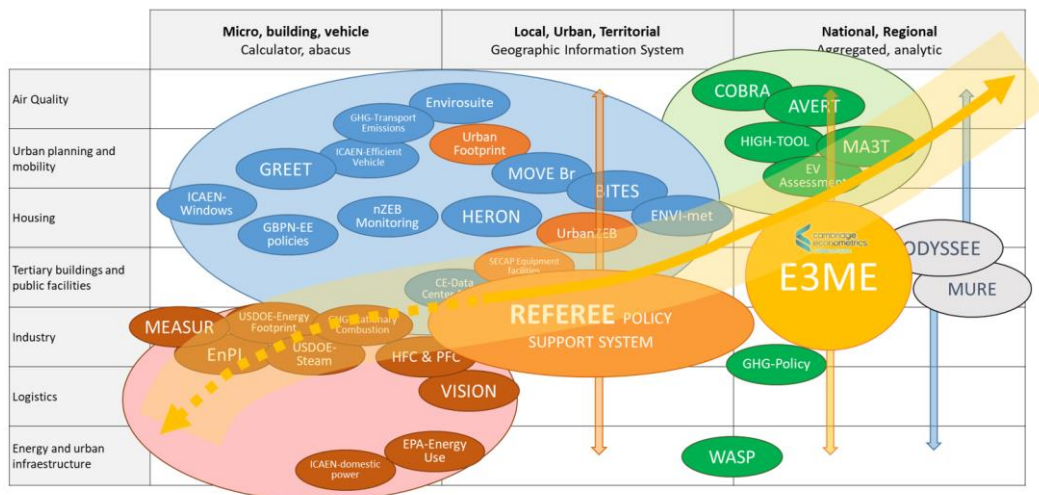


Figure 3. REFEREE's approach

## 2.5 Session 3: Breakout rooms

Participants were then distributed into three discussion groups, where they had to answer questions using Mural tool.

- **REFEREE Modelling questions**

Here was the list of impacts of energy efficiency impacts that were identified in the literature review:

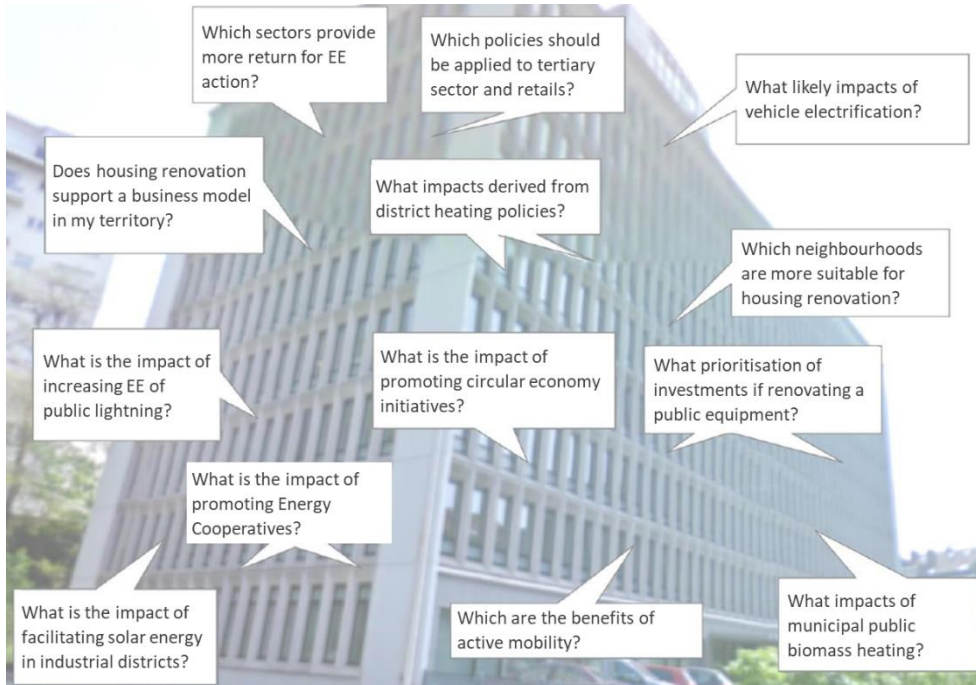
- Industrial competitiveness
- Gross Domestic Product (GDP)
- Employment
- Public budget
- Public health spending
- Air pollution and emissions
- Mortality and morbidity
- Labour productivity
- Natural resources
- Material consumption
- Skills
- Social impacts

Participants were asked to rank them in order of importance for you (very important, fairly important, not important), and to add any impact that would be missing.

Participants were then asked to rank the impacts based on the need for further evidence to support their decisions, based on the following choices: more evidence very needed, more evidence would be useful, no need for further evidence.

- **REFEREE Policy Support Tool questions**

Based on the image below (Figure 4), participants were asked to add any missing topic, and then select three critical topics and rate them in relation to their relevance for being considered in the Policy Support system.



*Figure 4 Policy Support Tool questions*

Then participants were asked how they would imagine the REFEREE policy-support tool:

- 1) A toolbox made out of simple tools to assess non-energy benefits for different kinds of buildings, facilities and services?
- 2) A spatialised tool for urban energy management to support energy efficiency plans?
- 3) An analytical tool for aggregated strategic energy policy impact assessment?
- 4) Knowledge and data integration tool for policy-making support?

And to rate their two best preference by putting stickers on the graph below (Figure 5), choosing along spatialized / analytical, disaggregated / integrated dimensions.

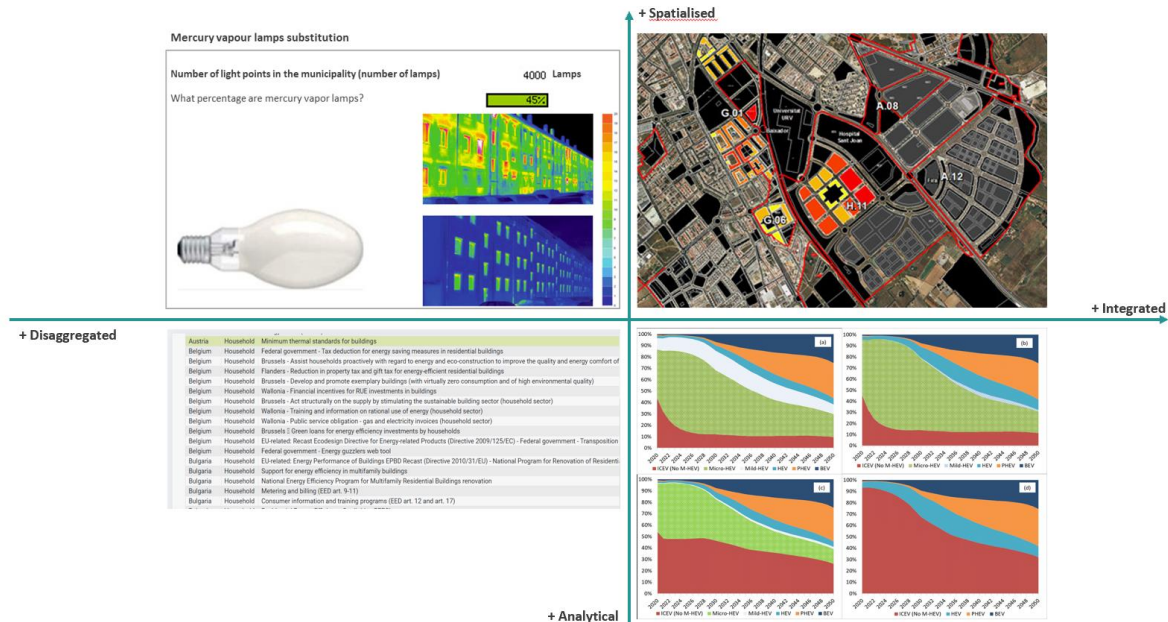


Figure 5 Possible dimensions for the REFEREE tool

## 2.6 Session 4: Discussion outputs

- **Group 1**

An overarching comment was raised that the REFEREE team has to align better its indicators with those of the EU taxonomy for sustainable activities and EU Sustainable Finance Taxonomy.

Most participants highlighted social impacts, employment and industrial competitiveness as the most relevant energy efficiency impacts, followed by air pollution, natural resource management and public budget gains. GDP and labour productivity have been perceived as fairly important but resulting as an outcome of the other more directly-related non-energy benefits. At the same time, these indicators (social impacts, natural resources & material consumption) are identified as the areas where more evidence is needed. In terms of the social impacts of energy efficiency, the participants also addressed the need to define further sub-categories to measure different dimensions and sub-indicators related to social benefits, including the impact on vulnerable groups, energy poverty impacts and employment. The most relevant topics to be included in the decision-support tool were the sectors that provide more return for EE investments, the impact on vulnerable groups, the neighbourhoods more suitable for housing renovation and circular economy activities. During the group

discussions, participants highlighted the need to study the impact not only on vulnerable consumers but also on the middle class. In terms of the type of neighbourhoods, one should consider not only social groups living in different neighbourhoods but also the different types of buildings they inhabit.

Regarding the last question, participants would like to use the tool for simple use to assess the benefits for different kinds of buildings, facilities and services, as well as a knowledge and data integration tool for policy-making support.

- **Group 2**

Air pollution and emissions were the major energy efficiency impact category for this group. All members deem this impact as “very important”. GPD and public budgets were the most voted categories under “fairly important” (each was mentioned by four members). Almost no topics are considered not important.

Group members added two other areas of impact: innovation and sovereignty/energy independence.

Industrial competitiveness, employment, and innovations are areas where more evidence is much needed, according to members (each impact was mentioned by four members or more). More evidence would be nice to have on public budgets and social impacts (mentioned by three members each). Skills is also a topic hardly explored. For almost no topics is it deemed that more evidence is not needed.

Likely impacts of vehicle electrification and benefits of active mobility are the most relevant topics to be included in the decision-support tool according to group members (four votes each). Circular economy promotion is also deemed relevant (three votes).

Preferred tool output is integrated, first with spatial features, and as second best integrated with rather analytical features. The need for an integrated policy-support tool was especially highlighted by participants working in the public sector. Databases often exist but do not dialog with each other, making it difficult to see interactions.

- **Group 3**

In this group, the impacts on industrial productivity and public budgets were among those considered among the most important (4 votes out of 5). In the preference among the most important, followed the impacts on Air pollution and emissions, Employment and Material consumption with three votes on 5. All these



impacts received also votes on the “fairly important” category resulting thus the overall most voted ones.

It is worth noting that in this group members added several new impacts and namely: Biodiversity, Ambient Comfort, Convenience and aesthetics, Increased Social Awareness, Increased value of assets, Business Competitiveness. These new impacts did not receive many votes in both the *main* and *fairly* important categories (from 2 to 1) but the last one can be assimilated to the impact “industrial competitiveness” increasing in this way its relevance. Five impacts were deemed non important all with one vote but the first: Public health spending, Mortality and Morbidity. Skills, Ambient Comfort, Increased Social Awareness

The impacts where more evidence is very needed or for which it would be useful to have some evidence are: Industrial competitiveness (evidence very needed by 5 members), employment and public budget (evidence very needed by 3, 4 members) but also the new proposed Biodiversity (evidence very needed by 3, members) and Business Competitiveness (evidence very needed by 4 members). Only the impact on air pollution and emission was deemed not to have evidence by one member.

Questions on “Which sectors provide more return for EE actions”, “Likely impacts of vehicle electrification and benefits of active mobility” and “Impacts on promoting circular economy initiatives” are by and large the most relevant topics to be included in the decision-support tool according to group members (from five to four votes each). Out of the other questions only the “Prioritisation of investments if renovating public equipment” was deemed fairly relevant with only two votes

As regards the preferences on the type of Policy Support Tool, the category of disaggregated tools is the one that has had the greatest preferences with a focus on the analytical ones. On the contrary, the analytical tools but with an integrated approach were considered less important and no vote was given to the integrated tolls with a spatial approach.

## 2.7 Conclusion and next steps

PAG member diversity was well reflected during group discussions, with **very diverse expectations and needs depending on their work area and level of action** (research and academics, local or national government, private sector, civil society).

More specifically, some comments were raised by participants asking to:

- Provide an integrated system where different databases can communicate with each other to enable analytical comparisons.
- Take EU taxonomy into account regarding non-energy impacts quantification, and pay attention to contribution to sustainable development goals
- Successful EU calculators were targeted at young people, tool design should be simple
- Which policy can drive energy efficiency: maybe start from the policy and then go down to technical details; and how policies will influence future choices.

Lastly, PAG members should share relevant existing EU tools if they have not been reviewed by MCRIT.

### Next steps

- Short term – April 2021: Members to share with MCRIT if they know a good tool that has not been reviewed.
- Long term: Next meeting to be held in November – December, to present CE Future Technology Transformation Diffusion models and multiple benefits quantification.



## 3 Second PAG meeting – 10 March 2022

### 3.1 Participants

The list of participants for this meeting can be found in Annex 2.

### 3.2 Agenda of the meeting

The objective of the second PAG meeting was to gather PAG members' opinions regarding the policies that the Referee would eventually be able to process (based on users' input), the contextual information necessary for end users to be able to use the tool as efficiently as possible, and to agree upon the type the user interface REFEREE should take on. The discussions built on the results of a survey sent to the PAG before the meeting.

The meeting was divided into two main sessions including a thorough update of the modelling process so far (see 3.3.) and a discussion in smaller groups regarding the information cited above, namely contextual information, policy inputs and the REFEREE interface (see 3.4). Finally, the meeting concluded with a review of the next steps (see 3.5).

The agenda of the meeting was as follows (see Table 3):

Part 1. Plenary – Project Presentation (30')		
Time	What	Who
5'	Briefing on REFEREE's progress	Stefano Faberi (ISINNOVA)
7'	Overview of the modeling framework and tool development	Jon Stenning (CE)
5'	Example of user interfaces, and REFEREE decision support interface	Oriol/Harold (MCRIT)
10'	Q&A	



Part 2. Group discussion (60')		
Time	What	Who
20'	<p>1/3. Discussion on the results of the survey regarding <b>CONTEXT</b> : contextual information provided by REFEREE (power sector generation mix, import intensity of fossil fuels,...)</p> <p>&gt; Potentially add specific contextual information</p>	<p><b>Led by CE :</b></p> <p>Group1] Jon Stenning, Stefano Faberi ;</p> <p>Group2] Iakov Frizis (CE), Radostina Primova;</p> <p>Group3] (tbc) Ornella Dellaccio (CE), Camille Defard</p>
20'	<p>2/3. Discussion on the survey results regarding <b>INPUT</b> : energy efficiency policy options (taxation, subsidy, regulation)</p> <p>&gt; Potentially add policy options</p>	<p><b>Led by CE :</b></p> <p>Group1] Jon Stenning, Stefano Faberi;</p> <p>Group2] Iakov Frizis (CE), Radostina Primova ;</p> <p>Group3] (tbc) Ornella Dellaccio (CE), Camille Defard</p>
20'	<p>3/3. Discussion on the survey results regarding <b>OUTPUT</b>: visualization of results – possible options</p>	<p><b>Led by MCRIT:</b></p> <p>Group1] Oriol Boscail, Radostina Primova;</p> <p>Group2] Harold de Castillo (MCRIT), Stefano Faberi;</p> <p>Group3] (tbc) <i>tbd</i> (MCRIT), Camille Defard</p>

Part 3. Conclusion and next steps (15')		
10'	wrap-up of group discussion	Radostina Primova (CSD), Camille Defard (JDI), Stefano Faberi (ISINNOVA)
5'	Conclusion and next steps (Timing and topic of next PAG meeting)	Stefano Faberi (ISINNOVA)

*Table 3 Agenda of the second PAG meeting*

### 3.3 Session 1: Opening and Project development update

After a short introduction from project coordinator Stefano Faberi (ISINNOVA), Jon Stenning (CE - Cambridge Econometrics) and Oriol Biosca (MCRIT) presented PAG members an overview of project's advancement on the modelling side (CE) and on the output visualization side (MCRIT).

- **Overall project advancement**

The REFEREE decision tool will help answer the following questions:

- How can policy instruments alter the take-up of energy efficiency measures?
- How might these policy instruments, and resulting take-up of efficiency measures, affect different aspects of EU Member States?
- What are the key impacts that energy efficiency measures can have within a Member State?

Project coordinator Stefano Faberi (ISINNOVA) informed PAG members about the progress of REFEREE. Tool development is aligned with the expected planning and completed the background analysis of the multiple benefits of energy efficiency, fed by the input provided by the first PAG held in March. In December 2021, the methodology of multiple benefit calculation was completed. The first tool prototype is expected by the end of 2022.

Stefano Faberi added that the current negotiations over the proposed recast of the Energy Efficiency Directive in the Council and Parliament are offering a good opportunity to streamline the multiple benefits approach at the national and local level: proposed amendments include the requirement for Member



States to report on energy efficiency investments and to develop and promote cost-benefit assessment methodology to estimate energy savings multiple benefits<sup>1</sup>. In this context, REFEREE is well positioned to be a potential tool to answer future EU requirements on multiple benefits.

- **REFEREE modelling (CE)**

**The modelling framework links** the deployment of energy efficiency policy to impacts that arise from it (see. “The impacts to be quantified”). **The modelling framework assesses** two distinct sets of outputs based on the policy inputs introduced:

1. How policy affects energy demand and demand for specific technologies (within the FTT technology diffusion models)
2. How the changes in demand for different energy carriers and technologies lead to different impacts (through the application of the E3ME model and additional quantifications).

This policy aspect is the specificity of REFEREE compared to traditional energy models which tend to discard policy influence on the final outcome. Below a schematic view of REFEREE tool functioning that was presented to PAG members. Based on users’ input on the envisaged policy mix and policies’ characteristics, technology diffusion models compute the impact of these policies on different technologies’ purchases (both low and high-carbon technologies), as well as the demand for different energy carriers (fuels and electricity). Then the results serve as inputs into the E3ME macro-economic model complemented with a range of social, economic and environmental metrics (for example on health), to quantify the impact of energy efficiency policies at the national level.

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<sup>1</sup> See the proposed modification to the article 3, letter a. of the Directive that requires Member States to develop a cost-benefit assessment methodology allowing the estimation of the co-benefits of energy savings, while the current wording of the article only requires the promotion and the application of such methodologies

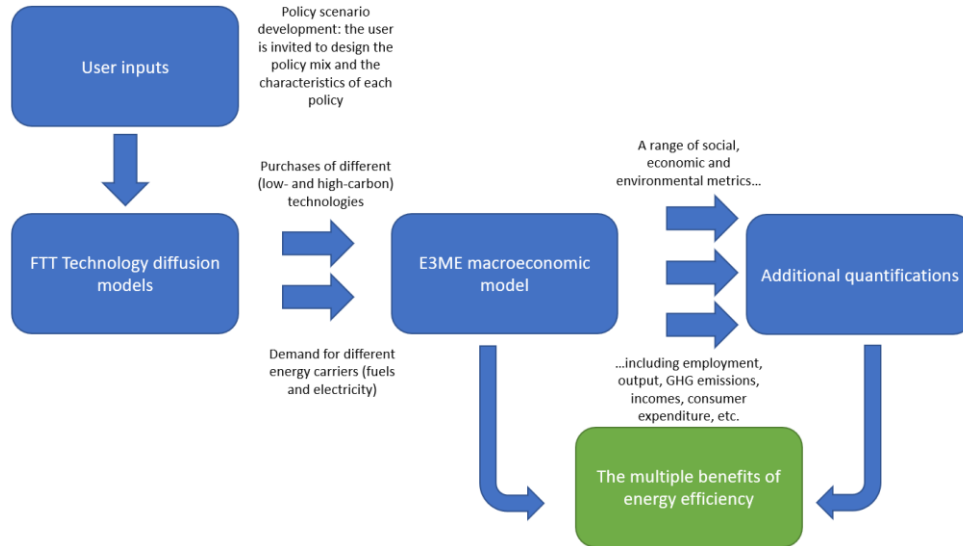


Figure 6 Schematic view of REFEREE tool functioning

**REFEREE will provide contextual information** to consider the fact that the impacts of energy efficiency policy can vary substantially across countries, because of country-specific factors. In addition to the multiple benefits indicators, the tool will report key indicators that help to determine the relative impact of energy efficiency policies. These will include:

- **Power sector generation mix:** share of each tech used in the generation of electricity (e.g. coal, gas, nuclear, solar): This determines both the relative cost of electricity and the level, of embedded emissions from electricity generation
- **Import intensity of fossil fuels:** The economic benefits from reducing fossil fuel consumption are a function of the extent to which fossil fuel spending is leaking out of the domestic economy through imports
- **Energy prices:** Variation in energy prices can have a considerable effect on the impact of energy efficiency measures, especially through fuel switching – smaller benefits can be expected in countries with high electricity prices paired with low petrol prices, for example
- **Energy expenditure as a share of total consumer expenditure:** This influences the relative impact of a reduction in energy use on household budgets

- **Share of energy demand by use case:** Affects the relative impact of energy efficiency policies targeting specific use cases, e.g. countries requiring less heating and cooling will experience proportionally smaller impacts from energy efficiency policies in this area

**Impacts quantified** will help policymakers and other engaged users to communicate the key effects of energy efficiency policy, aided by supporting contextual information. The quantified impact indicators are based on an extensive literature review of state-of-the-art techniques, current data availability and modelling limitations (see Figure 7).

Pillar	Indicator	Unit
Productivity	Gross Value Added	Million €
	Energy intensity	ktoe/million€
	Energy cost impacts	ratio
	International competitiveness	ratio
	Labour productivity	Million € per worker
Socioeconomic development	Gross Domestic Product	Million €
	Employment	Thousand jobs
	Public budget	Million €
	Energy poverty and vulnerable groups	€
	Demand for skills	Types of skill
	Increased value of assets	%
Health & wellbeing	Public health spending	Million €
	Mortality and morbidity	Number of avoided premature deaths
Environment & Climate	Air pollution and emissions	kt pollutants
	Fossil fuel consumption	ktoe
	Energy independence	ratio
	Water use	M3/GWh
	Material consumption	ktonne

Figure 7 Impacts to be quantified by REFEREE tool

Energy efficiency policy options will be entered in the REFEREE tool by the users according to the following steps:

1. The user identifies the energy carrier or technology that the policy targets.

Table 1. Energy carrier

Hard coal	Heavy fuel oil	Other gas	Biofuel
Other coal	Middle distillates	Heat	Hydrogen
Crude oil	Natural gas	Combustible waste	Electricity

Table 2. Technologies

24 individual technologies in power sector	26 individual technologies in steel
13 individual technologies in residential heating	25 individual technologies in passenger cars and trucks
<i>n individual technologies in chemicals (under development)</i>	

- The user chooses a policy. Basically, the policy choice will impact either the price (taxation or subsidy) or the quantity (regulation) of a certain technology, and this variation will translate into energy efficiency / energy gains.

Type	Instrument	Additional information required
Taxation instruments	<ul style="list-style-type: none"> <li>Fuel excise</li> <li>Carbon taxes</li> <li>Combustibles tax</li> </ul>	Tax rate; population affected
Subsidy instruments	<ul style="list-style-type: none"> <li>Direct transfers of funds</li> <li>Tax expenditures</li> <li>Under-pricing of goods/services</li> <li>Income/price support</li> </ul>	Per unit subsidy; total budget available for the subsidy, to (if required) put a hard limit on the total cost of the policy to government
Regulation	<ul style="list-style-type: none"> <li>Minimum Energy Efficiency</li> <li>Phase out of high carbon technologies</li> <li>Energy communities</li> </ul>	Regulation-specific information, e.g. % of population in Energy communities, energy efficiency standards, phase out threshold and speed

- The user designs the policy by introducing necessary pieces of information (default options will be provided). Generally, the user will be prompted to pick the implementation year(s) and the geographic scope of each fiscal instrument. Some instruments will require additional information relating to implementation.
- The user is invited to either add another policy instrument to the mix or to run the model. This process will be iterative, until the user is satisfied with the policy mix.

- REFEREE potential output: Policy Support System (MCRIT)**

Quantified multiple benefits resulting from the model will be presented in a visually attractive way to REFEREE users. Several options are currently considered:



1. **KPIs contextualisation with policy targets (Figure 8).** The user will be able to see the forecasts of the simulations for different scenarios compared to different policy targets.

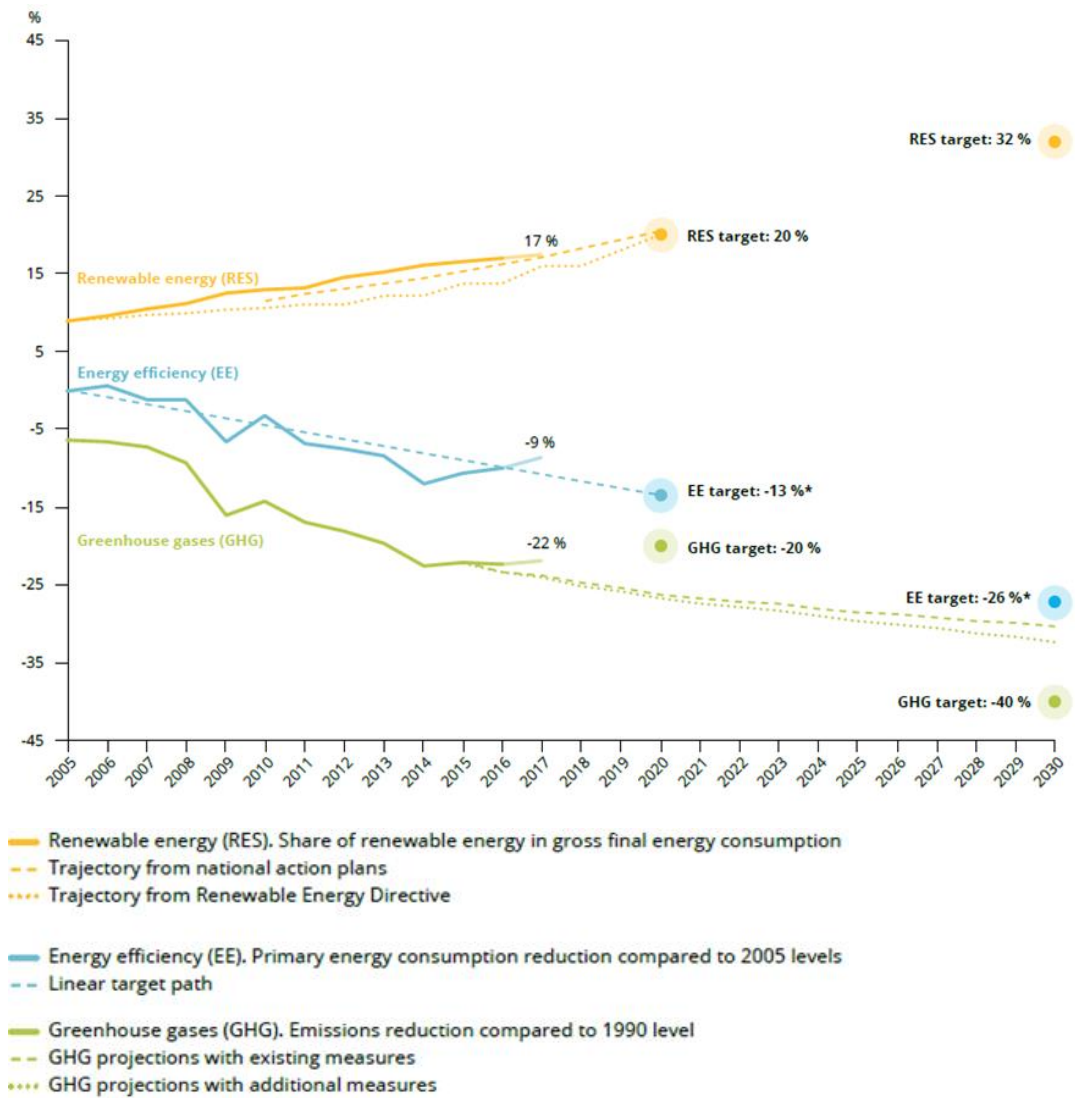


Figure 8 Possible output 1 - contribution to policy targets

2. **Cost-Benefit Analysis (Figure 9).** The impacts will be monetised and disaggregated by typology (e.g. by sector), it will allow the user to compare different types of impacts and identify the policies/actions with a better return.

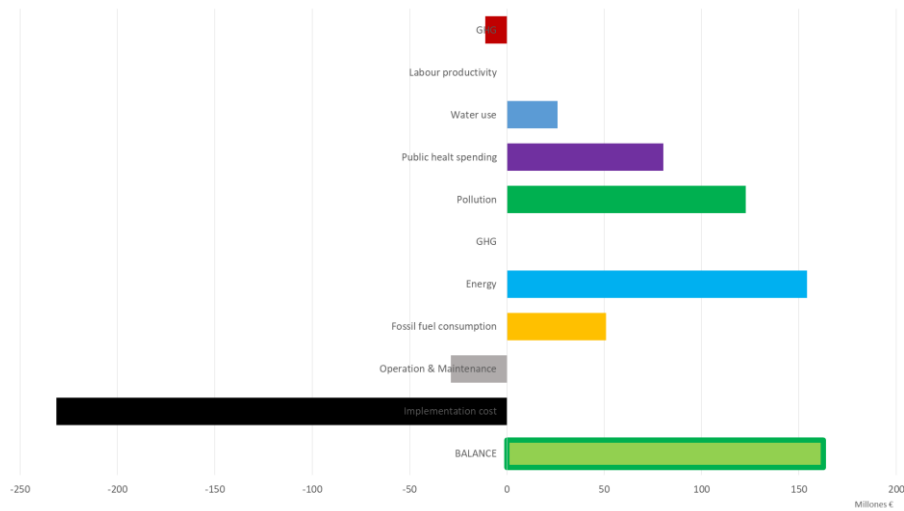


Figure 9 Possible output 2 - cost-benefit analysis

3. **Stakeholder Analysis (Figure 10).** The results will be disaggregated by impact typology and by agent impacted, the user will be able to identify which agents are the most impacted, positively and negatively.

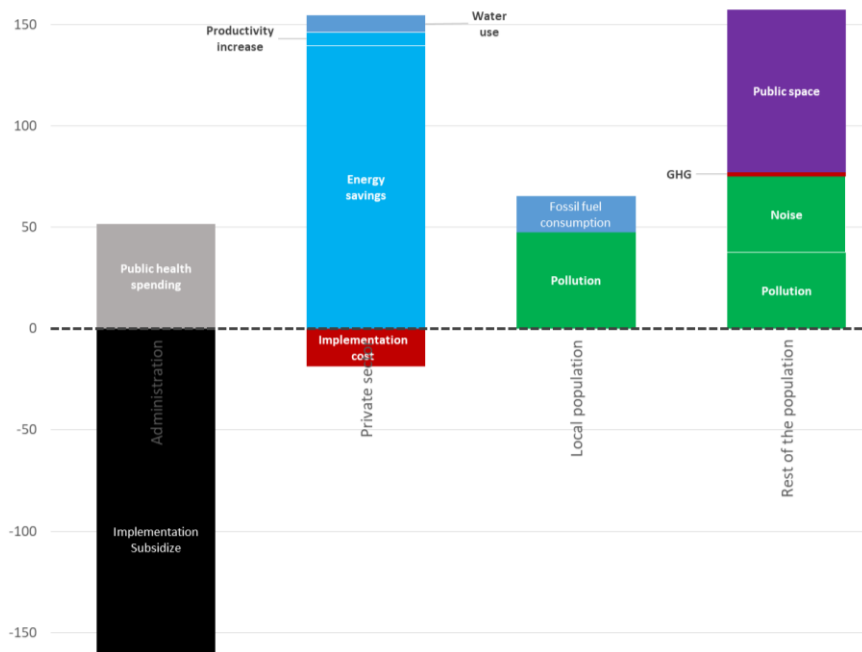


Figure 10 Possible output 3 - stakeholder analysis



4. **Spatial impact analysis (Figure 11).** The user will be able to identify the most and less impacted areas (country, region, city, neighbourhood)

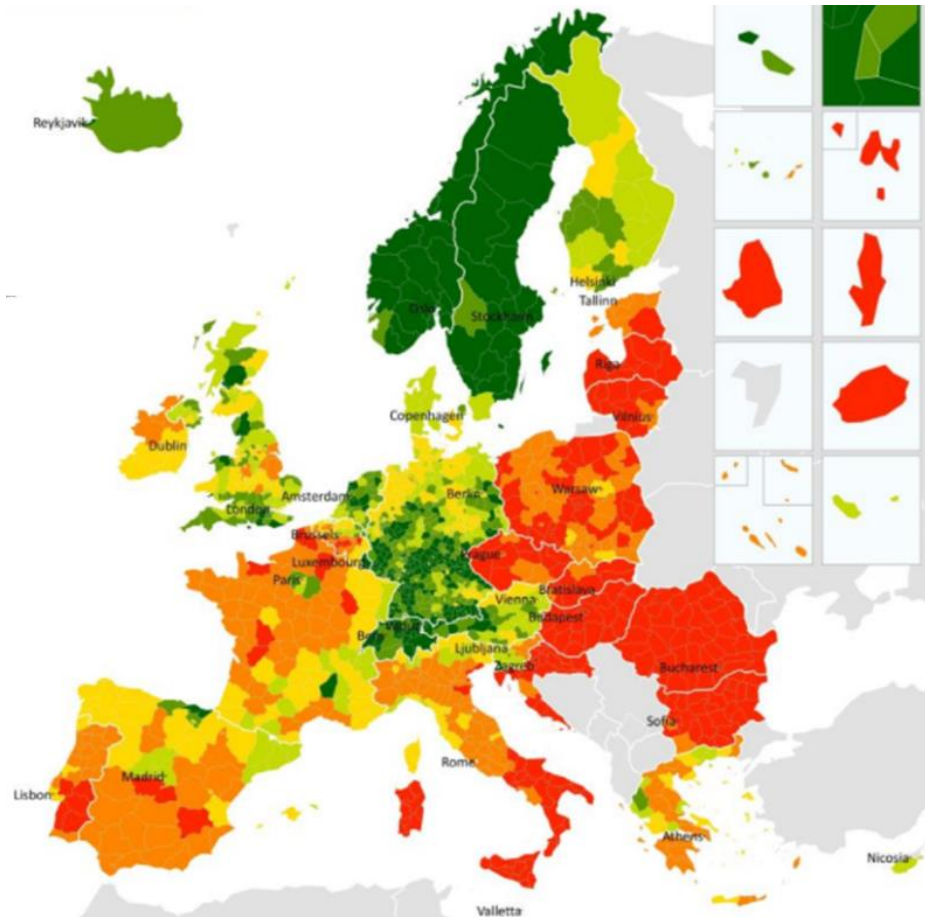


Figure 11 Possible output 4 - spatial impact analysis

### 3.4 Session 2: Breakout rooms

Participants were then distributed into two discussion groups which were held under a roundtable format so that PAG members could ask questions about the presentation, discuss survey results (see Annex 2), and raise additional comments.

- **REFEREE Modelling questions and survey results**

**First, are the contextual information elements envisaged below sufficient?**

Most respondents to the survey declared that it looked fine (see Figure 12), but there were some requests and suggestions to include indicators related to the structure of the energy demand (eg, energy demand by energy user and energy

type), as well as climate and building status (eg, heating and cooling degree day – this is currently under review by CE modelling team).

1. CONTEXT. The initial contextual information provided by the REFEREE tool is detailed below. \*

Would you like more contextual information on country-specific factors ?

- The impacts of energy efficiency policy can vary substantially across countries, as a result of country-specific factors.
- In addition to the multiple benefits indicators, the tool will report key indicators that help to determine the relative impact of energy efficiency policies. These will include;
  - **Power sector generation mix: share of each tech used in the generation of electricity (e.g. coal, gas, nuclear, solar)**  
This determines both the relative cost of electricity and the level, of embedded emissions from electricity generation
  - **Import intensity of fossil fuels**  
The economic benefits from reducing fossil fuel consumption are a function of the extent to which fossil fuel spending is leaking out of the domestic economy through imports
  - **Energy prices**  
Variation in energy prices can have a considerable effect on the impact of energy efficiency measures, especially through fuel switching – smaller benefits can be expected in countries with high electricity price paired with low petrol prices, for example
  - **Energy expenditure as a share of total consumer expenditure**  
This influences the relative impact of a reduction in energy use on household budgets
  - **Share of energy demand by use case**  
Affects the relative impact of energy efficiency policies targeting specific use cases, e.g. countries requiring less heating and cooling will experience proportionally smaller impacts from energy efficiency policies in this area

11 Antworten

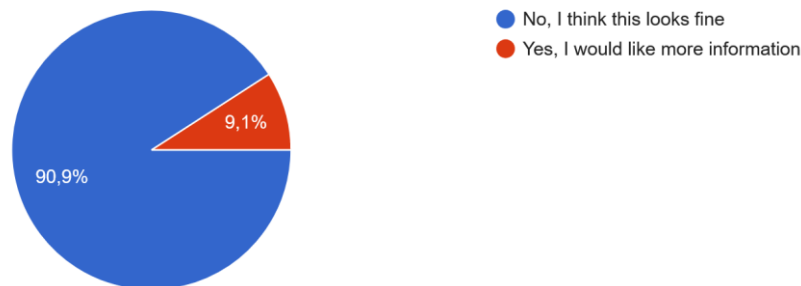


Figure 12 Survey results on contextual information

2. CONTEXT. If you answered yes to the previous question, kindly precise which kind of information you would like to include as contextual information.

2 Antworten

It's OK. But, I think we should be allowed to ask questions to you about illustrations on what you mean by "country-specific factors". Without taking to much time on it.

I suggest to add some indicator related to the structure of the energy demand (e.g. weight of different sectors), climate and building status, if possible.

Second, PAG members were asked to discuss and comment the policy options envisaged below.

Type	Instrument	Additional information required
Taxation instruments	<ul style="list-style-type: none"> <li>Fuel excise</li> <li>Carbon taxes</li> <li>Combustibles tax</li> </ul>	Tax rate; population affected
Subsidy instruments	<ul style="list-style-type: none"> <li>Direct transfers of funds</li> <li>Tax expenditures</li> <li>Under-pricing of goods/services</li> <li>Income/price support</li> </ul>	Total budget available for the subsidy, to (if required) put a hard limit on the total cost of the policy to the government
Regulation	<ul style="list-style-type: none"> <li>Minimum Energy Efficiency</li> <li>Phase out of high carbon technologies</li> <li>Energy communities</li> </ul>	Regulation-specific information, e.g. % of population in Energy communities, energy efficiency standards, phase out threshold and speed

11 Antworten

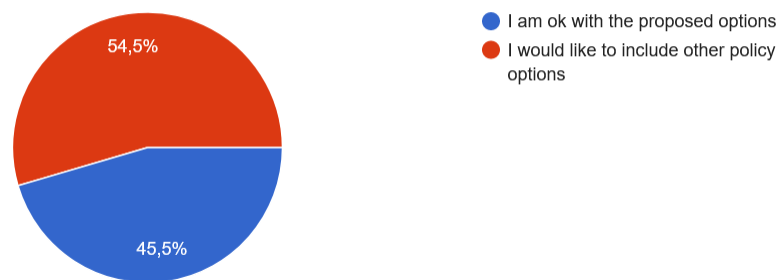


Figure 13 Survey results on policy options

Survey results indicated an interest in including accompanying dimensions of policy intentions such as communication on targeted themes, support for low-income households accessing information and support possibilities, guidance and advice on investment choices for households, training, and information campaigns. However, these are difficult to quantify or face a lack of data. Therefore, they will likely be implementable only as guidance, ie non-quantified information that would come along with the results to highlight their useful contribution to reaching the policy objectives.

PAG members that responded to the survey also suggested including these policy options, which are deemed directly implementable by CE modelling team (sorted by policy type):

Regulation

- Energy efficiency obligation



- White certificates
- Prices
- ETS or auctions

Taxation

- Tax credit schemes
- Property tax (linked to the energy performance of buildings)

Subsidies

- Guarantee funds
- Subsidised loans

• **REFEREE Policy Support Tool questions and survey results**

Regarding the policy support tool, PAG members were asked to rate the usefulness of the different output options presented above (contribution to reaching the policy targets, cost-benefit analysis, stakeholders analysis, spatial analysis). All the proposed options were deemed useful by PAG respondents (1 not useful – 5 very useful).

OUTPUT 1. Contribution to policy targets (energy efficiency, renewable energy, greenhouse gas <sup>\*</sup> reduction)

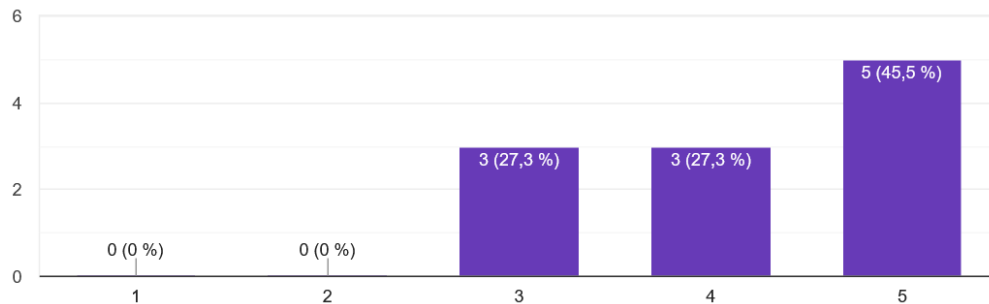


Figure 14 Survey results - Output 1

OUTPUT 2. Cost-benefits analysis

11 Antworten

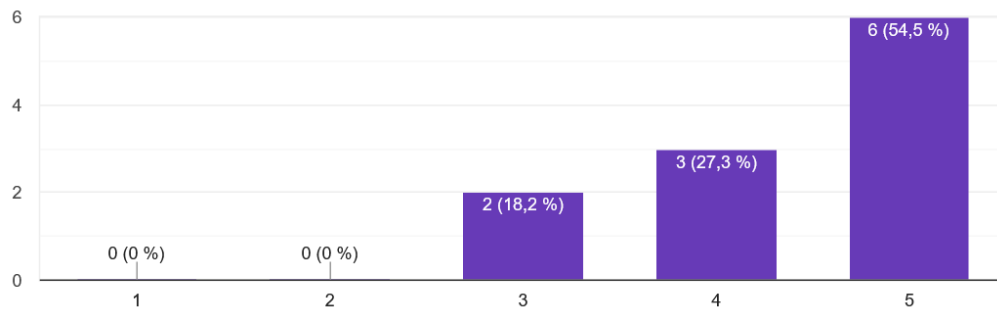


Figure 15 Survey results - Output 2

OUTPUT 3. Stakeholders analysis

11 Antworten

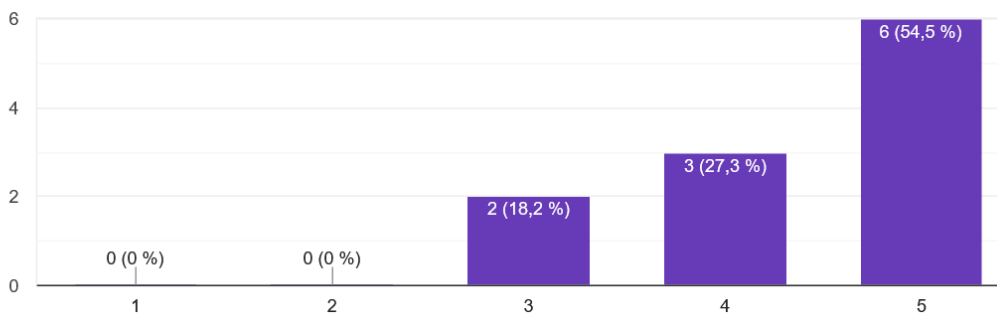


Figure 16 Survey results - Output 3

OUTPUT 4. Spatial impact analysis

11 Antworten

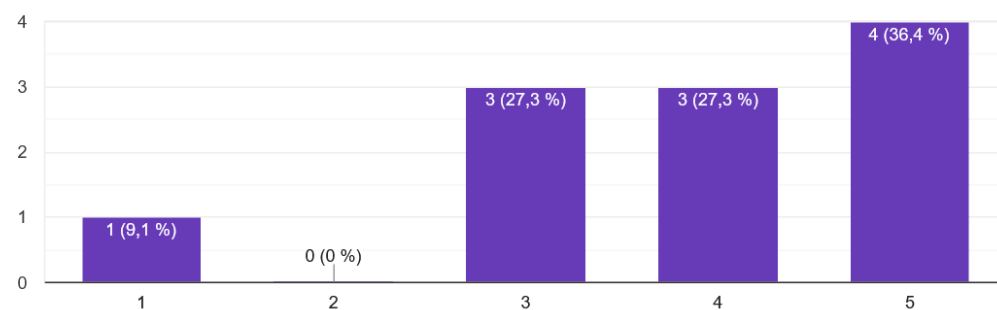


Figure 17 Survey results - Output 4

The PAG meeting was the opportunity to further discuss these results with the following questions:

1. Which outcomes do you think can bring in more added value to the ongoing European policy debate?
2. Which ones are more useful for your daily activities?
3. Do you know of any other examples that could be considered as a reference?

### 3.5 Session 3: Discussion outputs

- **Modelling discussion results – group 1**

On the modelling, CE brought several clarifications on the difficulty of including some contextual information, for example, of providing a differentiated analysis of the policy impact depending on the income level of the households. This would require differentiated adoption curves depending on the income segment, which are currently unfortunately unknown. But REFEREE could include guidance on the fact that some policies will have a greater impact on some households than others. This guidance would offer policy narratives to the user in favour of additional supportive policies whose effect would remain difficult to quantify (impact on low-income households, impact of information campaigns, etc.). PAG members agreed that the selected contextual information was useful and enough.

Following a question, CE clarified that tax credit schemes would be considered as subsidies under tax expenditures, and further added that subsidies would be expressed per unit (of heat pump for example), but also include the total value of the subsidy, because the idea is not to expose treasury to unlimited liability. PAG members agreed with the survey results suggestions of additional policies directly implementable.

- **Decision support tool discussion results – group 1**

Participants in general agree on the contextual information provided by the model (it was clarified that this information is provided as model outputs) and, as already mentioned, on the way the users can provide their input data in terms of policy options.

On the policy support tool, PAG members underlined that the policy target was absolutely needed, as the main outcome for the policymakers. The other options were deemed useful, but potentially secondary. MCRIT clarified that the cost-

benefit analysis was based on a socio-economic benefit analysis and not a financial return analysis. This approach has been developed by MRCIT to communicate the impacts of policies in the transport sector in a more meaningful way, to display diverging interests depending on the type of actor. The figures proposed are illustrative at this stage, but will try to aim in that direction, depending on PAG feedback. PAG members also agreed that including air pollution and air quality objectives could be useful. Lastly, they highlighted the importance of spatialization in policy debates at the EU and national level.

- **Modelling discussion results – group 2**

The contextual information provided has been considered sufficient by PAG members. They ask to have additional information on the structure of the energy demand by providing data based on energy sources and users. It has been suggested to include an analysis of building status according to type and climate (heating and cooling degree days) and also in relation to the Energy Performance Certificate.

Regarding the different policy options, the group had an extended discussion, especially on regulation, taxation, and subsidies. The major comment regards whether the tool includes also new policy options that have still not been implemented. For example, tax linked to energy building performance, or subsidies loan for energy efficiency intervention that has been implemented in some France regions and has still not been integrated into national models of energy efficiency.

- **Decision support tool discussion results – group 2**

Regarding the decision support tool, it has been discussed the need and challenges of scaling down in geographical terms the outputs of the analysis in order to describe differences at the subnational level. The main obstacle to implementing this tool's feature is the availability of data to perform the analysis, which still has to be assessed. A qualitative framework could be introduced to allow comparison and include the impacts of changing the policies' target group.

In terms of outcomes, spatial analysis was considered somewhat less helpful than others - such as cost-benefit analysis and policy goals listed as the most useful outcomes since they are applied daily by PAG members.

Concerning the stakeholders' analysis, it has been stressed the importance of including NGOs and civil society as a separate category and disaggregating the private sector, particularly SMEs, big companies, and private-public partnerships.



Finally, it would be valuable to consider the type of territories to read the analysis results.

### 3.6 Conclusion and next steps

PAG members showed broad support for the tool development advancement and the directions that CE and MCRIT presented, and added useful suggestions that will fuel their thinking in the coming months.

More specifically, some comments were raised by participants asking to:

- Include further policy options, including policies that are currently considered but have not been implemented yet (for example, property tax based on the building's energy performance).
- Include difficult-to-quantify contextual information (such as the impact of an information campaign) as guidance and complementary policy narrative.
- Keep all the proposed options for results visualization.

Next steps

October 2022

- **Technology diffusion models development (FTT):** Cambridge Econometrics is developing new, and expanding existing, technology diffusion models based upon the Future Technology Transformation framework. These will be integrated into the E3ME model, creating an enhanced version of E3ME used for initial scenario runs.
- **Scenario analysis:** Definition of the input framework to explore the impacts of energy efficiency policy at different levels (in terms of geography, levers, and ambition)
- **Development of a reduced form of E3ME (E3ME Lite):** The E3ME light model will be then integrated, together with the new FTT and the final multiple benefits calculations, into the user decision tool, to inform policymakers

November 2022

- **Next PAG meeting,** to present to discuss the scenario runs based on E3ME lite, with a special focus on the REFEREE decision support interface.





## 4 Third PAG meeting – 31 January 2023

### 4.1 Participants

The list of participants for this meeting can be found in Annex 3.

### 4.2 Agenda of the meeting

The objective of the third PAG meeting was to collect PAG members' insights about the definition of benchmark scenarios against which the policy scenario inserted by the user would be compared in order to calculate the impacts. The PAG members were also able to get a preview of what the REFEREE interface would look like. The discussions of this meeting built on the results of a survey sent to the PAG beforehand.

The third PAG meeting was thus divided in two main sessions. The first one provided the members with a general update about the development of the tool (see 4.3), while the second was dedicated to discussing the benchmark scenarios and the user interface (see 4.4.). Finally, the meeting concluded with a review of the next steps (see 4.5).

The agenda of the meeting was as follows (see Table 4):

Part 1. Plenary – Project Update (30')		
Time	What	Who
5'	Short briefing on REFEREE's progress	Stefano Faberi (ISINNOVA)
15'	Overview of the modeling framework and tool development advancement	CE and MCRIT
10'	Q&A	

Part 2. Group discussion – Roundtables (60')		
Time	What	Who
30'	<p><b>Discussion on country benchmarks</b></p> <p>Define an appropriate benchmark point for each country: what is a benchmark, why we need it to quantify policy impact, and which are the possible alternatives</p>	<p><b>Led by CE :</b></p> <p>Group1] Jon Stenning (CE), Stefano Faberi (ISINNOVA) ;</p> <p>Group2] Iakov Frizis (CE), Martin Vladimirov (CSD);</p>
30'	<p><b>Discussion on user interface (organization and functioning)</b></p> <p>user can design an energy efficiency policy mix: review of the options the online interface offers to define a policy mix – policy groupings, policies, targets, intensity and choosing order. Is the proposed system user-friendly?</p>	<p><b>Led by MCRIT:</b></p> <p>Group 1] Oriol Biosca (MCRIT), Stefano Faberi (ISINNOVA);</p> <p>Group 2] Harold de Castillo (MCRIT), Martin Vladimirov (CSD);</p>
Part 3. Conclusion and next steps (15')		
10'	wrap-up of group discussion	CSD, ISINNOVA
5'	Conclusion and next steps (Timing and topic of next PAG meeting)	Stefano Faberi (ISINNOVA)

*Table 4 Agenda of the third PAG meeting*

### 4.3 Session 1: Project update

- **Short briefing on REFEREE’s progress so far**

Stefano Faberi (ISINNOVA), project coordinator, gave a short introduction regarding the overall advancement of the project. He informed the participants that the technology diffusion model and the scenario analysis have both been completed, while the development of the Referee policy assessment tool is well underway. The Referee tool should be launched in March or April 2023.

He briefly reminded the PAG members of the conceptual architecture of the Referee decision tool (see Figure 18), before giving the floor to Jon Stenning (Cambridge Econometrics) and Efrain Larrea (MCRIT).

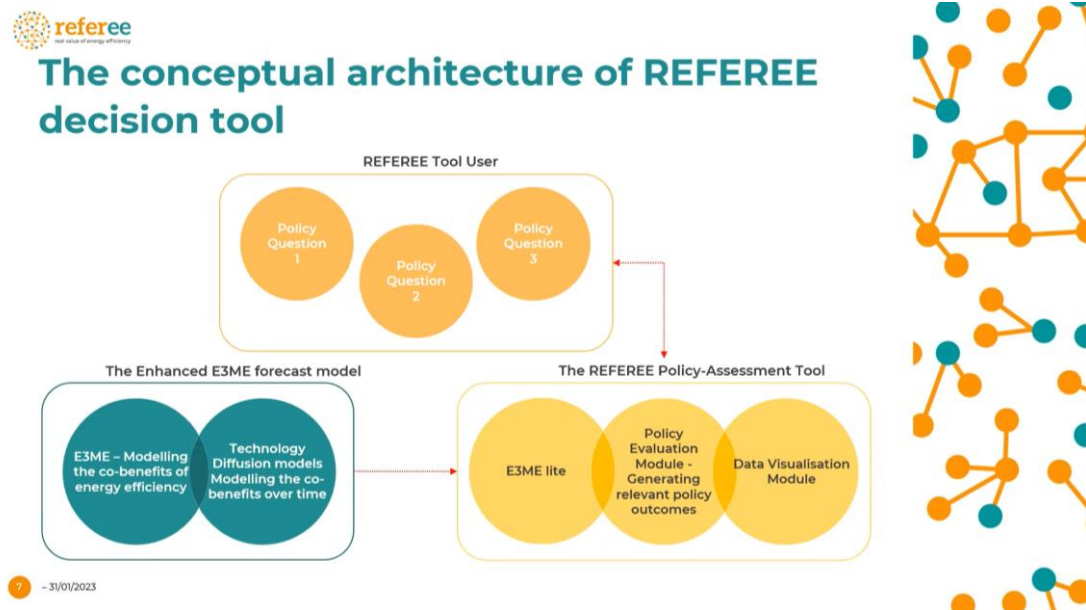


Figure 18 The conceptual architecture of Referee decision tool

- **Overview of the modelling framework and tool development advancement**

Jon Stenning, Associate Director at Cambridge Econometrics (CE), gave an overview of the five deliverables associated with the development of the tool, before providing more details about the different technology elements and their purpose for the final product.

To develop the tool, CE started by specifying the models, including the schematics for the model and the way to calculate the different impacts of energy efficiency. The next steps consisted of the scenario analysis, the implementation of the schematics, and the development of the modelling package. CE is now finalizing the E3ME Lite model. The last stage entails integrating everything that has been developed into the decision support tool working closely with MCRIT.

Jon Stenning (CE) reminded the PAG members that the goal of the tool is to allow users to understand the impacts of different kinds of energy efficiency policy, in individual Member States or at EU level. He set out the details about the technology used (see Figure 19).

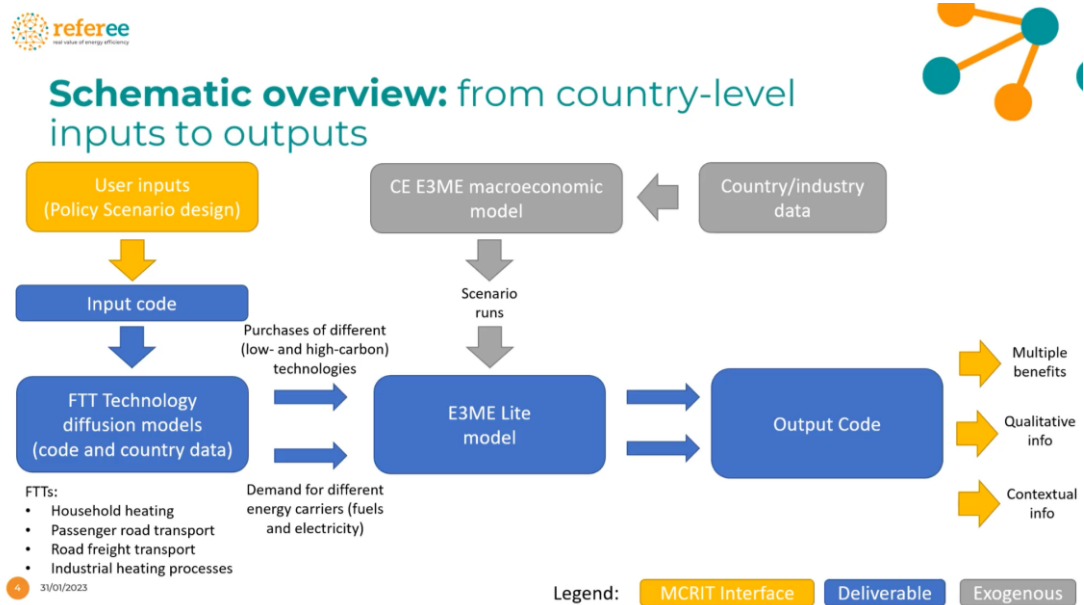


Figure 19 Schematic overview of the Referee tool

The FTT diffusion models aim at capturing the changes in the rate of take-up of different energy efficiency technologies depending upon the implementation of different policies. In addition, CE used their existing E3ME model to parameterize the E3ME Lite model, which quantifies the socio-economic impacts (e.g. employment, economic output, etc.). Additional code makes it possible to calculate and understand the wider range of benefits of such measures (e.g. health).

The finished tool will therefore ultimately allow the user to put a series of energy efficiency policies into the model (user inputs), so that they can explore their

impacts on technology diffusion, their socio-economic impacts, as well as their wider benefits, as compared to a baseline. Discussions today will focus on the definition of such a baseline.

It is important to note that the tool will also provide qualitative and contextual information to help decision-makers make informed decisions even when quantifying a certain benefit is not possible due to uncertainty or complexity.

- **Interface**

Efrain Larrea, Partner at MCRIT, presented the Referee policy input interface in its current state (see Figure 20). He informed the PAG members that while the interface is now working in terms of interaction with the user, the model has not yet been integrated.



## The online modelling tool:

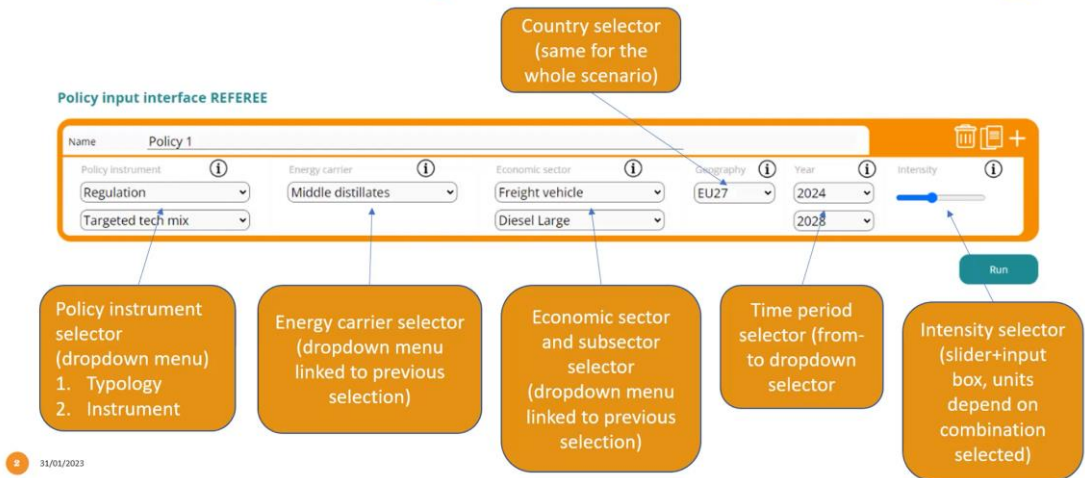


Figure 20 The Referee online modelling tool

The interface works by adding several policies that configure one scenario. Users can test how the system responds to the shock introduced by one or several policy instruments. Each box allows the user to define one policy instrument, with the possibility to stack up several policy instruments on top of each other to see their combined effect.

For each policy, an input box allows the user to name the policy. Information tool tips will be available to help guide the user as well as user-friendly tools to easily

delete copy or add a policy. The sections are divided into a **Policy instrument selector**, for which the choices of instrument change depending on the typology selected by the user; an **Energy carrier selector**, whose options now depend on which policy instrument was selected previously; an **Economic sector selector**, also linked to the previous selection; a **Country selector**, either one Member State or the European Union, but importantly, all policies must apply to the same geographical scope; a **Time period selector**; and finally an **Intensity selector**, consisting of both a slider and an input box, with the units also linked to the previous selection. Clicking the run button will trigger the computations and show the results, which the user will then be able to download. MCRIT is still working on the visualisation of the results, which will also be discussed with the PAG members during this workshop.

The interface is available online (in its current state) at [this address](#).

Questions from PAG members included the content of the dropdown menus, for instance adding economic sectors and subsectors currently missing (eg. differentiating commercial & public building heat). MCRIT confirmed that the menus will be improved and that these new subsectors will be added to the tool.

#### 4.4 Session 3: Discussion

- **Discussion on country benchmarks**

Iakov Frizis, Senior Economist at CE, introduced the discussion on the benchmarks, explaining in particular that the chosen benchmark will ultimately provide a sensible point of comparison with respect to energy prices. In other words, the impacts will be calculated as the difference between the scenario benchmark and the scenario inserted by the users.

To account for changes in the future, the consortium is considering offering flexible scenarios, one 'High price world' scenario, and one 'Low price world' scenario. Following a question on the update frequency of the EU reference scenario and the possible update of the tool accordingly, Jon Stenning (CE) noted that not only are updates to the Reference Scenarios by the Commission very rare, but also that due to budgetary constraints, the possibility to update the tool remains doubtful, hence the idea of proposing two broad scenarios in order to make the tool more sustainable in the long term.

Iakov Frizis (CE) then proceeded to present the results of the survey. Firstly, three benchmarks were proposed to the PAG members: the EU Reference scenario



2020, the EU Reference scenario 2020 + latest policies agreed at the EU level, and the EU Reference scenario 2020 + latest policies and targets agreed at the EU level. The policies and targets suggested were Fit for 55, the Eco design directive (eco-design of space and water heaters), REPowerEU, and the Energy efficiency directive. A majority of respondents would prefer that we use the EU Reference scenario + policies and targets as the baseline scenario (see Figure 21).

Q1. What is the most appropriate policy agenda to which the benchmark should be aligned? Should the forward-looking benchmark align with the current level of technology take-up, and energy demand, to:

7 responses

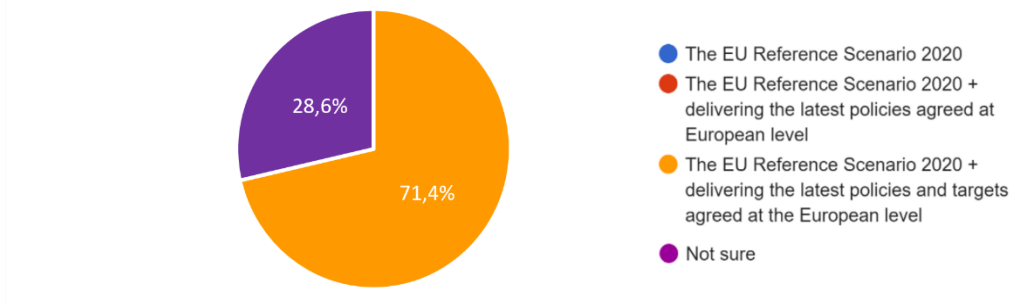


Figure 21 Survey results regarding the benchmark scenario

After presenting the consortium's view, Iakov Frizis (CE) opened the discussion with PAG members. Some highlighted the possible tension between EU policymakers and national policy makers, in particular considering that from the perspective of national policymakers, reaching the EU targets could rather be considered as an ideal world scenario rather than a benchmark scenario. In light of the additional information provided during the meeting, the EU Reference Scenario 2020 + policies agreed at the EU level seems to emerge as the preferred option.

The second question of the survey pertained to the pieces of legislation to integrate in the scenario. Results showed that most PAG members see all suggested directives as important, with the Eco-design directive being seen as the least important (see Figure 22).

Q2. Which pieces of legislation are most important to take account of when considering policies (and/or targets) to be incorporated into the benchmark from 1 (less important) to 4 (very important):

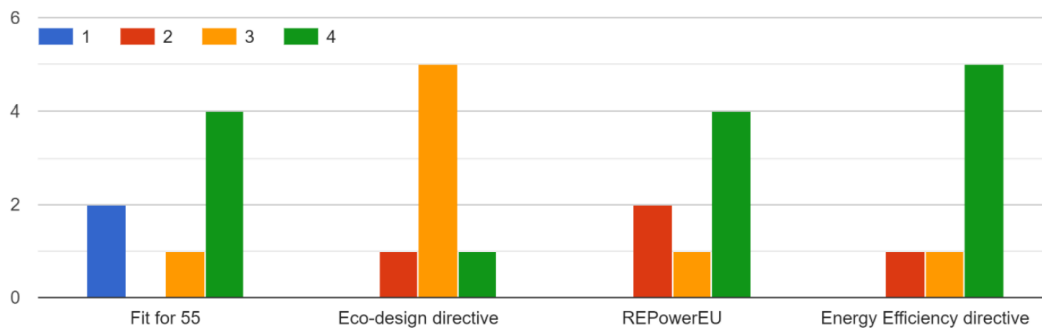


Figure 22 Survey results on the policies to be included into the benchmark

- Discussion on the user interface

Efrain Larrea (MCRIT) presented the results of the survey related to the interface of the tool.

He outlined the mixed results on the general state of satisfaction regarding the tool’s interface (see Figure 23). As the user interface remains a work in progress, it will be important to track possible changes in the level of satisfaction through other surveys as the interface evolves and the feedback of PAG members is integrated.

Q3. What is your general level of satisfaction regarding the tool’s interface?

7 responses

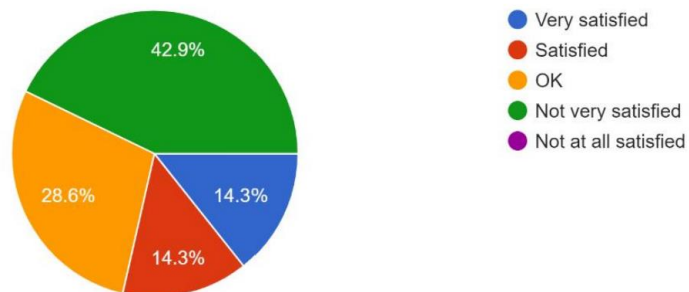


Figure 23 Survey Results regarding the user interface



For the majority of PAG members, the tool requires additional information in order to be fully usable by policymakers and stakeholders (see Figure 24). This will also be taken into account in the development of the interface, in particular through the setup of a landing page and the results visualization.

Q5. Is the tool easy enough to understand? Or does it require additional explanations?

7 responses

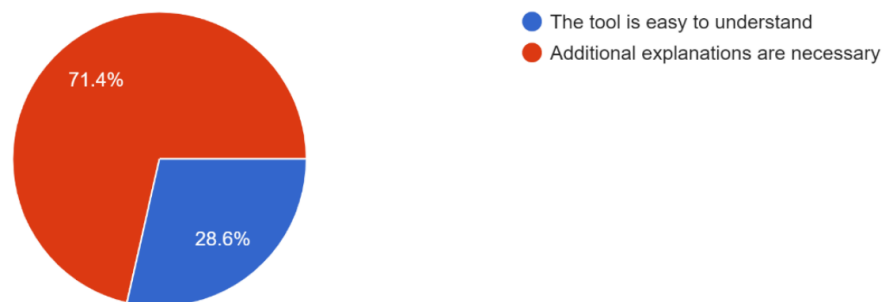


Figure 24 Survey results on the need for additional information for users

Lastly, more than 70% of respondents agreed with the idea of proposing registration to use the tool, 29% of them highlighting the importance of collecting information about the users, especially in the framework of a Horizon2020 project like Referee (see Figure 25). This was confirmed by the PAG members during the following discussion, although the need to make sure that users clearly understand the benefits of registering (possibility to save results, explaining why we are collecting data, etc.) was also stressed.

Q6. Do you think that the fact that users need to register to use the tool and include some personal information like email, country, organisation and position might hinder people from using the tool?

7 responses

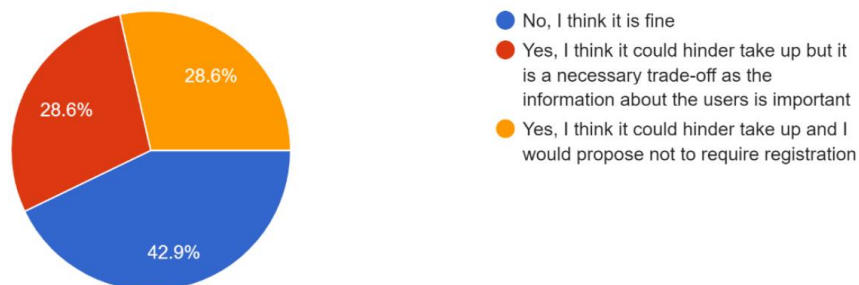


Figure 25 Survey results regarding user registration

PAG Members were then asked to give additional feedback on the interface, regarding three aspects:

- The general 'format' of the output: detailed output (e.g. similar to powerBI), or simple output, as well as the possibility to download the results as an Excel file.
- Expressing and visualizing the results either as distance to target or as absolute values.
- The inclusion of detailed definitions for each element of the policy selectors.

All PAG members would opt for simple, quick, striking, and immediately usable results, very suited to the needs of policymakers. It was also suggested that more detailed output could be made available in the downloadable Excel file.

There was also a consensus to display the results as distance to target rather than absolute values. A question regarding the actual cause-effect between a policy and the output/benefits (and often the lack of data on this matter) was raised by a member, the answer to which was that the tool will give only an idea of a possible output and that it should also be made clear to the users.

PAG members also considered that including detailed definitions for each element of the policy selectors would be very useful to the users. This was also stressed by Stefano Faberi (ISINNOVA) as a crucial element, and he proposed that these definitions, as soon they are ready, as well as the full composition of the tool's menus, be made available to the PAG members for their detailed feedback.

Other comments related to the need to provide the user with an overview of the tool and expected results. MCRIT indeed acknowledged that the landing page of the tool will serve this purpose but has not been prepared at this stage.

In addition, several questions and comments pertained to the intensity selector – many considering it the most sensitive element in a policy definition – and will be dealt with in more depth in the next testing / feedback phases.

Lastly, one member asked whether the tool would undergo a testing phase. Project coordinator Stefano Faberi (ISINNOVA) confirmed that case studies will be carried out between April and October in Spain, Germany, Italy and Bulgaria, to test and challenge the Referee tool in practice.

#### 4.5 Conclusion and next steps

To conclude the meeting, Stefano Faberi (ISINNOVA), presented the next steps of the project. He announced that the 4<sup>th</sup> PAG meeting will be held in May 2023, possibly in Brussels, in which case travel expenses will be reimbursed. The aim of the meeting will be to make an in-depth assessment of the tool's first prototype.

The 5<sup>th</sup> and last PAG meeting, to validate the final model, will take place after the end of the pilot cases.

Stefano Faberi (ISINNOVA) thanked the PAG members for their feedback on the benchmark and the interface. Before bringing the meeting to an end, he reiterated that the full composition of the tool's menus would be sent to the PAG members and that their comments and suggestions would be extremely valuable for the project.



## 5 Fourth PAG meeting – 19 September 2023

### 5.1 Participants

The list of participants for this meeting can be found in Annex 4.

### 5.2 Agenda of the meeting

The fourth PAG meeting was aimed at showing the features of the REFEREE tool and demonstrating a live-testing to our PAG, which had been enlarged at this occasion to additional stakeholders. The meeting was thus not only a way to finetune the tool but also to prepare for the upcoming dissemination phase.

The meeting was divided into two main sessions including an overall presentation of the model (see 5.3.) and breakout rooms to deep dive and allow for a more step-by-step approach for each of the policy assessment tools (national and local) depending on the participants' interest (see 5.4). The meeting concluded with the usual next steps for the project (see 5.5).

The agenda of the meeting was as follows (see Table 5):

9.45 – 10.00	Welcome and introductory session: motivation and presentation of the project
10.00 – 11.00	Overview of the Policy Assessment Tool (45 min) Q&A (15 min)
11.00 – 11.15	BREAK (coffee, tea)
11.15 – 12.00	Break-out room(s) for the deep dive session on the national case studies
11.15 – 12.00	Break-out room for the deep dive session on the local case studies
12.00 – 12.15	Last feedback in plenary, next steps and closing
12.15 - 13.15	Lunch

*Table 5 Agenda of the fourth PAG meeting*



### 5.3 Session 1: Updating on the REFEREE development

After a short introduction from project coordinator Stefano Faberi (ISINNOVA), the consortium moved to present the REFEREE tool as it currently stands and highlighted recent developments made to the interface in the previous months. Participants were about to raise questions and provide feedback throughout the presentation, as reflected in the following account of the discussions.

- **Overview of the model**

Jon Stenning (CE – Cambridge Econometrics) and Isaac Farradellas (MCRIT) presented the overall model behind the national and local simulations of the Referee tool (see Figures 26 and 27 below), which is still in the process of finalisation.

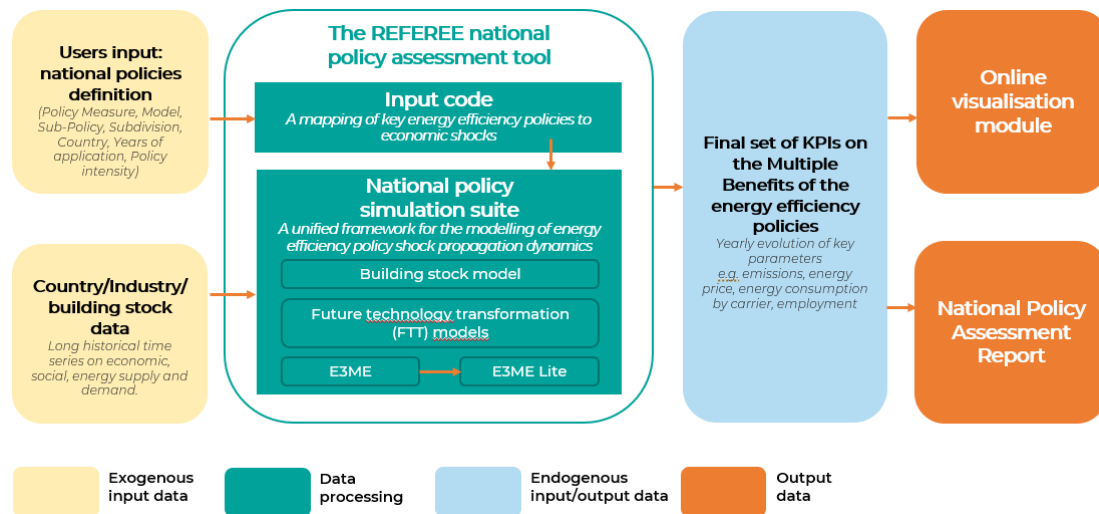


Figure 26 National Policy Assessment

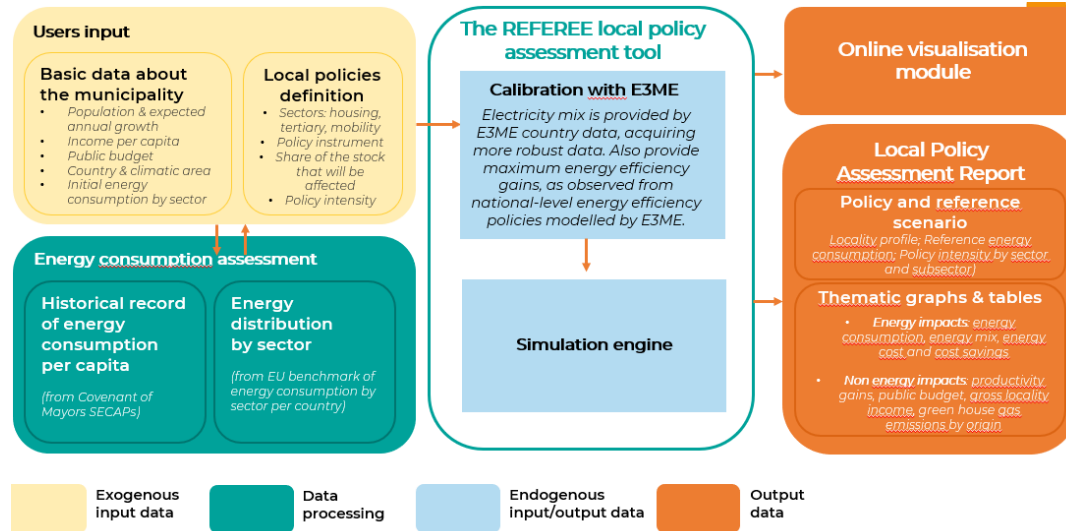


Figure 27 Local Policy Assessment

It was clarified that a specific model was developed for this tool, utilizing extensive data with variations emerging from different data sources. To address these variations, the model resorts to using the best estimates available.

A participant noted that macroeconomic models, whether they are more neo-classical or Keynesian-oriented, yield different results, and thus enquired over the theoretical economic background used by the models behind Referee. CE specified that the models are post-Keynesian, which is more suitable for evaluating the impact of policies than most neoclassical versions of these models, which would consider policies to be interfering with the innate efficiency of the market. This way, it assumes that introducing policies that can bring resources – people, capital – into the market and lead to better economic and social outcomes.

The topic of elasticity was brought up. It was explained that because the tool relies on technology diffusion models, elasticity would be non-linear, in other words, different at various points in time.

Some participants were also interested in getting access to the model behind the tool itself.

- **Reference scenarios**

The presentation continued with an explanation of the different reference scenarios against which the impacts of energy efficiency measures can be compared (see Figure 28). The model accounts for changes in fossil fuel prices in line with the latest EU policies agreed at the EU level and sets ETS2 cost at approximately 45 EUR/ton CO<sub>2</sub>. The fourth scenario provides the users with the option to further increase fossil fuel prices by a variable percentage, making it possible to keep the REFEREE results relevant over time, in particular, to account for the uncertainties regarding ETS2 costs and the impact of future policies. During the meeting, it was also explained that the first scenario, which does not integrate the latest EU policies, makes it possible to measure the benefits of less ambitious policies and assess their contribution to achieving EU targets.

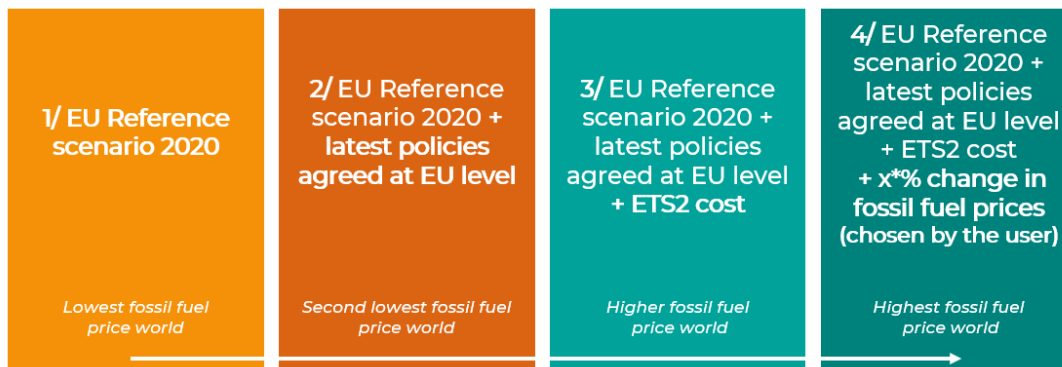


Figure 28 Reference scenarios

An important question was raised about the reference scenarios, and more specifically whether the model behind Referee would be updated with the new data coming at the end of November 2023. CE emphasized the difficulty of updating the model and the limited added value that it would bring as the results would not expect to change significantly. However, a possible solution that the tool offers is to mimic these policy changes through a first simulation that would eventually serve as a new comparison point when running a second simulation. This solution would be more complex for the user but would still allow the model to withstand the test of time. Furthermore, such an update to the Reference scenarios could potentially be explored should the project be extended or revisited in several years.

- **Policies**

CE and MCRIT presented the different policy instrument types that the Referee tool can process: fuel tax/subsidy, vehicle tax/subsidy (biofuel, electric, hybrid, ICE), phase out of technology or fuel, mandatory change in the energy mix, increase of renovation rate, energy efficiency improvement in domestic buildings. For more details on the national and local policies, please refer to Figures 29 and 30.

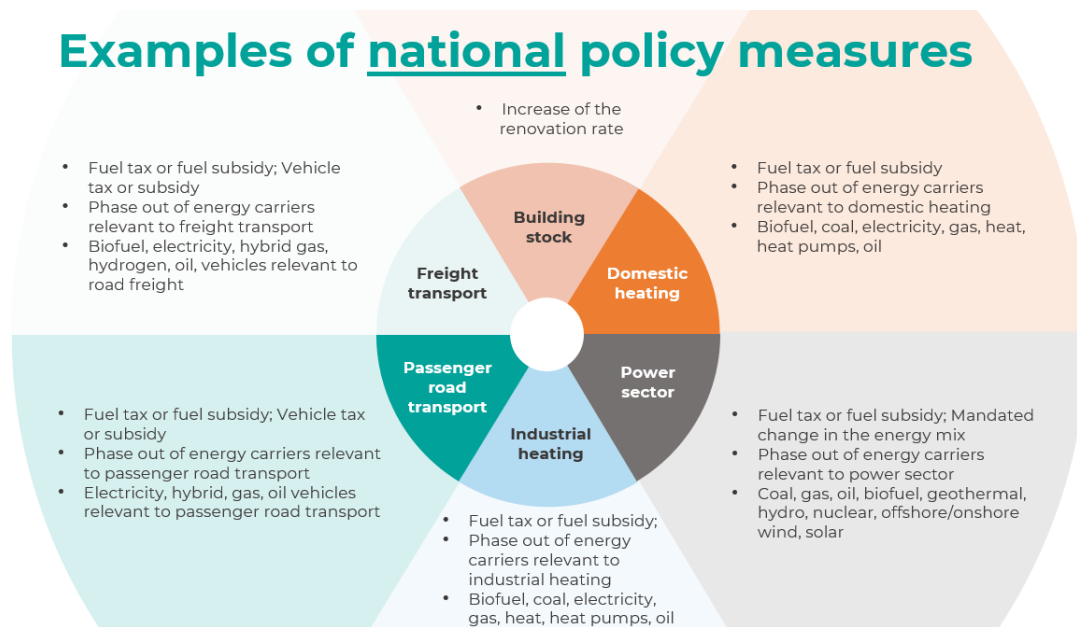


Figure 29 National policy measures



## Examples of local policy measures

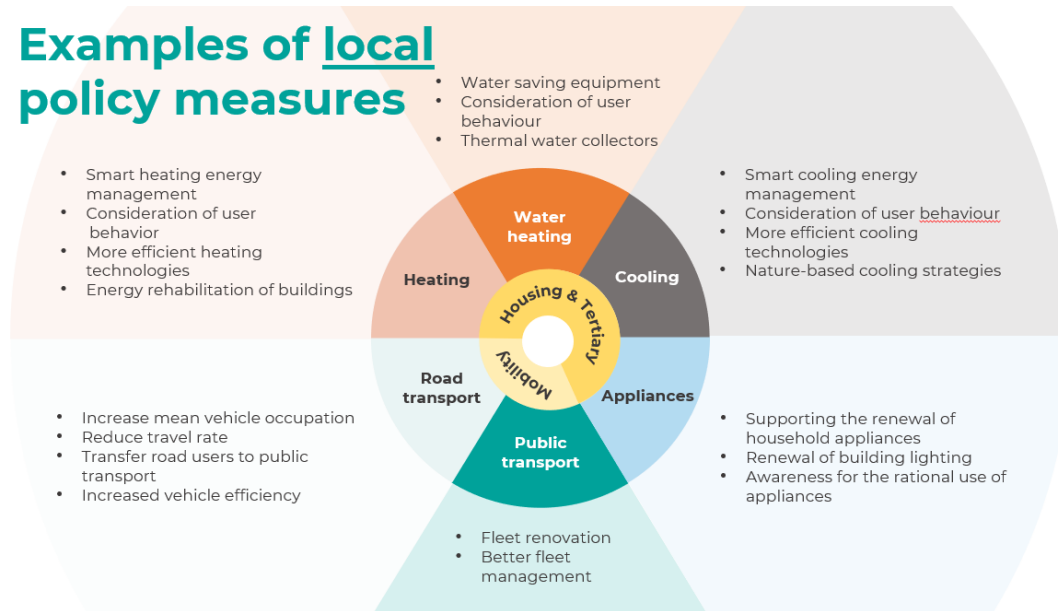


Figure 30 Local policy measures

Following a question on time range, it was confirmed that the Referee tool could process policies between 2023 and 2050. This piece of information is to be better highlighted in the tool's presentation and guidelines.

Another query related to the level of segregation of presented policies, e.g. whether 'vehicles' included only cars and trucks or motorcycles and buses, as well, and to what extent the tool could simulate policies for only one of these categories. It was clarified that the tool involves a technology-specific model, primarily focusing on core technologies. Taking the example of buildings, there is for instance limited differentiation between homes and apartments currently due to a lack of sufficient data.

Another remark pertained to the fact that, in its current form, the Referee tool might not account for sufficiency measures adequately.

- **Outputs**

To conclude the first part of the meeting, CE and MCRIT showcased the tool's outputs at the national (Tables 6 and 7) and local levels (Table 8). It was outlined that for the national simulation, both primary and support outputs are made available to the users, the support outputs being interim results that account for the policy influence on technology take-up.

Impact areas	Indicators
Industrial productivity	Gross Value Added (GVA)
	Energy intensity
	Energy cost impact
	International competitiveness
	Labour productivity
Socioeconomic development	Gross Domestic Product (GDP)
	Employment
	Demand for skills by type of occupation
	Demand for skills by skill level
	Public budget as a share of GDP
	Share of energy consumption by quintile
	Share of total space heat demand
Air quality & wellbeing	Air pollution damage costs
Environment & Climate	Air pollution and emissions
	Fossil fuel consumption
	Fuel imports as a share of gross output
	Water used in electricity generation
	Material consumption

*Table 6 Primary outputs at national level*

Energy consuming activity	Indicators
Road transport – Freight and passenger cars	Demand met by different technologies (battery electric, hybrid and ICE vehicle.)
	Demand met by different transport fuels (oil, gas, electricity, etc.)
Household heating/cooling	Demand met by different grid-level heating fuels (oil, gas, electricity)
	Demand met by different heating/cooling technologies (heat pumps, gas boiler, oil boiler, coal furnace)
Power sector	Demand met by different electricity-generating technologies (solar, offshore wind, onshore wind, gas turbine, coal-fired power plant, etc.)
Manufacturing industries (with process heating)	Demand met by different heating fuels (coal, gas, oil, electricity, biomass, steam distributed, heat pumps (indirect only)) for either direct or indirect process heating

*Table 7 Support outputs at national level*

Impact areas	Indicators
Expected energy consumption and energy savings	<p>Energy consumption and energy savings (total &amp; by sector)</p> <ul style="list-style-type: none"> <li>•Housing: heating, cooling, water heating, appliances</li> <li>•Tertiary: heating, cooling, water heating, appliances</li> <li>•Mobility: public transport, road transport</li> </ul>
Cost savings and public finances (pre-tax)	<p>Costs and cost savings (total &amp; by sector)</p> <ul style="list-style-type: none"> <li>•Housing: heating, cooling, water heating, appliances</li> </ul>

	<ul style="list-style-type: none"> <li>•Tertiary: heating, cooling, water heating, appliances</li> <li>•Mobility: public transport, road transport</li> </ul>
	Magnitude of savings contrasted to locality aggregated income (Proxy to municipal GDP)
Climate Change	CO2 emission savings (total & by sector) <ul style="list-style-type: none"> <li>•Housing: heating, cooling, water heating, appliances</li> <li>•Tertiary: heating, cooling, water heating, appliances</li> <li>•Mobility: public transport, road transport</li> </ul>
	Contrast with existing policy targets for greenhouse gas emission reduction
Socioeconomic impacts	Increase of available income per capita
	Increase of available local aggregated income
	Municipal public budget impacts
Governance (transformation capacity of public policies)	Impact of public policies derived from citizen behaviour
	Impact of public policies derived from cleaner technology (cleaner energy mix)
	Exogenous gains not deriving from local policies (derived from cleaner electricity mix)

*Table 8 Outputs at local level*

The discussion touched on measures catering to energy-poor households, for instance when it comes to worst-performing buildings. A participant asked how the tool could measure the impact of such targeted policies. MCRIT acknowledged the relevance of this demand while noting that additional user input would be required to make this possible. Given the critical nature of the issue, the team stated their willingness to investigate the feasibility of integrating this feature into the tool.

Similarly, it was clarified that building energy consumption will be included in the results but without details by building type due to data limits. Emissions will also be aggregated due to data constraints.

Furthermore, there was a query about the minimum level of energy efficiency measures that are required to make a visible impact on employment or on GDP, and whether this minimum requirement level was the same for both the national and local levels. In this vein, concerns were raised that smaller policies at local level might not be able to result in any visible macroeconomic impacts. CE informed the participants that no minimum level had been set and that such scenarios would certainly lead to only a small difference in percentage being displayed in the results of the simulation. However, it was acknowledged that this kind of scenario would need to be properly tested, not only at the local level but also for smaller Member states e.g. Malta.

After these presentations, the meeting moved into deep dive sessions, where participants were guided step-by-step through the process of using the tool and going through the results. The deep dive sessions were split in two: one for the national case studies, led by Cambridge Econometrics, and one for the local case studies, led by MCRIT.

## 5.4 Session 2: Breakout sessions

- **National simulation tool**

**Presentation** – A step-by-step demonstration of the national tool was shown to the participants. It was clarified that a policy package comprises different underlying policy instruments. Users can name the policy package, and then specify the policy inputs (instruments). After selecting a policy input, users can provide details, and the tool links to models to calculate multiple benefits in a dynamic way based on initial choices. For example, intensity can be set at 30% to model a 30% reduction in heat pump costs. However, for technology phase-out, the intensity is not a significant element for the simulation, but the start year is. Users can also copy policy inputs over time and adjust start/end dates and intensity. Energy efficiency improvements can also be assessed. The choice of reference scenario is crucial since the results are compared to this baseline.

Users will have access to an online dashboard, that will provide them with the appropriate guidance to properly navigate and use the Referee tool. This dashboard will be developed for the local simulation as well.



After a processing time, users will eventually be able to visualize key result charts online, on top of being able to download a more comprehensive report (excel file). However, this feature is not yet fully functional.

**Discussion** – Throughout the discussion, participants made several suggestions. First, they recommended adjusting the input setting for the power sector as shown in the example. They also proposed adding a process bar when the results are being loaded since the model currently takes about 10 minutes to run and display results. Participants also suggested better indicating the reference scenarios and how they relate to the results in the output displays.

In addition, it was advised to include historical renovation rate data by country, especially for the buildings sector, in the national dashboard. Participants also recommended including basic model assumptions in the guidance documentation in order to build trust with users.

- **Local simulation tool**

**Presentation** – Isaac Farradellas (MCRIT) started the breakout session by presenting in further detail the local simulation tool and its functionalities. He provided a step-by-step explanation of both input pages – municipality's profile and policy packages. He for instance showed examples of policy measures in different sectors, such as the refurbishment of building facades for the housing sector, air conditioning efficiency in offices and stores for the tertiary sector and road transport reduction efforts, e.g. by supporting remote working, for the mobility sector. The session delved into explaining the key terminologies concerning input values of policies, in particular stock targeted, policy intensity, and maximum energy efficiency impact, and how users can best estimate these values.

The presentation proceeded to showcase the results of the simulation through both the online visualization tool and the offline Excel file, which contains a more comprehensive overview of the results with data tables and graph visualizations for each sector. Concluding the presentation, Isaac quickly presented the tool's dashboard, which will be an interactive user guide. It is now only developed for the national simulation tool but will be extended for the local simulation as requested by the policy advisory group.

**Discussion** – Participants pointed out the difficulty of estimating the energy consumption effects of policies targeting consumer behaviour and governance.



MCRIT acknowledged the difficulty in quantifying these impacts, considering the need for imperfect assumptions to be made. Concerns were also raised about the possibility of properly quantifying the effectiveness of policies such as information campaigns.

Following a question by one of the participants, it was made clear that the tool could estimate both exogenous and endogenous impacts of policies. In addition, participants emphasized the importance of highlighting monetary benefits in the outputs on top of other benefits. For a future Referee+ model, participants suggested adding the feature whereby the tool could quantify the capacity to reach a set of energy targets by introducing certain policies.

Participants praised the relevance of adapting the Referee tool for municipalities, stressing the tool's potential to enhance capacity building at the local level and help address issues like lack of expertise in smaller administrations or local energy agencies to carry out such analyses without adequate support. On this topic, concrete synergies were identified with another energy efficiency tool in development by the European Federation of Agencies and Regions for Energy and Environment. The organisation is developing a similar online tool working with six pilot regions in six countries, and engaging with 100 regions overall. The project is running until November 2025. This tool and the Referee tool could be very complementary and thus Referee could be part of a wider toolkit for energy efficiency policy planning at regional and local levels. A collaborative meeting between November and June is envisaged.

Lastly, enquiries were made about the release date of the tool and the creation of tutorials and guiding materials. MCRIT informed participants that the Referee tool should be ready in early 2024 and will include a comprehensive interactive user guide, both for the national and local simulation. An offline user guide in PDF format should also be developed as well as a step-by-step tutorial video is also being considered, especially following the feedback of the PAG members.



## 5.5 Conclusion and next steps

The meeting wrapped up with a plenary session where the outcomes of each break-out session were briefly summarised to all. Overall, and despite some limitations, the tool was very positively received by the policy advisory group, as it provides scientific data that can be used to advocate for energy efficiency policies.

Nevertheless, it was advised by several participants to ensure users would be thoroughly guided so that they could harness this potential and use the tool in their everyday lives. In particular, it was outlined that users might want to use Referee (i) to determine the best mix of measures in order for a Member state to achieve its targets (ii) to visualize the changes in non-energy outcomes that different policy packages, with similar energy efficiency results, might bring. These questions should be taken into account when drafting any guiding documentation. A suggestion was made in this regard to organise training sessions for stakeholders and the project advisory group. On this topic, participants were informed that a video tutorial would be developed and that policy reports based on case studies in different countries would also be made available to explain how the tool can be used by municipalities or ministries.

Finally, before closing the meeting, participants were invited to send any additional feedback to project coordinators Giorgia Galvini and Stefano Faberi (ISINNOVA).



## 6 Fifth PAG meeting – 3 April 2024

### 6.1 Participants

The list of participants for this meeting can be found in Annex 5.

### 6.2 Agenda of the meeting

The objective of the fifth and final PAG meeting was to collect final thoughts on the Referee tool and on the guidance material that accompanies it. A couple weeks before the meeting, the PAG members were sent the link to the tool as a preview so that they could test it and navigate the different features/results in their own time. They also received the tutorial documents, dashboard & videos for the national and local tools to review. Finally, they were also sent a survey to rate the tool and the guidance material and provide final comments.

The meeting was thus divided into two main sessions. The first one focused on the final tool, presenting the last fix following the testing phase and the new features following the last PAG meeting, as well as on reviewing the guidance materials (see 6.3). The second session was dedicated to the results of the survey (see 6.4) in order to kick off discussions with the PAG members (see 6.5).

The meeting concluded the PAG process since the tool would now be able to go live and be available to users everywhere. Nevertheless, further opportunities for training and getting familiar with the REFEREE tool were presented to the PAG members in the last part of the meeting (see 6.6).

The agenda of the meeting was as follows (see Table 9):

10.00 – 10.10	Introduction	ISINNOVA
10.10 – 11.00	<b>PART 1 – Final impressions and questions on the REFEREE tool</b>	Cambridge Econometrics
10.10 – 10.20	Update regarding the tool developments since the last PAG	
10.20 – 10.30	Presentation of the results of the survey regarding the final tool	

10.30 – 11.00	Reactions from the PAG & questions on the results	
<b>11.00 – 11.50</b>	<b>PART 2 – Feedback on the guidance materials</b>	
11.00 – 11.10	Overview of the guidance materials	MCRIT
11.10 – 11.20	Presentation of the results of the survey regarding the guidance materials	
11.20 – 11.50	Reactions and questions from the PAG	
<b>11.50 – 12.00</b>	<b>Conclusion, future events</b>	ISINNOVA

*Table 9 Agenda of the fifth PAG meeting*

### 6.3 Session 1: Presentation of the latest developments, final version of the Referee tool and guidance materials

Iakov Frizis (Cambridge Econometrics) reminded the PAG on how the tool works and how the impacts are calculated, before offering an overview of the REFEREE tool's latest developments since the last PAG meeting held in September 2023.

He informed the PAG members that the last months have been dedicated to quality assurance checks using a multi-layered approach. The modelling team, the analysis team, and then the wider REFEREE consortium was able to test the tool and spot any inconsistencies. This also was the opportunity for the consortium to gain a better understanding of the tool and how it can be used.

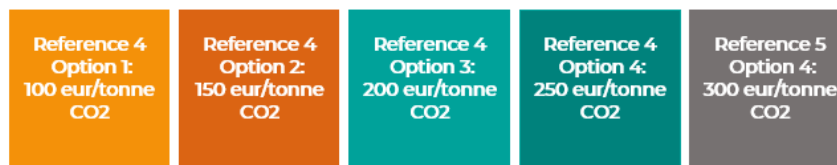
Besides extensive testing and the design of guidance documents, two major updates have taken place.

Firstly, Cambridge Econometrics updated the modelling framework by integrating the building stock model within the existing modelling framework, which makes it possible to estimate the impacts of increased renovation rates. The modelling team also introduced FTT (Future technology transformation models) linkages across models and sectors to ensure that the impacts of policy packages – especially second and third-degree impacts – are estimated correctly (i.e. the direct impacts of the first policy package are fed into the model again and

used as a starting point to estimate the second policy package). As an example, when inputting a target that would affect power generation, the price of electricity is calculated within the power sector. The interlinkage will impact the calculation of energy demand as a result of the change in the price of electricity in the different sectors, which, in turn, will be accounted for in the calculations to express the multiple impacts.

Secondly, Cambridge Economics finalised the different reference scenarios, making sure to pay attention to the complexity around different carbon prices based on ETS2. The main goal was to increase the lifespan of the REFEREE tool and make it relevant in the future. Therefore, the 4<sup>th</sup> reference scenario now offers different subcategories (see Figure 31 below) to anticipate various future carbon prices. Extensive guidance on the reference scenarios is available to users so that they are able to make the right choices for their own use.

### Reference 4 –ETS2 price



*Figure 31 Reference scenario n°4 - Subcategories based on ETS2 prices*

Isaac Farradellas (MCRIT) and Iakov Frizis (Cambridge Economics) then demonstrated the guidance materials developed for the national and local tools.

For the national tool, Cambridge Economics developed an interactive and user-friendly dashboard to guide users and help them interpret the results. Categories of the dashboard include contextual information, guidance for the reference scenarios, detailed explanations of the different policy options and indicators, as well as a FAQ section (see Figure 32).

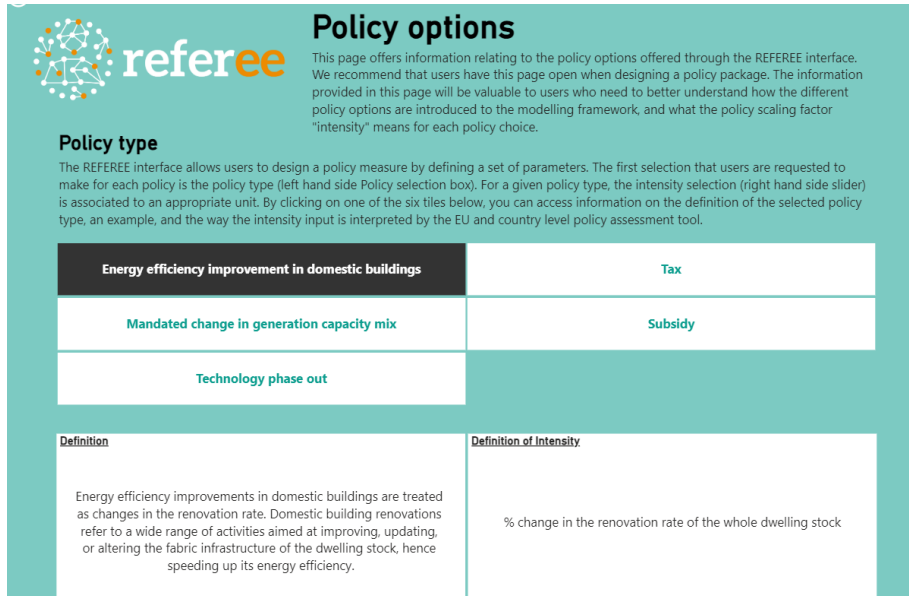


Figure 32 Screenshot of the national tool guidance dashboard

For the local tool, a comprehensive guidance document has been created, presenting the Referee tool more generally (purpose of the tool, defining inputs and outputs), offering very detailed guidance with a step-by-step guide (see Figure 33), and providing additional information on the European legislation and targets.

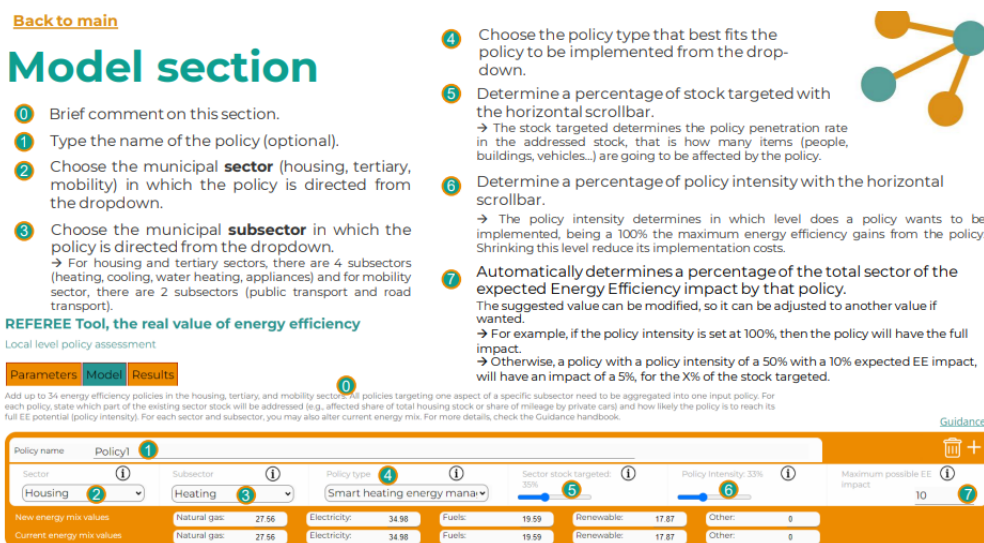


Figure 33 Screenshot of the local guidance document

During the meeting, it was emphasised that the users were encouraged to first review the guidance materials in order to best utilise the Referee tool, in particular to clarify the different parameters and assumptions that drive the policy simulations.

## 6.4 Session 2: Results of the survey

Stefano Faberi (ISINNOVA) then delved into the outcomes of the recent survey sent to the PAG members before the meeting.

Opinions on the REFEREE tool and its usefulness were overwhelmingly positive (see Figure 34 below). One PAG member commented more specifically that the REFEREE tool is very useful for a pre-assessment of policies at the local, and notably to “support local authorities in the definition of their Sustainable Energy and Climate Action Plans (SECAP) and other local action plans”.

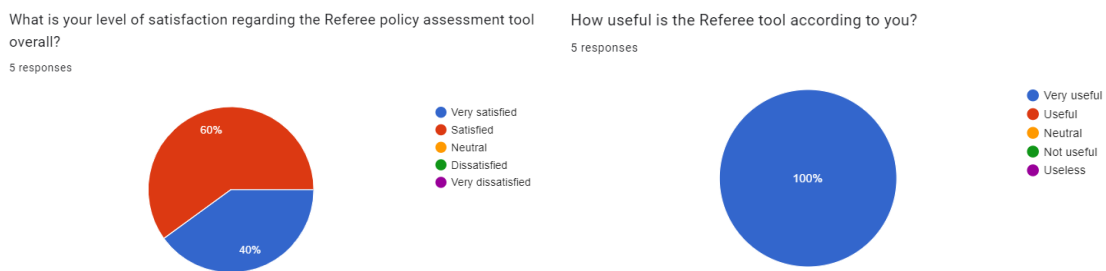


Figure 34 Survey results on the final Referee tool

While reaching good results, the user-friendliness aspect of the tool scored lower than other features. For the consortium, the interface developed by MCRIT enables users of all levels to efficiently utilize the tool, with detailed guidelines being nevertheless instrumental in the process. However, it was also pointed out that familiarity with concepts such as theory of change, first and second-degree effects, and macroeconomic behaviour models can deepen understanding and optimise the experience of using the REFEREE tool, especially when interpreting the results.

How easy is it to navigate and interpret the results generated by the Referee tool?

5 responses

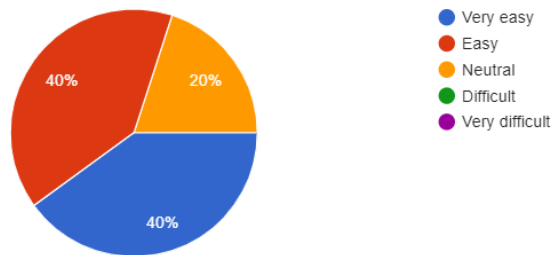


Figure 35 Survey results on the user-friendly aspect of the final tool

Finally, regarding the guidance materials, a high level of satisfaction was reached (see Figures 36-28). One PAG member commented that they are “a must to use the tool and interpret the results properly” while another praised the guidance materials for being “comprehensive and well designed”.

Rate the guidance material for the local policy assessment tool (1 being the lowest score, 5 the highest)

5 responses

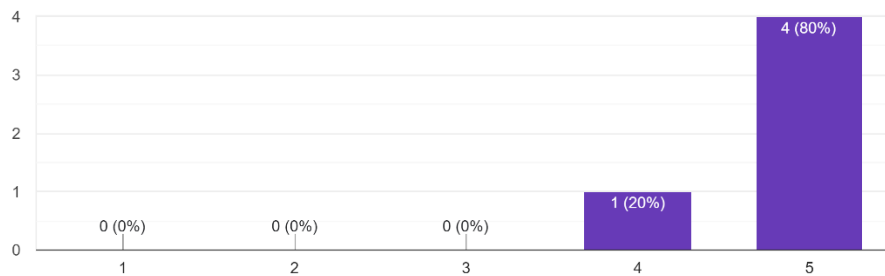


Figure 36 Survey results on the local guidance material

Rate the interactive dashboard for the EU & country policy assessment tool (1 being the lowest score, 5 the highest)

5 responses

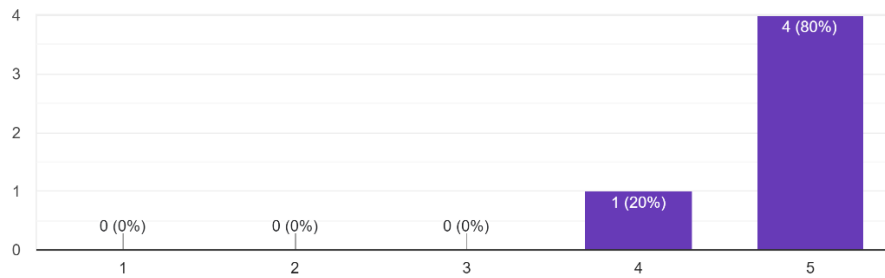


Figure 37 Survey results on the national guidance material

Rate the tutorial videos for the Referee tool? (1 being the lowest score, 5 the highest)

5 responses

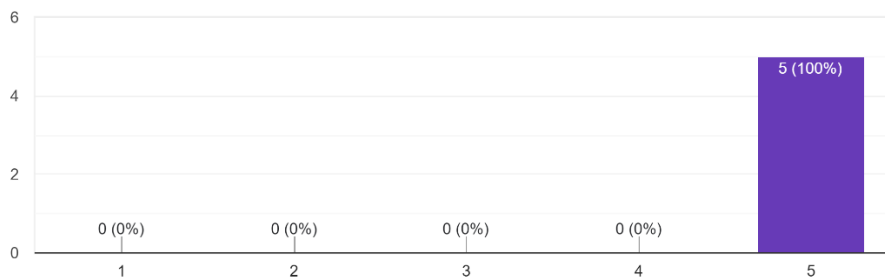


Figure 38 Survey results on the video tutorials

## 6.5 Session 3: Questions and answers

Throughout the meeting, several questions and remarks arose.

Firstly, responding to a question about the use of the tool by energy agencies, it was clarified that the REFEREE tool is freely accessible to anyone or any organisation. Upcoming workshops will educate energy agencies for more in-depth training (see conclusion).

Another question dealt with input from the users. It was explained that for the national tool, the only data to be provided is the description of the chosen policy package, while for the local tool, additional parameters need to be provided. A

specific section on this is available in the guidance document to help municipalities with this task.

Regarding a follow-up question on the policy input, it was clarified that the users might need to translate the policy into an input that the tool will understand, and which might differ from the information that policymakers have that can be more detailed. This is especially true for the intensity parameter, which changes according to the type of policy measure selected, and which might require the user, in certain cases, to do some calculations.

A last question was raised about the runtime of the national and local tools. The REFEREE consortium informed the PAG members that the process typically takes between 7 to 15 minutes subject to internet speed and the complexity of policy packages for the national tool, while the runtime is significantly shorter for the local tool, amounting to between 10 and 20 seconds. One mitigating solution proposed is to run different simulations across different tabs simultaneously.

## 6.6 Conclusion

The meeting concluded by informing the PAG members about two events. First, an online training workshop addressed to the national energy agencies through DENA (the German energy agency) will be organised in the coming weeks. PAG members will be informed and those interested will be able to attend.

The REFEREE consortium was also selected to host a policy session during the 2024 European Sustainable Energy Week. Registrations open on April 16<sup>th</sup>.





## 7 Annexes

### 7.1 List of participants for the first PAG meeting of 25 March 2021

- REFEREE Partners

Organisation	Name	
ISINNOVA	Stefano Faberi	REFEREE Project Coordinator, Senior Partner
ISINNOVA	Giorgia Galvini	Project Manager
Center for Study of Democracy	Radostina Primova	Senior Analyst
Center for Study of Democracy	Todor Galev	Expert
Jacques Delors Institute	Thomas Pellerin-Carlin	Director Energy Center
Jacques Delors Institute	Camille Defard	Research Fellow
Jacques Delors Institute	Matthieu Meunier	Communication Officer
Cambridge Econometrics	Jon Stenning	Associate Director
Cambridge Econometrics	Matteo Caspani	Senior Economist
Cambridge Econometrics	Ornella Dellaccio	Economist
MCRIT	Oriol Biosca	Partner
MCRIT	Harold de Castillo	Project Consultant
MCRIT	Albert Sole	Project Consultant
BAUM	Anna Stetter	Consultant
EEB	Davide Sabbadin	Policy Officer
EEB	Margherita Tolotto	Senior Policy Officer
EEB	Barbara Mariani	Senior Policy Officer

- REFEREE Policy Advisory Group Members

Organisation	Name	Position
ENEA	Alessandro FEDERICI	Head of Monitoring Energy Policies for Energy Efficiency Laboratory
EptaPrime - financial advisory consultancy	Gianpiero PODDIGHE	Founder
IKEM	Bénédicte MARTIN	Team Lead Energy Law
German Federal Ministry for Economic Affairs and Energy	Florian KNOBLOCH	Policy Advisor
Rénovons! CLER	Danyel DUBREUIL	Coordinator
Area Metropolitana de Barcelona	Gil MORALES (replacing Elena Lacord)	Head of Office Energy Transition



Buildings Performance Institute Europe	Judit KOCKAT	Executive Director
EVN Bulgaria	Anna DIMITROVA	Head Of Department, Energy Policy
Emilia Romagna Region	Apollonia TIZIANA DE NITTIS	Expert
EIT Urban Mobility	Pierre SERKINE	Public Affairs and Stakeholder Relations Officer
Municipality of Gabrovo	Koleva DESISLAVA	Senior Expert
University of Exeter	Jean-Francois MERCURE	Senior Lecturer
Regione Emilia Romagna	Attilio RAIMONDI	Senior expert
Macao University	Aileen LAM	Lecturer
Royal Society of Chemistry	Tanya SHERIDAN	Policy and Evidence Manager
FIRE Italian Federation for the Rational Use of Energy	Dario DI SANTO	Managing Director
CNR-IMAA institute	Carmelina COSMI	Researcher
ADEME	Didier BOSSEBOEUF	Scientific and technical advisor
IKEM	Aleksandra NOVIKOVA	Team Lead

## 7.2 List of participants for the second PAG meeting of 10 March 2022

- **REFEREE Partners**

Organisation	Name	Position
ISINNOVA	Stefano Faberi	REFEREE Project Coordinator
ISINNOVA	Giorgia Galvini	Project Manager
Center for Study of Democracy	Radostina Primova	Senior Analyst
Cambridge Econometrics	Jon Stenning	Associate Director
Cambridge Econometrics	Iakov Frizis	Senior Economist
Cambridge Econometrics	Ornella Dellaccio	Senior Economist
MCRIT	Oriol Biosca	Partner
MCRIT	Harold de Castillo	Project Consultant
MCRIT	Efrain Larrea	Project Consultant
BAUM	Anna Stetter	Consultant
EEB	Davide Sabbadin	Policy Officer
EEB	Ludwig Karg	CEO
EEB	Patrick ten Brink	Director of EU Policy



EEB	Barbara Mariani	Senior Policy Officer
Jacques Delors Institute	Camille Defard	Research Fellow

- REFEREE Policy Advisory Group Members

Organisation	Name	Position
ENEA	Alessandro FEDERICI	Head of Monitoring Energy Policies for Energy Efficiency Laboratory
EptaPrime - financial advisory consultancy	Gianpiero PODDIGHE	Founder
Emilia Romagna Region	Apollonia TIZIANA DE NITTIS	Expert
Macao University	Aileen LAM	Lecturer
CNR-IMAA institute	Carmelina COSMI	Researcher
ADEME	Didier BOSSEBOEUF	Scientific and technical advisor
IKEM	Aleksandra NOVIKOVA	Team Lead
Diputació de Barcelona	Parpal NÚRIA	Environmental Program Manager
Greek energy agency	latridis MINAS	Energy Policy Analyst
Greek energy agency	Giakoumi ARGYRO	Energy Policy Analyst

### 7.3 List of participants for the third PAG meeting of 31 January 2023

- REFEREE Partners

Organisation	Name	
ISINNOVA	Stefano Faberi	REFEREE Project Coordinator, Senior Partner
ISINNOVA	Giorgia Galvini	Project Manager
Cambridge Econometrics	Jon Stenning	Associate Director
Cambridge Econometrics	Iakov Frizis	Senior Economist
MCRIT	Efrain Larrea	Partner
MCRIT	Harold de Castillo	Project Consultant
MCRIT	Oriol Biosca	Project Consultant
EEB	Davide Sabbadin	Policy Officer
Center for the Study of Democracy	Martin Vladimirov	Programme Director



Center for the Study of Democracy	Marius Koeppen	Analyst
BAUM	Rita Dornmair	Consultant
Jacques Delors Institute	Klervi Kerneis	Research Fellow
Jacques Delors Institute	Alicia Barbas	Communication Officer

- **REFEREE Policy Advisory Group Members**

Organisation	Name	Position
EptaPrime - financial advisory consultancy	Gianpiero PODDIGHE	Founder
Emilia Romagna Region	Apollonia TIZIANA DE NITTIS	Expert
CNR-IMAA institute	Carmelina COSMI	Researcher
Royal Society of Chemistry	Tanya SHERIDAN	Policy and Evidence Manager
Rénovons! / CLER	Danyel DUBREUIL	Coordinator

## 7.4 List of participants for the fourth PAG meeting of 19 September 2023

- **REFEREE Partners**

Organisation	Name	Position
ISINNOVA	Giorgia Galvini	Project Manager
Cambridge Econometrics	Jon Stenning	Associate Director
Cambridge Econometrics	Iakov Frizis	Senior Economist
Cambridge Econometrics	Ornella Dellaccio	Senior Economist
MCRIT	Efrain Larrea	Partner
MCRIT	Isaac Farradellas	Economist Consultant
MCRIT	Oriol Biosca	Project Consultant
EEB	Davide Sabbadin	Deputy Policy Manager for Climate
EEB	Luke Haywood	Policy Manager for Climate and Energy
EEB	Alberto Vela	Senior Communications Officer for Climate & Energy
Center for the Study of Democracy	Martin Vladimirov	Programme Director
Center for the Study of Democracy	Kostantsa Rangelova	Senior Energy and Climate analyst
BAUM	Patrick Ansbacher	Head of division



BAUM	Dario Pagnia	Consultant for sustainable mobility and climate protection
BAUM	Joshua Dietz	Consultant
Jacques Delors Institute	Klervi Kerneis	Research Fellow
Jacques Delors Institute	Alicia Barbas	Communication Officer
<i>Online</i>		
ISINNOVA	Stefano Faberi	REFEREE Project Coordinator, Senior Partner

- REFERENCE Policy Advisory Group Members

Organisation	Name	Position
CAN Europe	Verena BAX	Energy Savings Policy Coordinator
EFIEES	Eline BLANCHARD	Head of Policy
ADEME	Didier BOSSEBOEUF	Scientific and technical advisor
CNR-IMAA	Carmelina COSMI	Researcher
ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development)	Alessandro FEDERICI	Head of Monitoring Energy Policies for Energy Efficiency Laboratory
CRES	Argyro GIAKOUMI	Energy Policy Analyst
BPIE	Judit KOCKAT	Project Manager
FEDARENE	Florine SERRAULT	Policy officer
ENEA	Salvatore TAMBURRINO	Researcher
ENEA	Maurizio MATERA	Research Fellow
Université de Liège	Nathalie SIMONIS	Student
<i>Online</i>		
Emilia Romagna Region	Apollonia TIZIANA DE NITTIS	Project Manager
EptaPrime	Gianpiero PODDIGHE	Founder
ADEME	Thérèse KREITZ	Resp for int affaire, expert white goods



## 7.5 List of participants for the fifth PAG meeting of 3 April 2024

- REFEREE Partners

Organisation	Name	Position
ISINNOVA	Giorgia Galvini	Project Manager
ISINNOVA	Stefano Faberi	REFEREE Project Coordinator, Senior Partner
Cambridge Econometrics	Jon Stenning	Associate Director
Cambridge Econometrics	Iakov Frizis	Senior Economist
MCRIT	Efrain Larrea	Partner
MCRIT	Isaac Farradellas	Economist Consultant
EEB	Davide Sabbadin	Deputy Policy Manager for Climate
Center for the Study of Democracy	Martin Vladimirov	Programme Director
Center for the Study of Democracy	Kalina Tcolova	Climate and Energy Analyst
BAUM	Dario Pagnia	Consultant for sustainable mobility and climate protection
Jacques Delors Institute	Klervi Kerneis	Research Fellow

- REFEREE Policy Advisory Group Members

Organisation	Name	Position
ADEME	Didier BOSSEBOEUF	Scientific and technical advisor
ADEME	Lucie BIORET	Economist
CNR-IMAA	Carmelina COSMI	Researcher
CNR IMMA	Luigi SANTOPIETRO	Researcher
BPIE	Judit KOCKAT	Project Manager
ENEA	Salvatore TAMBURRINO	Researcher
Emilia Romagna Region	Claudia ROMANO	Project Manager

