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CORDIS Results Pack on

better energy policy design

A thematic collection of innovative EU-funded research results

May 2024

Modelling and behavioural science for energy efficiency

Research and Innovation

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Editorial

Modelling and behavioural science for energy efficiency

Reducing energy consumption and achieving energy savings is essential to deliver the European Green Deal. The eight EU-funded projects presented in this CORDIS Results Pack highlight bottom-up research on energy behaviour and modelling, supporting the design and implementation of better energy policies.

Decarbonising the energy system is critical if Europe is to reach its climate and energy security objectives. These goals are enshrined in the European Green Deal, which aims to make Europe the world's first climate-neutral continent by 2050, as well as the 'Fit for 55' package, a comprehensive set of legislative revisions designed to align EU policies with the goal of reducing greenhouse gas emissions by 55 % by 2030.

As part of that legislative work, the Energy Efficiency Directive (EED) was revised in 2023, further increasing its ambition by setting higher binding targets, promoting energy-saving measures and encouraging investment in energy-efficient technologies and practices.

To deliver on these commitments, energy efficiency must be prioritised. Energy savings are the easiest way of reducing greenhouse emissions, while also saving consumers money. Simple and no-cost measures such as awareness campaigns on switching off lights and electrical equipment, promoting alternative modes of transport or adjusting heating temperatures by 1 °C helped to achieve significant energy reductions and illustrated the power of non- technological, behavioural solutions, when applied at scale and throughout Europe. Understanding consumer behaviour is therefore essential for effective policies. Useful insights from behavioural science and psychology on stimulating energy-efficient behaviour can be employed to guide the design of policies and behavioural change campaigns.

The benefits of energy efficiency are not sufficiently taken into account in financial and political planning and decision-making. Prioritising energy efficiency also involves applying the Energy Efficiency First principle, in particular when energy supply or energy infrastructure investments are at stake. In those cases, decision makers need to consider actions in energy efficiency and energy demand management on an equal footing with alternative actions to respond to a specific need or objective. However, to apply it, it is necessary to understand better the structure of energy demand and the impacts of energy efficiency measures.

Three dimensions of this challenge were explored by recent Horizon 2020 Calls for Proposals, with the aim of making the energy efficiency first principle more operational, substantiating the demand-side aspects in energy modelling, and improving the understanding of non-energy benefits linked to energy efficiency. Parallel to that, other calls focused on enabling local actors to implement better energy efficiency policy measures and campaigns with the support of behavioural scientists. This Pack highlights just some of the research that answers these challenges.

The Horizon 2020 Energy Efficiency programme and its successor, the LIFE Clean Energy Transition programme, provide funding for a wide range of activities working towards an energy-efficient, renewable energy-based, climate-neutral and resilient economy.

Cultural context matters for effective energy efficiency campaigns

Testing well-established behavioural change interventions in real life, has enabled the EU-funded ENCHANT project to match energy users to the technique most likely to reduce their consumption.

As human behaviour ultimately determines the success of energy efficiency policies, understanding what motivates people to act in certain ways is crucial to affecting change.

"While we have learned a lot from small-scale pilots, for significant change, we now need to scale up efforts," says Christian Klöckner, project coordinator of the ENCHANT project.

We see many utility companies changing their ethos to offer flexible services that reduce consumption, we want to help drive that change.

ENCHANT ran 15 pilots, each implementing at least one of seven behaviour-changing interventions. The team compared the results to control groups where no intervention was made. The pilots, ranging from a handful of individuals to millions of people, focused mostly on domestic electricity consumption.

The project's interventions are estimated to have reduced primary energy consumption by as much as 195 gigawatts. "Additionally, we believe that project participants ended up investing around EUR 5.1 million in household energy efficiency measures such as insulation," adds Klöckner, a professor of Social Psychology at the Norwegian University of Science and Technology. However, the project found that it isn't straightforward to infer causality from specific interventions, partly due to the role of cultural context.

Trials in the intervention matrix

ENCHANT demonstrates both the potential and limitations of behaviour change campaigns, emphasising the importance of setting realistic expectations about interest levels and participation.

The project benefited from the participation of 11 partners – including energy utility companies, municipalities and NGOs – across six countries: Austria, Germany, Italy, Norway, Romania and Türkiye.

"This gave us both routinely used channels, such as bills or newsletters, through which to conduct our trials, alongside access to a vast array of data about European energy behaviour," explains Klöckner.

Over 2 500 households were recruited to an online platform developed by ENCHANT, to test energy efficiency campaigns, either as stand-alones or in various combinations.

Campaign intervention techniques to influence energy consumption included monetary incentives, communicating social norms, individual feedback, simplified hands-on tips, private or public commitments and a competition.

Strong cultural differences were also found for the different techniques trialled on the platform.

While hands-on electricity saving tips communicated through the platform were positively received in all countries, some interventions only worked in select cases. For example, competitions were most effective in Germany, while nudge communications, informing participants about peer behaviours (so-called social norms), worked best in Norway.

Interestingly, psychological profiling was good at predicting which energy-saving tips participants would self-report as being adopted. However, actual energy use, measured in kWh, didn't tally with the claims.

"We need more research to find out why, but it could simply be that while only one person self-reported, multiple householders were actually using the energy," says Klöckner. "This is a reminder that as energy consumption is most strongly determined by socio-structural aspects such as household size and available infrastructure, the margin for influencing change is small."

'Go greener' smart tools

Data from the project's platform was used to train a machine learning algorithm, which predicts which intervention is most likely to reduce future energy consumption. Ultimately the aim is for the technology to be integrated into utility company apps.

"We see many utility companies changing their ethos from the maximisation of energy sales profits to offer flexible services that reduce consumption; we want to help drive that change," concludes Klöckner.

PROJECT
ENCHANT – Energy Efficiency through behaviour change transition strategies

COORDINATED BY
Norwegian University of Science and Technology in Norway

FUNDED UNDER
Horizon 2020-ENERGY

CORDIS FACTSHEET
cordis.europa.eu/project/id/957115

PROJECT WEBSITE
enchant-project.eu

The psychological surprises underlying energy efficiency choices

The EU-funded EVIDENT project has been uncovering the key drivers of energy efficiency decision-making, to better understand the influence of financial and environmental literacy at play.

While many energy efficiency measures, such as product labelling, have been successful, not everyone is influenced to the same extent. The EVIDENT project used research methods – including 'nudge' campaigns, a large-scale survey and games – to gauge which incentives could most effectively alter the behaviour of different groups of energy consumers.

EVIDENT investigated consumer behaviour across five use cases.

Three were led by the Democritus University of Thrace in Greece. Two of them explored whether peer 'nudges' could curb electricity usage, in collaboration with Swedish energy service company CheckWatt (website in Swedish). The third investigated if big data could gauge the effects of behavioural changes on actual energy consumption.

Pro-environmental attitudes alone are insufficient to change behaviour.

These use cases explored the effects of non-price interventions (such as feedback, peer comparisons and tips) on the residential energy consumption of 867 participants.

"Consumption decreased by 10 %, on average, due to these interventions, more than observed in similar studies," says Panagiotis Sarigiannidis, professor at the University of Western Macedonia in Greece, and coordinator of the EVIDENT project. "But because we think some actually increased their overall consumption after photovoltaic panels were installed, there is potential for further reductions."

Trinity College Dublin in Ireland led the final two use cases. The first case study used a game, played by over 1 000 EU residents, to analyse how factors such as personal background as well as environmental and financial knowledge influenced willingness to pay for household appliance repairs.

Results showed that older people and students preferred replacing broken appliances, while the unemployed opted for repairs. "Surprisingly, those expressing environment concerns were less willing to pay for repairs, suggesting pro-environmental attitudes alone are insufficient to change behaviour," remarks Sarigiannidis.

The second use case surveyed over 2 000 European citizens to measure environmental, energy and financial literacy levels, exploring how this impacts appliance choices. Participants selected appliances within different scenarios and with varying types and levels of information.

"We found a disconnect between knowledge and action," notes Sarigiannidis. "Environmental or financial knowledge simply wasn't enough to predict choice. Psychological factors, such as favouring immediate rewards, proved a huge influence."

More tailored and better targeted interventions

EVIDENT demonstrates that as consumer behaviour data increases, energy efficiency campaigns can be better targeted to specific groups, based on age, income level and so on.

A number of policy recommendations were developed by the project. One calls for governments and financial institutions to offer consumers financial incentives to invest in more energy-efficient home appliances. This could include subsidies, low-interest loans and extended warranties.

In addition, financial literacy workshops and resources to improve decision-making could be made available to consumers, especially the unemployed and those with lower incomes.

"We envisage a day where behavioural insights combine with big data and machine learning to create models that manage energy supply and demand more sustainably," concludes Sarigiannidis.

PROJECT
EVIDENT – bEhaVioural Insights anD Effective eNergy policy acTions

COORDINATED BY
University of Western Macedonia in Greece

FUNDED UNDER
Horizon 2020-ENERGY

CORDIS FACTSHEET
cordis.europa.eu/project/id/957117

PROJECT WEBSITE
evident-h2020.eu

Understanding the true value of energy efficiency

A tool from the EU-funded MICAT project allows policymakers to identify and highlight the full value of energy efficiency measures that could help to drive investment and encourage positive change.

Is it better to invest in new infrastructure to increase the supply of energy, or should we prioritise lowering energy demand in a cost-optimal way? It is difficult for policymakers to respond and to compare options when they look only at energy savings. To compare options for various policies and investment programmes, one needs to take into account the broader picture for society.

The MICAT project sought to address this by developing a freely available online tool to help all levels of governance make more informed decisions.

Quantifying multiple impacts

"We sought to develop a more comprehensive approach for quantifying and monetising what we call multiple impacts (MIs) of energy efficiency," explains MICAT project coordinator Barbara Schlomann, from the Fraunhofer Institute for Systems and Innovation Research in Germany.

The project grouped these MIs into three categories: social, economic and environmental impacts. A social impact might be avoiding the burden of asthma for example, while an economic impact might be job creation.

Based on this, the project developed the publicly available MICATool, where policymakers select their level of governance (local, national or EU-wide), the field of activity they are interested in, and the identified policy change. So, for example, a national rail provider might investigate the impact of switching fuels. The tool takes the user to a page that calculates the potential impacts across the three categories.

Publicly available tools

The tool is accompanied by detailed documentation and a comprehensive overview. Fact sheets cover the scope of a particular impact, such as the alleviation of energy poverty, and contain a discussion of potential overlaps with other impacts, as well as the calculation steps applied.

The successes of the MICAT project are now being built upon in a follow-up project called SEED MICAT. The project was launched in December 2023, with the intention of widening the scope of the MICATool even further.

"The new Article 3 of the revised Energy Efficiency Directive on the 'energy efficiency first' principle not only asks for cost-benefit analyses to take into account the wider benefits (i.e., the MIs) of energy efficiency solutions, it also asks for transparent methodologies to compare climate neutrality options, including the wider impacts," notes Schlomann.

Under SEED MICAT, the tool will be further developed over the next three years to meet these needs. This will facilitate the analysis of potentially competing or complementary paths and options towards climate neutrality.

"This broader view on energy efficiency is very important," says Schlomann. "Energy system costs alone are not enough, especially when climate neutrality pathways based on large amounts of renewables have to be distinguished from pathways based on strong energy efficiency policies."

Schlomann notes that while both pathways save carbon dioxide and reduce local emissions, land consumption, resource demand and economic impacts may be different.

"Including the wider MIs – as calculated in the MICAT and SEED MICAT projects – can help to ensure that energy efficiency, with its economic, environmental and societal impacts, is valued on an equal footing with other options to reduce greenhouse gas emissions," she remarks.

The MICATool will really be able to help decision makers to comprehensively assess multiple impacts.

"This is where the MICATool will really be able to help decision makers to comprehensively assess MIs, and understand the true value of energy efficiency."

PROJECT
MICAT – Multiple Impacts CAlculation Tool

COORDINATED BY
Fraunhofer Institute for Systems and Innovation Research in Germany

FUNDED UNDER
Horizon 2020-ENERGY

CORDIS FACTSHEET
cordis.europa.eu/project/id/101000132

PROJECT WEBSITE
micatool.eu/seed-micat-project-en/about-micat.php

Anticipating the effect of societal trends on energy demand

From the sharing economy to work from home, societal trends are reshaping energy use. Improved energy models from the EU-funded NEWTRENDS project allow policymakers to react to Europe's future energy needs.

Trends advanced by digitalisation, such as circular economies, integration of renewable energies, electric vehicles and even autonomous driving could in theory reduce broad-scale energy demand and greenhouse gas emissions. But these positive impacts are far from certain.

"It's not by default that digitalisation will bring us to reaching the climate goals," explains Heike Brugger, head of the Energy Policy Division at the Fraunhofer Institute for Systems and Innovation Research in Germany and NEWTRENDS project coordinator. "It could potentially go in both directions: we have a lot of increasing energy demand factors through digitalisation, and of course benefits which can support us in reaching climate neutrality," she adds.

In the NEWTRENDS project, Brugger and her colleagues identified how societal trends may affect energy demand in the future. The project combined analytical foresight methods with quantitative models to develop new energy models to provide an accurate vision of Europe's future energy demands, to help improve policy design and energy efficiency.

"Developments in technology are quite fast," says Brugger, "so we have to make sure that policymakers are keeping up."

Trend scouting

First, the project scouted through publications from foresight research to identify future trends that could impact energy demand. They drew up a list of over 240 factors, considering cross-sectoral impacts of these new trends on future energy demand.

Developments in technology are quite fast, so we have to make sure that policymakers are keeping up.

Through a range of interviews with EU policymakers, stakeholder workshops, and analysis of big data (e.g., from smart meters), they could identify the role of policies in responding to these trends and see how the design of such policies could be improved.

One major component of the project was to improve energy demand models, by identifying gaps in trends and policy needs, closing these gaps in the models and calculating how new policies might affect overall energy demand.

The team focused on four in-depth studies from across society: the circular economy, the digitalisation of the economy and private life (such as the increased prevalence of work from home), the ongoing transition from consumers to 'prosumagers' (where individuals consume, produce and store energy while managing their own energy demand) and the rise of the sharing economy.

Highlighting the importance of future policies

Overall, the project identified both opportunities and challenges for policymaking triggered by these new societal trends.

For example, the models showed that the circular economy could reduce steel and cement demand by 38 % and 26 % by 2050, respectively. Yet the current policy mix was found to be insufficient to deliver these positive gains.

In a move to a shared economy of transport, enhanced and new policy instruments are also needed, such as an effective carbon tax, more stringent CO_2 standards and more alternative fuel infrastructure.

Stronger policy coordination is also needed to manage 'interrelationships' between trends, for example between the location of data centres and the availability of water resources.

"None of the trends have by default only a very clear positive or negative effect on the future energy demand," remarks Brugger. "Policymaking and policy design are instrumental in how the effects of the trends will unfold, and thus their effect on future energy demand and the chance of reaching our climate targets."

PROJECT
NEWTRENDS – NEW TRENDS IN ENERGY DEMAND MODELING

COORDINATED BY
Fraunhofer Institute for Systems and Innovation Research in Germany

FUNDED UNDER
Horizon 2020-ENERGY

CORDIS FACTSHEET
cordis.europa.eu/project/id/893311

PROJECT WEBSITE
newtrends2020.eu

Nudging Europe's citizens towards energy efficiency

Using behavioural science, the EU-funded NUDGE project sought to improve energy-use awareness and efficiency among citizens.

For Europe to meet its ambitious goal of being the first climate-neutral continent, individual citizens must be enabled to become more aware of their energy use and ultimately develop more energy-efficient habits. Yet present interventions often follow a 'one-size-fits-all' model and appear to have limited effectiveness in driving long-term change.

"Traditional methods to promote energy efficiency are often designed using partial understanding about how different interventions interact with one another, and contrasting evidence about their effectiveness, as a result of poor testing under real-world conditions," explains Filippos Anagnostopoulos, senior expert at the Institute for European Energy and Climate Policy, and NUDGE project coordinator.

The NUDGE project harnessed behavioural science to design and test subtle nudging interventions aimed at promoting energy-saving habits. Examples include users being told what their neighbours or peers do, or changing the default settings of energy devices.

The work involved in-depth consumer analysis through surveys and randomised control trials across five EU countries: Belgium, Croatia, Germany, Greece and Portugal. The diverse testing ground encompassed residential buildings, energy communities and schools, representing a variety of energy usage scenarios, demographics and socio-economic backgrounds.

"NUDGE's research paves the way for the integration of behavioural nudges into policy frameworks, empowering both governments and private entities to make informed decisions," says Anagnostopoulos.

Small pushes, big changes

To understand the real-world impact, NUDGE delved into individual psychology and contextual factors that influence energy consumption. The team created detailed user profiles that can help to better tailor nudges, and conducted experiments to evaluate their efficacy.

They achieved this by leveraging surveys, user feedback and data from modern sensor technologies such as smart meters, mobile apps and air quality sensors, all implemented in real-world settings.

Results showed that interactive nudges led to energy savings of up to 4 % in some settings, and up to 16 % for a specific subset using automated settings. However, the project also revealed crucial limitations. Nudges were not universally effective, and for some groups, the effects were negligible or even contradictory.

Beyond the lab: real-world limitations of nudges

The NUDGE project highlighted several key limitations of nudges in real-world settings. Firstly, there are competing priorities, as households often prioritise other daily activities over monitoring energy consumption apps.

Seasonal fluctuations – such as holidays – are disruptive to energy-saving efforts, as routines and consumption patterns change. External factors such as the weather can also significantly impact energy use, limiting nudge effectiveness.

The research also identified factors beyond individual behaviour that can hinder nudges' effectiveness. For instance, mismatched regulatory incentives can overpower the nudges' influence, such as when regulations offer stronger financial incentives for certain behaviours.

Using tailored nudging strategies

The results highlighted several key insights into personalised behavioural nudges regarding energy efficiency. For nudges to be effective, they must be clearly linked to the specific energy-saving behaviours they aim to influence.

Policymakers also need to ensure nudging campaigns complement, rather than contradict, existing regulations and market mechanisms. "It is important to identify potential conflicts so nudges can be designed to work seamlessly," adds Anagnostopoulos.

NUDGE's research paves the way for the integration of behavioural nudges into policy frameworks, empowering both governments and private entities.

The project emphasised the importance of 'default nudges' that require minimal user effort. Automatically setting an option (on EV charging settings, for example) can nudge consumers towards more efficient habits without requiring active engagement.

Importantly, NUDGE underscored the critical role of providing consumers with immediate feedback on their energy use. "By visualising consumption data through apps or smart meter displays, individuals are empowered to make informed decisions and adjust their behaviour accordingly," notes Anagnostopoulos.

PROJECT
NUDGE – NUDging consumers towards enerGy Efficiency through behavioural science

COORDINATED BY
Institute for European Energy and Climate Policy in the Netherlands

FUNDED UNDER
Horizon 2020-ENERGY

CORDIS FACTSHEET
cordis.europa.eu/project/id/957012

PROJECT WEBSITE
nudgeproject.eu

A holistic approach to understanding energy efficiency trends

Energy efficiency has become vitally important in recent years, as Europe strives to reduce carbon emissions. The EU-funded ODYSSEE-MURE project developed a range of tools and resources for policymakers, researchers and industry professionals to drive impactful change.

ODYSSEE-MURE is a flagship EU project on energy efficiency. Its platforms work together to deliver a holistic approach towards understanding and analysing energy efficiency trends.

Launched in 1993, it has been supported by the European Commission through multiple funding programmes, including SAVE, Intelligent Energy Europe (IEE), Horizon 2020 and, since 2022, LIFE.

The initiative draws from two databases: Odyssee, which focuses on energy efficiency indicators and energy consumption, and Mure, which is dedicated to national policies and measures related to energy efficiency.

Didier Bosseboeuf, scientific and technical advisor at France's Environment and Energy Management Agency, explains: "Eurostat was not in a position to produce comparable information concerning energy efficiency at a detailed level of demand. Our project aimed to fill this gap through two main tools: energy efficiency indicators and the policies' database."

Core components

ODYSSEE-MURE's standout feature is a treasure trove of detailed information on end-use demand data, energy efficiency indicators and policies. The granular level of detail enables users to analyse energy consumption patterns within specific sectors such as industry, transport and buildings. With policy briefs as well as country and sectoral profiles summarising key findings, policymakers gain valuable insights into successful energy efficiency policies implemented across different countries.

But ODYSSEE-MURE isn't just about collecting data, Knowledge sharing is another key component of the platform, with webinars conducted by experts in energy efficiency policy. These webinars created a global community of practitioners, enabling attendees to interact and gain deeper insights into emerging trends and best practices.

"We aim to foster a collaborative European approach towards energy efficiency through open dialogue, data dissemination and analysis," adds Bosseboeuf, who coordinated the project. "It's a collaborative process, with teams in each country, from energy efficiency agencies, contributing to our success."

Country profiles are yet another valuable resource, with data extrapolated from the 27 EU Member States, Norway, Serbia and Switzerland. This allows users to compare energy efficiency performance and policies across different countries and sectors. Policymakers and industry professionals can identify where improvements in energy efficiency can have the greatest impact against local and national standards.

"The most interesting result is a European scoreboard on energy efficiency, allowing fair comparison of countries," notes Bosseboeuf. "It's a great way to open the debate on the differing results in each nation."

Guided decision-making

ODYSSEE-MURE also provides indicators and policy evaluation tools that track progress and identify areas for improvement. It provides useful inputs for modellers to simulate scenarios and assess potential outcomes, so stakeholders can predict the effects of different policy measures, anticipate future energy needs and tweak resource allocation strategies. These evidence-based insights support the informed choices that positively impact Europe's sustainable energy use.

We aim to foster a collaborative European approach towards energy efficiency.

The project has created a powerful platform for the comprehensive analysis and monitoring of energy efficiency measures in Europe. Its methodology has been internationally recognised as best practice and replicated in more than 70 countries worldwide.

Over more than 30 years, the scale of the project has been extended, and continues under the LIFE programme as OdysseeMure-fit-4-55, where it now covers a network of 34 organisations across the EU and nine energy community countries (Albania, Bosnia-Herzegovina, Georgia, Kosovo, Moldova, Montenegro, North Macedonia, Serbia and Ukraine).

PROJECT
ODYSSEE-MURE – Monitoring EU energy efficiency first principle and policy implementation

COORDINATED BY
Environment and Energy Management Agency in France

FUNDED UNDER
Horizon 2020-ENERGY

CORDIS FACTSHEET
cordis.europa.eu/project/id/847082

PROJECT WEBSITE
odyssee-mure.eu

Analysing energy efficiency fuels climate-neutral policies

Measuring the impacts of energy efficiency with an easy-to-use tool gives decision-makers much needed information at national, local and business levels.

Energy efficiency means getting the same result for less expenditure of energy. To reach the goal of climate neutrality by 2050, Europe must improve energy efficiency in buildings, transport and industry. For that to happen, policymakers need to understand the range of impacts caused by energy efficiency measures. The EU-funded refereetool.eu (REFEREE) project has designed tools for use at national and local levels to meet this need.

Energy efficiency and its impact

Energy efficiency includes a wide range of applications. Upgrades to insulation, smart thermostats, A+ appliances and LED lighting are some examples. Renewable energy is also part of the energy efficiency portfolio, and it impacts all sectors of human activity.

The positive effects of energy efficiency are wide-ranging. For consumers, results include reduced energy bills, improved health and increased property value. Societally, benefits lead to reduced greenhouse gas emissions, job growth and reduced poverty levels.

To make the best policy decisions and further accelerate adoption of energy efficiency strategies, it is necessary to quantify environmental, financial and social benefits. According to project coordinator Stefano Faberi: "The project has produced two tools which can be used to assess impacts first at national and second at local level."

Multiple-benefits European and localities tools

The multiple-benefits European tool provides modelling and simulation analyses appropriate to national level systems, whereas the localities tool is designed to work on a more granular scale. A major aim of the project is to develop a mechanism on the E3ME platform that links the REFEREE-designed analytic engine to a complex set of external engines in one easy-to-use tool. Faberi clarifies this goal: "Simulations and impact quantifications are achieved through background calculations – conducted using models created outside of the REFEREE project – plus a modelling engine built within the project which further processes and calibrates the outcomes."

The integration of multiple modelling sources presented several challenges. Faberi says: "The main way in which these have been addressed is through strong collaborative working across the REFEREE consortium. Different partners have carried out extensive scenario testing within the European model, which has proven to be a rapid way to identify problems."

The project's tools are currently being tested in four case studies. Studies in Germany and Spain are testing the performance of the localities tool in discrete municipalities. In Bulgaria and Italy, studies are testing the REFEREE tools at both national and municipal levels.

Training end users

In addition to the challenge of designing a tool that integrates multiple analytic engines, a further challenge is ensuring correct application of the tools by non-expert users. In particular, correct parameterisation and accurate interpretation of associated results is important. The case studies continue to provide valuable feedback concerning user guidance.

REFEREE has created powerful analytic engines to guide community decision making at multiple levels. Testing is underway, and when completed it will be followed by a communication campaign to make the target audience aware of the tools available. With training in how to use these tools, European nations and municipalities have the potential to turn the 'hidden fuel' that is energy efficiency into the 'first fuel' driving prosperity and well-being.

Different partners have carried out extensive scenario testing within the European model, which has proven to be a rapid way to identify problems.

PROJECT
REFEREE – Real ValuE oF EneRgy EfficiEncy

COORDINATED BY
Institute of Studies for the Integration of Systems (ISINNOVA) in Italy

FUNDED UNDER
Horizon 2020-ENERGY

CORDIS FACTSHEET
cordis.europa.eu/project/id/101000136

PROJECT WEBSITE
refereetool.eu

Innovative modelling of household energy consumption

Predicting the energy consumption patterns of large groups of people is a daunting task. The EU-funded WHY project adapted tools from climate modelling to provide decision-makers with all new insights.

From a morning shower to an evening bath, we all have our own routines which influence when, and how much, energy we use. These consumption patterns can vary based on when people are home, how insulated their home is, even by how much sunlight comes in. It's no surprise then that predicting household consumption patterns across hundreds or thousands of homes is a major challenge, even for the most sophisticated prediction models.

The WHY project aims to address this by developing more accurate energy system models (ESMs), using innovative methodologies for short- and long-term forecasting. ESMs are tools that help energy analysts, planners and policymakers to rationally describe energy systems and systematically evaluate the impacts of long-term scenarios.

"ESMs have been widely used to develop and explore pathways for climate change mitigation and assess strategies to decarbonise the energy system, but they lack the degree of accuracy we need on the energy demand side," explains Cruz E. Borges, coordinator of WHY on behalf of the University of Deusto in Spain. "On the other hand, WHY consortium members have experience building models of household behaviour, so we decided to join forces."

Building on existing behaviours which can currently be seen (such as avoiding excessive energy use during high tariff periods), the team developed a causal model that maps the underlying decision-making processes of consumers. This way, it's possible to not only assess the outcome of an intervention (e.g., the impact of a new energy tax), but also understand the future or past status of the system (e.g., how much energy households would consume if energy efficiency labels had never been implemented).

Together this offers a more accurate and actionable framework for policy development and implementation.

Ensuring accuracy and impact

The WHY project employs a meticulous validation process, incorporating expert knowledge and natural experiments to construct and assess its models. "The models constructed have been assessed by a panel of more than 30 interdisciplinary experts, cross-checked with established tools and databases," Borges notes. This rigorous validation ensures the reliability and robustness of the project's findings, which advocate a combination of energy efficiency improvements and low-carbon energy sources to decarbonise European homes effectively.

The project opens new avenues for research and application, aiming to extend its methodologies to model collective investment behaviours in energy transition and to enhance the real-world applicability of its technologies. Further academic engagement, skill workshops and open science practices look set to foster widespread adoption and implementation of the project's innovative models.

The models constructed have been assessed by a panel of more than 30 interdisciplinary experts.

WHY stands as a testament to the power of interdisciplinary collaboration and innovative thinking in addressing the complex challenges of climate change and residential energy efficiency. By providing a more nuanced understanding of energy use patterns and introducing advanced modelling techniques, the project not only contributes to the scientific community but also offers practical solutions for policymakers, stakeholders and European citizens striving for a sustainable energy future.

PROJECT
WHY – Climbing the causality ladder to understand and project the energy demand of the residential sector

COORDINATED BY
University of Deusto in Spain

FUNDED UNDER
Horizon 2020-ENERGY

CORDIS FACTSHEET
cordis.europa.eu/project/id/891943

PROJECT WEBSITE
why-h2020.eu

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CINEA – Horizon project manager

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CINEA also implements two societal challenges of the Horizon 2020 programme: Secure, clean and efficient energy, and Smart, green and integrated transport. CINEA provides technical and financial management services at all stages of the programme and project life cycle – from the calls for proposals, evaluation of projects and the award of financial support, to the follow-up of project implementation and control of the use of funds allocated.

CINEA provides visibility for EU funding opportunities and project results – and supports potential applicants and beneficiaries, allowing them to benefit from the Agency's long-standing experience of programme implementation with a high level of performance and seeks to promote synergies between the programmes in order to benefit EU citizens and promote economic growth.

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RESULTS PACK ON AN INCLUSIVE ENERGY TRANSITION

Achieving a citizen-centred and inclusive energy transition requires harnessing affordable and clean energy solutions while facilitating the active participation of consumers in line with the aims of the European Green Deal. The 15 EU-funded projects featured in this CORDIS Results Pack are working towards making that happen.

Check out the Pack here:
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