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649342 EUFORIE

Summary report of the participatory national EUFORIE workshops

WP7 Deliverable D7.1

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Executive summary

The purpose of this deliverable is to present the views on energy efficiency and its role in energy and environmental policies based on the opinions of different stakeholder groups. For this, a set of national workshops was arranged in the Euforie project, where selected results of the project were presented and discussed. Three workshops were organised altogether, the first one in Rome, Italy in November 2016, the second ne in Barcelona, Spain in March 2017 and the third one in Frankfurt A.M. in Germany in June 2017. Additional material was collected with two surveys in the context of the Italian and Spanish workshops, and with stakeholder interviews carried out in Finland in May-June 2017.

Title of the workshop	International workshop on costs and benefits of energy efficiency – Scenarios for Italy and Europe	Lessons learned from a critical analysis of European energy directives: Policy implications for Pla de l'Energia i Canvi Climàtic de Catalunya 2012-2020	Beyond energy efficiency
Location	Rome, Italy	Barcelona, Catalonia/Spain	Frankfurt a.M., Germany
Date	18.11.201	24.3.2017	2..6.2017
Number of participants	32	43	26
Survey on energy efficiency	Yes	Yes	No
Responsible EUFORIE partner	Parthenope University of Naples, Italy	Autonomous University of Barcelona, Spain	Sustainable Europe Research Institute, SERI Germany
Notes	In collaboration with the Federation of energy service companies (FEDERESCO)	In collaboration with Associació i Col·legi d'Enginyers Industrials de Catalunya (CEIC)	In collaboration with Bund für Umwelt und Naturschutz (Friends of the Earth Germany)

Energy efficiency is a popular catchword, but as a concept it is a relative one and its operationalization is strongly dependent on the context where the concept is applied. From a scientific point of view, the difficulty of operationalization goes hand in hand with the level of aggregation. At the macro level of society (national level), where policy targets are usually set, operationalization is almost impossible.

There is also overlapping between different fields of policies, where energy efficiency is a topic: In energy policy, energy efficiency has been promoted over 40 years for economic reasons. In environmental and climate policies, energy efficiency has been seen as a means to limit CO_2 emissions and environmental impacts in general – but this is seriously threatened by the Jevons paradox, which says simply that saved energy will be consumed elsewhere. In economic and employment policies, attention has been paid to an energy efficiency (service) market, motivated by potential job creation and economic growth. These issues make energy efficiency unclear as a policy target.

Absolute targets to reduce energy consumption (and related environmental impacts) from a measured level are better than relative targets or targets set in relation to a projected absolute consumption in the future (as the current EU target). Targets should be set at a level where monitoring is possible.

Indicators of energy efficiency, such as energy intensity, should be calculated by preferring the use of physical variables. Mixing physical and economic variables is problematic. Economic growth usually seems to decrease energy intensity, even though there is no real improvement in energy efficiency, but other things such as structural change or financial transactions instead.

Different policy instruments promoting energy efficiency may be useful in driving and supporting technological change and change in consumer behavior and lifestyle, which are important elements in reaching targets set on energy consumption or on related environmental impacts. There are many promising policy instruments, but what is needed is a monitoring system where the costs, benefits, and other effects of the use of the policy instruments in different EU Member States would be collected on a regular basis. However, there is no ultimate policy instrument, and the opinions on them vary a lot between different EU Member States and between different stakeholders.

Technologies for improving energy efficiency are available, for energy production and consumption, but the major problem seems to be that energy efficient technologies are not taken into use for economic reasons – usually payback periods are too long. It seems that the best drivers for energy efficiency are higher energy prices, and government policies are needed especially in cases where energy prices remain at a low level.

The results are useful for policy makers in the European Union and in the EU Member States, They are also of interest to all other stakeholders interested in energy and environmental policies, and especially in the role of the concept of energy efficiency in related target setting and design of policy instruments.

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Abbreviations

Acronym	Explanation
BP	British Petroleum (oil company)
CBA	Cost-benefit analysis
CHP	Combined heat and power production
CO_2	Carbon dioxide (emissions)
DSM	Demand-side management
EASME	Executive Agency for Small and Medium-sized Enterprises
EC	European Commission
EsCo	Energy service company
EU	European Union
EUFORIE	European Futures for Energy Efficiency
GDP	Gross Domestic Product
IEA	International Energy Agency
KfW	Kreditanstalt für Wiederaufbau (government-owned German development bank)
LCA	Life-cycle assessment
LED	Light emitting diode
Mtoe	Million tonnes of oil equivalent
NEEAP	National energy efficiency action plan
NGO	Non-governmental organization
SMACC	Smart City Coaching
SME	Small or medium-size enterprise
WP	Work Package

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Goals of this deliverable

This deliverable is a summary report covering Tasks 7.1-7.4 of the Horizon2020 project 649342 EUFORIE (European Futures for Energy Efficiency) WP7. The purpose of this deliverable is to provide the most important results from the national participatory workshops carried out in the beneficiary Member States. The results deal with workshop-specific topics (biophysical and financial aspects, energy planning and policy, energy efficient technologies, and energy sufficiency), in addition to more generic but context-influenced beneficiary and stakeholder views on energy efficiency and related policies in Finland, Italy, Spain, and Germany. The results formulate the major input to the next and final Task 7.5 of EUFORIE WP7 and the whole project, the European roundtable. Other input will be selected from the results of other EUFORIE research and innovation WPs (WP2-WP6 and WP8). The target of the roundtable is to provide the most useful elements to be utilized in the still non-existing but hopefully forthcoming European vision and strategy of energy efficiency.

Policy context: Energy efficiency policies in the EU

Energy efficiency is a means to tackle energy-related negative impacts such as harmful emissions in the air, but in the policy context it has gained a status of a target even as such. Energy efficiency can be improved in both energy production and consumption, and there are many technologies and policy instruments available for it (see Future Energy 2017; ODYSSEE-MURE 2017, for example). Based on the EU directive on energy efficiency (EC 2012), the EU Member States are currently preparing their next National Energy Efficiency Action Plans (NEEAPs), where they set out the estimated energy consumption, planned energy efficiency measures, and the improvements the EU Member States expect to achieve. The Member States report their achievements in the Annual Reports.

Table 1. Projected energy consumption in the EU Member States in the year 2020 (EC 2017; primary/final energy consumption ratio added by the authors).

	Energy consumption in 2020 as notified from Member States in 2013, in the NEEAP 2014 or in a separate notification to the European Commission in 2015		
EU Member State	Primary energy consumption, Mtoe	Final energy consumption, Mtoe	Primary/final energy ratio
Austria	31.5	25.1	1.25
Belgium	43.7	32.5	1.34
Bulgaria	16.9	8.6	1.97
Croatia	11.5	7.0	1.64
Cyprus	2.2	1.8	1.22
Czech Republic	39.6	25.3	1.57
Denmark	17.8	14.8	1.20
Estonia	6.5	2.8	2.32
Finland	35.9	26.7	1.34
France	219.9	131.4	1.67
Germany	276.6	194.3	1.42
Greece	24.7	18.4	1.34
Hungary	24.1	14.4	1.67
Ireland	13.9	11.7	1.19
Italy	158.0	124.0	1.27
Latvia	5.4	4.5	1,20
Lithuania	6.5	4.3	1.51
Luxembourg	4.5	4.2	1.07
Malta	0.7	0.5	1.40
Netherlands	60.7	52.2	1.16
Poland	96.4	71.6	1.35
Portugal	22.5	17.4	1.29
Romania	43.0	30.3	1.42
Slovakia	16.4	9.0	1.82
Slovenia	7.3	5.1	1.43
Spain	119.8	80.1	1.50
Sweden	43.4	30.3	1.43
United Kingdom	177.6	129.2	1.37
Sum of indicative targets EU-28	*1526.9*	*1077.5*	*1.42*
EU-28 target 2020	*1483.0*	*1086.0*	*1.37*

Based on the 2014 NEEAPs, the EU has provided a document where the estimated primary and final energy consumption as well as the 2020 targets have been presented for all EU-28 Member States (Table 1). On 30 November 2016 the Commission proposed an update to the Energy Efficiency Directive, including a new 30 % energy efficiency target for 2030, and measures to update the Directive to make sure the new target is met (EC 2016). This is a current and important issue in national energy policies of the EU Member States.

Figures 1-4 show the primary and final energy consumption trends and the existing 2020 targets for Italy, Spain, Finland and Germany, respectively. These are the EU Member States where the four beneficiaries of the EUFORIE project come from, and where the national participatory workshops mentioned in the title of this deliverable have been carried out.

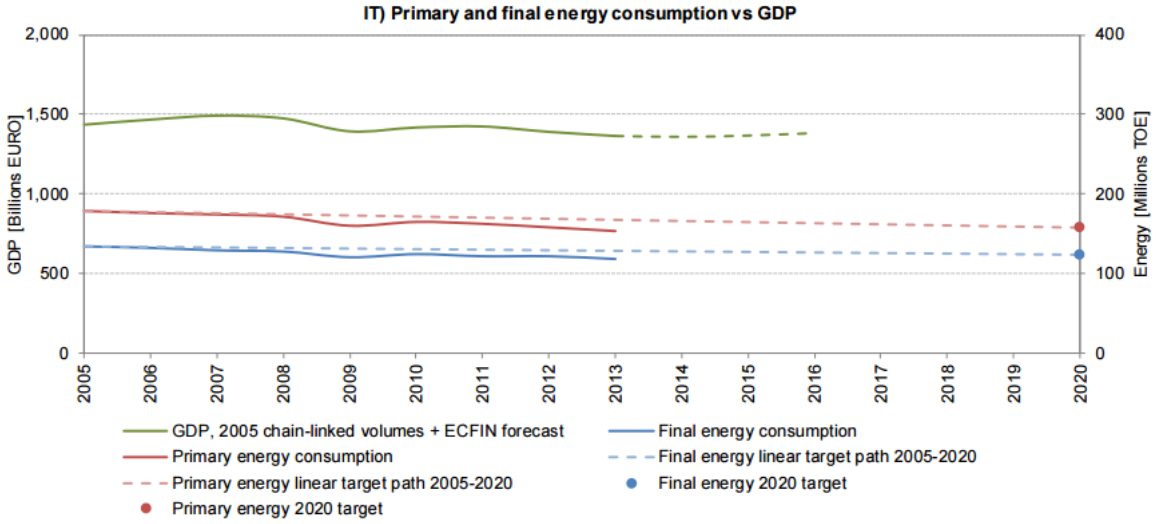


Figure 1. Primary and final energy consumption targets in Italy (EC 2015).

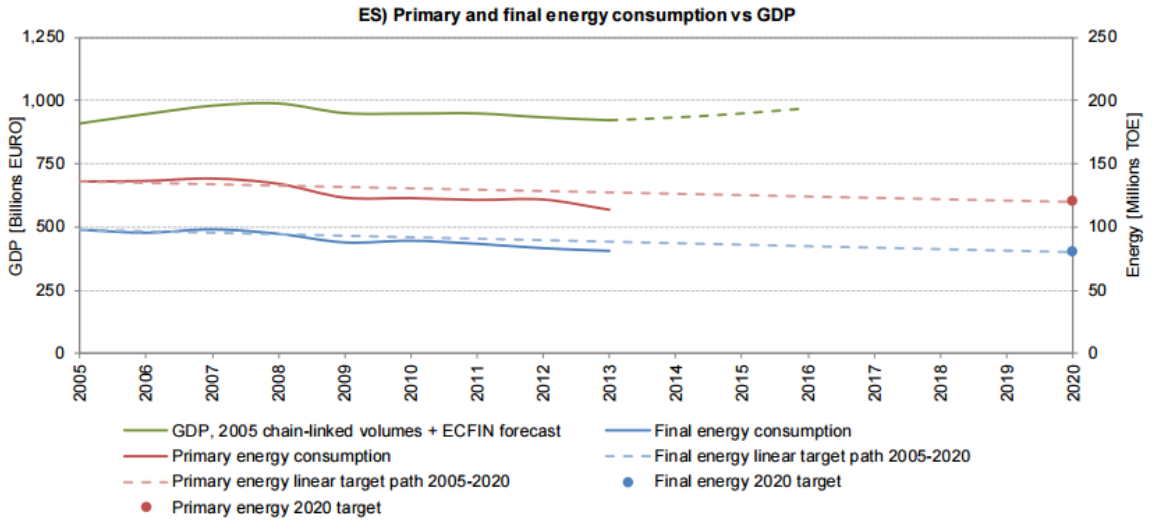


Figure 2. Primary and final energy consumption targets in Spain (EC 2015).

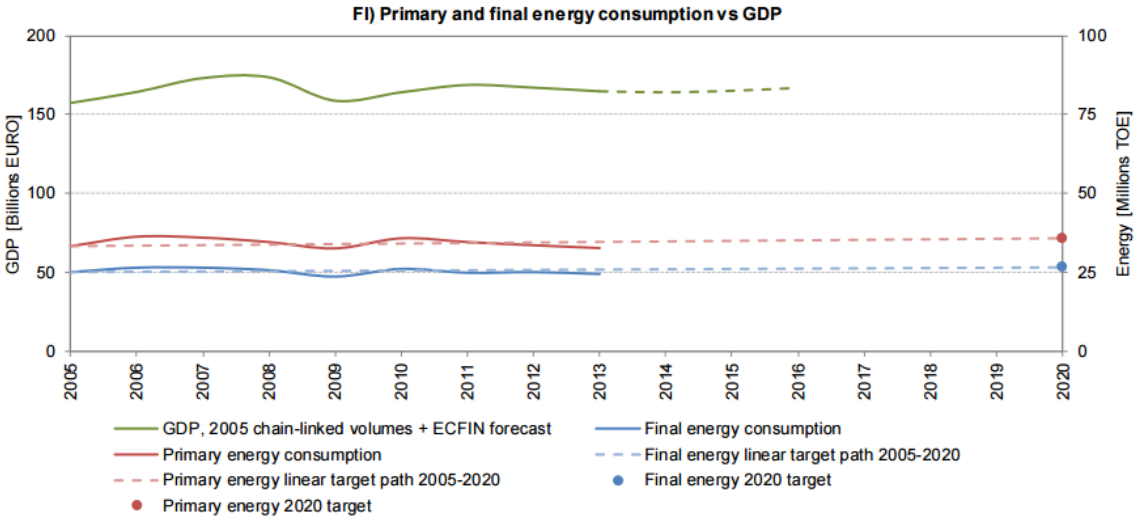


Figure 3. Primary and final energy consumption targets in Finland (EC 2015).

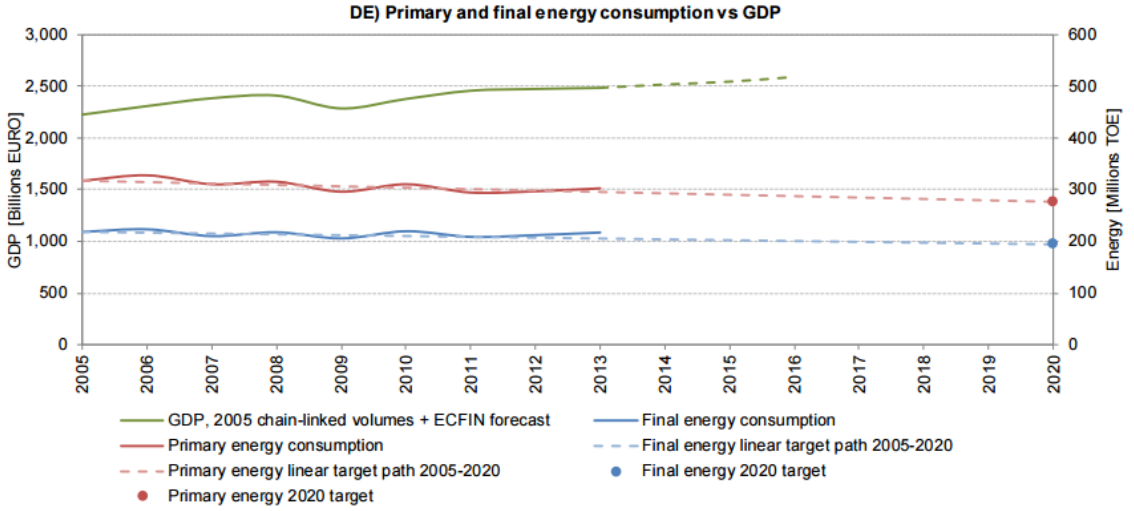


Figure 4. Primary and final energy consumption targets in Germany (EC 2015).

When looking at Figures 1-4, the targets for primary energy consumption and final energy consumption in 2020 do not seem to be unrealistic. In fact, continuation of the historical trend seems to lead to even lower consumption than the 2020 target. The German target is clearly the tightest one among the four Member States discussed here. In the recent years, the German “Energiewende” has strongly focused on replacing nuclear power by electricity generated from intermittent renewable sources such as wind and solar, and at the same time, the use of fossil fuels has increased. The existing 2020 targets on primaty energy consumption and final energy consumption of all EU-28 Member States are presented in Table 1 above. The targets set individually by the Member States are tied to the target of the whole EU.

Designing the participatory workshops

The EUFORIE Work Plan includes four participatory national workshops for stakeholders of energy efficiency policy and implementation, to be organised in the EU Member States the EUFORIE consortium beneficiaries come from, i.e. Finland, Germany, Spain and Italy. The Work Plan did not specify the design of the workshops, so the workshop contents were designed during the implementation of the WP7 tasks 7.1-7.4. An important milestone in this regard was the EUFORIE Consortium meeting in Naples, Italy in April 2016. There guidelines for the workshop design were made at the first time:

1. The four workshops should form a coherent continuum, where each workshop will have a specific theme, and the output of the first workshop serves as an input to the next workshop etc.
2. The specific themes are biophysical and financial issues for Italy, planning for Spain, technology for Finland, and governance for Germany.
3. Partners will organize a venue for the workshop, and invite the participants from "Quartet Helix" stakeholder groups which should represent the Academia (universities/independent research institutes), the Industries (companies/employer organizations), Public sector and the Government (ministries/their departments and other organizations under auspice of the Ministries), and the Civil Society (citizens/consumers/NGOs).
4. The workshop will have two parts: In the first part, input for the workshop participants will be provided based on the EUFORIE results and in the second part, the participants will discuss the specific workshop topic.
5. The beneficiaries will chair the discussion where a preferred national language of their own Member State will be used, and provide minutes written in English to the Coordinator in order to report the outcomes of their workshop for this summary report.
6. The Coordinator, responsible of WP7, will send a preliminary general format of the workshop to the partners.

Preliminary timetable and locations for the workshops were also agreed in the EUFORIE meeting in Naples as follows:

1. November 2016, Rome, Italy.
2. March 2017, Barcelona, Spain.
3. April 2017, Helsinki, Finland.
4. May 2017, Berlin, Germany.

Annex 1 includes the format of the workshop sent to the partners in October 2016. The workshop format included one-day workshop. Integrating the suggested workshop format, the Naples guidelines, interests of the EUFORIE beneficiaries (to bring their own work as input in the workshops), as well as the practicalities such as available time (in the particular context where the workshops were implemented) was challenging. As a result, the beneficiaries organized the Italian, Catalan and German workshops more from their own starting points, which connected the work carried out in WP3, WP4, and WP5, where they had the responsibility, to WP7. This approach integrated these work packages and the work of partner organizations better to WP7 than the original workshop format (which was based more on WP2 results). This choice was successful from the perspective of the EUFORIE project. From the original workshop format (see Annex 1), evaluation of policy options and technological

choices was made in the Italian and Catalan workshops through a questionnaire to the participants. In Finland, these issues were included in stakeholder interviews. The results of these questionnaires and interviews are presented in this summary report.

In Finland, where the stakeholder groups of energy issues are small, the key persons busy and thus not very willing to invest a whole working day for a project workshop with a relatively short notice and without compensation, the workshop scheduled on 28th of April 2017 did not gain a sufficient amount of participants. Thus, a set of interviews of selected representatives from different Quartet Helix stakeholder groups was carried out instead. The Finnish topic agreed in Napoli, technology, was very suitable for interviews.

In the other Member States workshops were organized as planned, based on the Napoli meeting guidelines and the Quartet helix stakeholder groups participated in all four Member States (see Table 1). Many of the workshop participants and the interviewed persons represented in practice more than just one stakeholder group. Especially the relatively large share of NGO participants in the German workshop had different backgrounds. The Coordinator of the EUFORIE project participated in all three national workshops with an introductory general speech dealing with introduction and the objectives of the workshop, and preliminary findings from the EUFORIE project.

Table 2. The share of Quartet Helix stakeholder representatives in the national EUFORIE workshops and interviews.

Quartet Helix stakeholder group	Italian workshop	Spanish/Catalan workshop	Finnish interviews	German workshop
Government/public sector	12 %	9 %	23 %	15 %
Industry/companies	25 %	47 %	31 %	15 %
Academia	47 %	35 %	31 %	27 %
Citizens/NGOs	16 %	9 %	15 %	43 %

Main results

Energy efficiency as a policy target

The EUFORIE consortium shares a critical perspective to energy efficiency as a policy target. Improving energy efficiency is good, but focusing on a single non-absolute but only relative indicator on a macro level of a society may not necessarily lead to real efficiency improvements. Energy efficiency should be considered more at the levels where the stakeholders operate.

On the other hand, energy efficiency can be considered also as a means to reach other targets such as energy saving, which means decreasing (fossil/non-renewable) energy consumption, or mitigation of global climate change by decreasing greenhouse gas emissions (mainly carbon dioxide, CO_2) of converting primary energy sources into energy carriers (electricity, heat, and fuels). Because the concept of energy efficiency is very context-dependent, a general energy efficiency target is always a risky one. These critical views were included in the input of the Catalan workshop, and the participants shared them as well. They were dealt with in other workshops and interviews, too.

The meaning of energy efficiency in European energy policy and in the energy efficiency directive is not clear for the stakeholders who look at it from their own perspectives, as shown by the Italian questionnaire and the Finnish interviews. This is because the national targets have to be presented in terms of primary energy consumption and final energy consumption. These are, however, different things. Moreover, the national target can be set also in other terms such as primary energy savings, final energy savings or energy intensity, but also in these cases, the targets have to be transferred into primary energy consumption and final energy consumption, with all calculations they are based on (EC 2012).

In the political discussion, energy efficiency is even more unclear, because it means different things to different stakeholders in different contexts – energy use per unit of production is a practical meaning of energy efficiency in the industrial context, and decreasing fossil or non-renewable energy is a usual context of energy efficiency in environmental NGOs. In households, a typical example of context is appliances such as refrigerators and washing machines, their electricity consumption and related energy labels. For academia, energy efficiency is a challenge because natural sciences, technical sciences and social sciences all offer useful perspectives to it. In general, more from less –type of thinking is the starting point of energy efficiency. Various examples of problems related to energy efficiency were shown in the workshops and interviews, and a clear conclusion is that there is no shared definition or view of energy efficiency. Thus, energy efficiency can be considered as a strongly context-dependent concept, and its significance lies in its attractiveness as a political catchword. This is not necessarily a good thing: in the U.S., discussion on energy efficiency has been polarized into skeptics and advocates (Brown & Wang 2017), and the same can be expected to happen in Europe, too.

In practically all EU Member States, energy efficiency is mentioned as a key policy objective in addressing large societal issues such as climate change issues, energy, and sustainability. However, in the opinion of many stakeholders, energy efficiency related EU legislation is somewhat abstract and easily misinterpreted. In addition, certain EU directives contain significant overlap and incoherence, namely in the objectives set for energy efficiency, renewable energy, reduction of greenhouse gas emissions, and creating an energy efficiency (service) market. In the German workshop, German

national energy policy was criticized for focusing too much on “Energiewende”, and neglecting and even harming many other important issues, such as energy efficiency. In the Finnish interviews, many stakeholders pointed out that energy efficiency is not a key priority in the Finnish energy policy.

To solve these problems, a clear and flexible framework is needed for promoting energy efficiency in the Member States, without systematically regulating every detail. A legislative framework with more freedom to Member States in the ways to achieve the common objectives is a better solution, preferring indicative targets to legally binding ones, possibly combined with economic incentives as a tool to promote investments in energy efficiency. A more flexible framework would be beneficial for the energy efficiency market (cf. Bukarica & Tomsic, 2017) too, and thus support other important EU policy targets such as employment and job creation. Moreover, information about the particular effects of energy efficiency policies are missing in all EU Member States. Lack of monitoring is a problem recognized in the literature a long time ago, see e.g. Harmelink et al (2008). Monitoring was requested also in the Italian workshop.

The interviewed industry stakeholders in Finland were critical about the establishment of objectives that could limit energy consumption as a means to increase energy efficiency. As some of the industrial branches are energy-intensive by nature, it is not easy to reduce the amount of energy used in certain industrial processes. Examples can be found in chemical industry, for example. Thus, limiting energy consumption in these industries could severely harm economic competitiveness.

Challenges of energy efficiency

Energy efficiency as a means to reach targets of energy saving (primary energy and final energy consumption) and reducing CO_2 emissions and other harmful emissions of energy use are the most common energy and environmental policy targets where energy efficiency can contribute. In the EU directive on energy efficiency (EC 2012), energy efficiency appears as a means to reduce energy consumption, but in public discussion, energy efficiency is often treated like a political target *per se*. This may reflect a hidden overlapping between climate, energy, and economic policies, as some stakeholders pointed out in the workshops and interviews.

Economic profitability of energy efficiency improvements is a major challenge of energy efficiency. The length of the payback period should be short enough that investments will be made, but low price of energy makes the payback period often too long for companies. The development of energy efficiency market based on both demand-side management (DSM) and supply-side options, is strongly dependent on the valuation of the payback time. Energy price is the most important driver here. On the other and, in the case of investments for energy production acceptable payback periods are much longer. In the economic context, other challenges that may arise are mostly related to the lack of resources to invest, combined with a lack of updated knowledge about investment opportunities. Information about available incentives to improve energy efficiency does not always reach the potential stakeholders. This is especially relevant in SMEs, where the limited workforce often lacks time and resources to update their knowledge on such opportunities and may therefore not always be aware of their eligibility for investment support, for instance.

In the current situation, updating the national energy efficiency targets for the year 2030 is a major challenge for many EU Member States.

Technology is no longer a challenge in energy improving efficiency. Much more important are the institutional, organizational, economic and political issues, in addition to behavioural aspects of different energy consumers. Moreover, change in the structure of energy production is a challenge. Due to growing decentralization and increasing electricity production from intermittent energy sources, energy supply and demand systems have to constantly readapt to changes, which creates organizational and management-related challenges. Also the traditional roles of energy producers and consumers are disappearing, especially in the electricity market, while more players adapt to dual roles and are either net producers or net consumers depending on e.g. weather, season, time, market conditions, etc.

In addition, energy efficiency-related legislation is already too complex and detailed, both at the EU and Member State levels. This complexity is increasing due to e.g. the reasons mentioned above, and can potentially be an obstacle to the improvement of energy efficiency in practice – policies are enforced despite the existence of better options for improvement in specific situations.

A significant challenge is the influence of consumer behaviour on energy efficiency. When not strictly an obstacle, it is nonetheless seen as an important factor that can greatly effect energy efficiency on a large scale. Personal comfort and the willingness to pursue a different lifestyle with reduced comfort is a major challenge to fulfil objectives that really lead to reduced energy consumption.

Indicators of energy efficiency

Aggregated energy concepts based on summing up different energy forms, such as total primary energy supply, gross inland energy consumption, and final energy consumption, have been criticized in EUFORIE WP4 for “mixing apples and oranges”, because physically summing up different forms of energy is problematic. Especially the calculation of primary energy in relation to nuclear, hydro, solar and wind energy has problems in energy statistics. The treatment of electricity produced by these primary energy sources is different: nuclear electricity is multiplied by a coefficient 3, while hydro, wind, and solar electricity are multiplied by a coefficient 1, when primary energy is calculated. In British Petroleum (BP) energy statistics, which are also widely used, primary energy is calculated by assuming a thermal efficiency of 38 % for electricity produced by nuclear, hydro, wind and solar power.

Moreover, mixing aggregated energy concepts and economic data into a single indicator (such as energy intensity, or its inverse, energy productivity) have been criticized in the EUFORIE project. From a scientific point of view, the whole life cycle of the biophysical aspects including imports and exports related to energy production and consumption should be taken into account. Moreover, mixing biophysical and economic variables into a single indicator is problematic, because energy intensity, for example, can change for many reasons and without any change in energy efficiency defined in biophysical terms. Thus, the use of these indicators in formulating policy objectives has been considered as problematic and risky. This was argued in the Catalan workshop, and the Italian workshop brought out that focusing too much on macro-level indicators, energy efficiency can lead to problems when policy implementation is planned. Some stakeholders also in the Finnish interviews pointed out the problems related to EU-wide energy efficiency targets, by highlighting national differences which should also be properly reflected in the target-setting.

Different stakeholders benefit from different policies, so the social parameters need to be assessed in formulating the policy objectives. The Catalan workshop concluded that there is no need for additional

indicators for energy efficiency. The need for indicators of energy efficiency was not directly dealt with in other workshops.

Cost effectiveness of energy production

In the Italian workshop, energy efficiency was approached from the perspective of cost effectiveness of energy production, including both technological choices and policy instruments such as subsidies. The participants shared international experiences, so the focus was broader than just Italy. They discussed especially biomass-based energy production, and the conclusion was that reaching a cost effective solution requires a careful analysis of available alternatives. For this kind of analysis, there are various methods available. The input of the Italian workshop from the EUFORIE project was strongly based on life-cycle assessment, and this method was reflected in the workshop outcome too.

The intermittent nature of wind and solar energy came up in the Catalan and Italian workshops. The latter concluded that dependence of renewable energies on fossil fuels is a major reason to the fact that despite of investments in renewable energy, and the increase of their share in the energy mix, no significant reduction in harmful substances into the atmosphere, such as carbon dioxide emissions, has not taken place. This discussion had a reference to Germany, where investments in renewable energy have been substantial. In the German workshop, it came out that the “Energiewende” has focused on electricity and replacing nuclear power by renewables, without affecting the coal industry. At the same time, no specific effort has been put on energy savings in the housing sector.

Energy production is one aspect in circular economy, which was discussed in the Italian workshop. Re-use and recycling of materials in an efficient way requires interpretation of the society’s complex metabolism, and careful strategic planning. Focusing on energy efficiency only is not enough; material and resource efficiency in general should also be taken into account. Moreover, different stakeholders benefit from different choices, so social parameters are important too in the decision-making process. Integrative approaches are needed at many levels. One of the examples presented in the Italian workshop was acting in the educational system at the same time when energy efficiency of school buildings is improved.

Energy efficiency potential

It seems that there is a technological abundance of available solutions for improving energy efficiency in all economic sectors. Typically, new technology is more efficient than old technology, improving efficiency (doing more from less) is the most important, even dominant driver of technology development. However, the availability of financial resources strongly correlates with energy efficiency-related improvement initiatives. The most potential sectors for improvement includes transport, industry, buildings, the service sector and SMEs. For additional and more in-depth information, see a recent review article of studies on energy efficiency potential in the EU Member States (Knoop & Lechtenböhmer 2017).

In addition to technological advances in decreasing energy consumption, digitalization is a key driver of energy efficiency. Moreover, consumer behaviour can help significantly shaping the trends in energy consumption and energy efficiency at the Member State level. If individual behaviour can be directed in a way that energy consumption decreases, visible improvements can be achieved.

Another key area with large potential is the development of flexible supply and demand of electricity and heat. As energy production tends to move towards a more decentralized production and increasing amount of intermittent production capacity, it is important to have a system in place that can utilize the excess energy produced at peak times as efficiently as possible, thus matching supply and demand and minimizing unnecessary production. An important area is also demand side management, e.g. electricity peak cutting during high demand periods, which is one of the current topics in the Finnish discussion. In many EU Member States, there are institutional and legal barriers to improve DSM activities, which might be very effective in improving energy efficiency.

New buildings are often already fairly energy-efficient, which makes further improvements difficult to realize cost-efficiently. Public buildings such as schools, hospitals and office buildings, have large potential for improvement in terms of reduction of energy consumption and improvement of energy efficiency. Energy efficiency in buildings is now looked at from a more systemic point of view: smart control mechanisms can be used for real-time monitoring and regulation of indoor temperature, ventilation and lighting. Often installation of such control systems does not require a large investment, and its benefits clearly outweigh the costs.

In industry, companies actively invest in improvements that enhance the energy efficiency of plants and processes because such investments are cost-effective. Large improvements only occur through large innovations, whereas energy efficiency can be improved continually but in smaller steps through constant ameliorations. Some potential ways to improve energy efficiency in the industrial sector are waste and excess heat recovery (cf. Viberg 2015), automation and control of the origin of the energy supply. Finally, there is a large potential for the indirect improvement of energy efficiency through product development. For instance, the chemical industry can indirectly improve the energy efficiency of a product by developing better, energy-efficient materials that minimize energy use throughout its lifetime. The large future potential of energy efficiency has been recently acknowledged also in the literature, see e.g. Fais et al (2016).

Energy efficient technologies

A plethora of technologies were mentioned in the workshops and especially in the Finnish interviews focusing on energy efficient technologies. Many stakeholders found it difficult to identify “superior” technologies that would be the most important one in order to improve energy efficiency. They rather emphasized the need for hybrid systems where a combination of complementary technologies is used to achieve the best results.

The most often mentioned technologies for improving energy efficiency were smart, automated heating/cooling, ventilation, lighting management systems for buildings, heat pumps, waste heat recovery technologies, and insulation. Additional Insulation needs to be combined with improved heating/cooling and ventilation management in order to avoid moisture, mold and indoor air problems.

Another area that the stakeholders sought important to develop is energy storage technologies. Improving energy storage capacity can greatly minimize energy losses during production and ensure a steady, uninterrupted source of power for industry, a critical requirement for many industrial processes.

In addition to the above-mentioned technologies, the stakeholders also cited other ones such as renewable energy technologies, LED lighting, new know-how for carbon sequestration, frequency changers for electric motors (for both transport and industrial sectors), electric vehicles, hydrogen technologies, and passive energy management systems.

Policies and measures to improve energy efficiency

Results from the Finnish interviews, the Italian and Spanish/Catalan questionnaires, and the Italian, Spanish/Catalan and German workshops clearly show that there is no superior policy instrument to promote energy efficiency. National differences in the popularity seem to be significant (Table 3).

Table 3. Top-5* policy instruments promoting energy efficiency based on the opinions of stakeholder participants in Finland, Italy, Spain/Catalonia, and Germany.

Top-5 ranking	Finland	Italy	Spain/Catalonia	Germany
1	Voluntary agreements	Information offices for energy efficiency solutions	Energy taxes	Standards
2	Research and education	Subsidies for energy production	Energy audits	Subsidies for investments
3	Standards	Government's help to reduce energy consumption	Smart meters and billing information	Information provision
4	Energy audits	Energy audits	Tax deductions	Regulation
5	Information and campaigns	Energy labels and certificates	Subsidies	

*The policy instruments presented to the stakeholders were not necessarily similar in all countries. The table is generated from the results of the workshops, questionnaires, and interviews presented in this summary report.

In Finland, the most popular policy instruments were voluntary energy efficiency agreements based on the results of stakeholder interviews. Voluntary agreements between the State administration and energy-consuming industrial and other branches are very largely used in in Finland. Their popularity and good coverage of companies in many braches is based on positive attitude, non-binding nature and lack of legal obligations on either side, which makes the structure of the agreement light. The companies have the freedom to progress towards energy efficiency goals on their own terms and pace. In addition, some subsidies to investments are available. A specific detail in the Finnish interviews was that in addition to the respondents had an opportunity to consider policy instrument not only as significant but also as harmful. Codes, energy taxation and tradable permits were seen as harmful by some of the respondents.

In Italy, the most popular policy instrument, based on the answers by stakeholders to a questionnaire, appears to be information provision, more specifically 'information offices for energy efficiency solutions'. In Catalonia, energy taxes, was the most popular instrument on the basis of a questionnaire answered by the workshop participants. In the case of Germany, policy instruments in Table 3 are the

only ones mentioned in the German workshop. In EUFORIE WP5, standards have been seen as the most effective policy instrument to reduce energy consumption in households.

Table 3 reflects at least three things in relation to policy instruments for promotion of energy efficiency in the EU: (1) differences between the Member States, (2) the complexity and problems of energy efficiency as a concept at the macro level, and (3) the methodological differences in the EUFORIE WP7 work carried out by the beneficiaries. Thus, it is not surprising that no policy instrument belongs to all Top-5's of the four EU Member States. The most shared views seem to be on energy audits, subsidies and information provision, each of them is included in all national "rankings" in Table 3.

Finally, the workshops, interviews and questionnaires showed that no single policy instrument was perceived as effective on its own. A good solution seems to be a combination of complementary instruments that promote both economic flexibility and cost-effective solutions.

The Italian workshop: "Methods of measurement and rating of energy efficiency", afternoon session in the "International Workshop on costs and benefits of energy efficiency. The scenarios in Italy and Europe"

Organizational aspects

The “International Workshop on costs and benefits of energy efficiency - Scenarios in Italy and Europe” was held in Rome on November 18 at the headquarters of the GSE (Energy Services) and was organized jointly by the University of Naples Parthenope and Federesco to deepen the theme of energy efficiency and to implement the collaboration between institutions, the research community and civil society, aimed at greater participation and collaboration on issues of pressing environmental and social relevance. An agenda of the workshop is enclosed in Annex 2 of this report.

This initiative took place as part of SMACC European projects (Smart City Coaching) and EUFORIE (European Futures of Energy Efficiency) and involved qualified operators in the energy sector, which actively participated in the roundtable discussion and who filled out, in paper form during the conference and later in electronic form, a questionnaire related to energy efficiency (see a specific chapter in this report).

Among others, participants belonging to Parthenope University of Naples, University of Turku/Finland Futures Research Centre, the Autonomous University of Barcelona, the University of Rome Sapienza, the University Ca' Foscari of Venice, Emergency, Aura Energy Srl, VPE Srl, Easy Energy Srl, PERSUD, A&C Ecotech Srl, Telservice Srl, the Energy Commission of the Order of Engineers of Naples, the Italian Association of Consumers Energy Process (AICEP), and the City of Neptune joined the session.

The meeting, organized in Rome on 18th of November 2016 by Parthenope University of Naples in collaboration with the National FEDERESCO (Federation of Energy Service Companies), hosted by GSE Headquarters (Gestore Servizi Energetici) – the Italian Public Board with functions of energy market management, http://www.gse.it/en/Pages/default.aspx), was structured in two parts.

Participants

The morning session gathered all the actors involved in the energy efficiency sector, from industry to academia to NGOs, including high levels of institutions - among others, S. Serra (representing the Ministry of the Environment), M. Mallone (representing the Ministry of Economy), T. Castrichino (representing the Ministry of Foreign Affairs); the afternoon session was instead more focused on specific EUFORIE issues, involving a smaller number of stakeholders and their experiences in an interactive roundtable. In both sessions, there was a large attendance of participants. Participants to the morning session were 134, divided in: 18 from the public sector (14 %); 86 belonging to the private sector (ESCo, bank, consultancy) (64 %); 15 from the academy (11 %); 15 from associations (NGOs, other) (11 %).

Participants to the afternoon session were 32, divided in: 4 local administrators (12 %); 8 from the private sector (ESCo) (25 %); 15 from the academy (47 %); 5 from associations (16 %). A complete list of participants of the afternoon session is enclosed in Annex 3 of this report.

Summary of the afternoon session

The round table was opened by the experiences of stakeholders on the issue of energy efficiency, having shared their operational viewpoints. There was some discussion about the initiatives carried out by the ESCos, associations, universities and Commissions and Orders in the sector. Everyone showed the topics, issues, strategies and solutions adopted in the energy sector, mainly aimed at implementing environmental and social benefits.

Biomass energy production process was analyzed, using different methods, in order to estimate energy consumption and the environmental impact to provide an alternative to energy production from fossil fuels. The analyses, however, revealed that this alternative has proved to be inefficient, because the energy produced does not seem to be high enough to pay back the energy investment that must be addressed in the production process. One of the conclusions was, then, that it is not possible to identify in advance the most efficient solution, but there is the need to analyze the possible alternatives, before arriving at the final choice. The methods used depend on the policies and goals to be pursued, that should reflect not only economic benefits, but also respond to environmental, physical, social aspects.

For example, the discussion showed that the stakeholders that benefit from the different choices are several and belong to different social groups. Therefore, the choices made must also be made under different social parameters.

In addition, since the extraction of any kind of material implies an impact and the choices presuppose different costs, benefits and perspectives, the methods used for these analyses are manifold.

One such methodology is the Life Cycle Analysis that aims to assess various resulting environmental impacts (such as climate change, eutrophication, land use, human toxicity, acidification, etc.) to produce goods from raw material extraction to disposal and possible recycling of the product considering the entire production chain including associated services, such as the necessary transportation, electricity use and production phases.

Circular economy and planning strategies were then discussed, to implement an efficient process of reuse and recycling through the experience of participants and initiatives carried out in Italy, in Europe and worldwide. It emerged that interpreting society's metabolism is an essential aspect, but articulated and complex, so it first requires a rigorous analysis of the problem, a careful planning and a strategy to implement, taking into account all the different aspects. An example is financial subsidies, in order to guide the choices of the stakeholders in the sector. This instrument is, however, considered necessary, but not sufficient to strengthen a winning strategic line.

Later, validation of energy projects was examined. As these interventions often provide a possibility of failure, either because of the procedures to be adopted and of the technical aspects to be respected, there is the possibility of entrusting these initiatives to accredited bodies and experts in the field, in order to assess their compliance with local regulations. Energy efficiency measures include different work activities, supplies and services; this means that the project also covers the technical

and financial aspects, as well as the maintenance and management of the property. The assessment is a verification of an integrated process for corrective actions in order to increase the probability of success, which is not only a direct result of correct technical parameters, but also the result of an efficient contract.

It also emerged that there is a need to address the energy efficiency complex system in an integrated manner, for example by acting on the educational system and increasing the energy efficiency of school buildings. Therefore, it is important to focus on technologies that can solve the complex problem. A practical example reviewed concerned the tax deductions that has been active for several years, but lacks a database to draw information from. Lacking such an integrated database, there is a consequent lack of information and awareness on the benefits of this financial instrument. One aspect to focus on should be the training and dissemination through conferences, thematic meetings, and study days.

Furtherly, the discussion continued by addressing the energy efficiency theme, comparing the systems implementations in Italy, with other examples of European countries like Germany and outside Europe, such as China and the United States. It has been explained that in Germany, for example, despite increases in the installed capacity of renewable energy plants, there was no radical reduction in pollutant emissions into the atmosphere, according to the studies. This would happen because the modeling of electrical networks that are still dependent on fossil fuels and thus the renewable energy plants are not autonomous but are still dependent on the production of coal, gas, etc. From the discussion, it seems that a possible solution should be linked to the consuming model, or to new energy storage technology, and not only rely on the system of subsidies, useful in the short term but not in the long run.

Further shared initiative during the day was conducted by an association from Campania, which reduced energy consumption through the renovation of a house in a nineteenth century's building, with the intent to implement the energy efficiency by 25 %. In preliminary design, they took account of the orientation and exposure of the property. Northern and western walls were insulated from the inside; the ceiling, the air chamber and the wood frames were modified, and this produced a better noise insulation. They used a system of ventilation with heat recovery, thermostatic valves, hot-water mixers, a separate electrical grid (with its own outlets) for the photovoltaic system. This has, of course, increased the energy class of the building.

Finally, we got into the initiative conducted by an association which participated in the design of a hospital in Sudan, a center of excellence for cardiac surgery, built from scratch. The building was designed choosing advanced solutions for energy efficiency, but at the same time saving energy resources and allowing to contain the economic spending. For example, considering the climatic context in which the building is, a major objective was to cool the air, and in this regard different technical solutions were chosen, capable of implementing energy efficiency and to limit the financial resources. The popularization of the initiative has been very detailed, in order to raise awareness and increase the number of supporters of the foundation, since it is a positive example of energy efficiency improvement action, with social implications.

Conclusions

As for the morning session, the most important result is that actors "in conflict" sat at the same table and made a move to understand each other's difficulties. A first example is that of the bureaucracy.

In Italy, there is a certain slowness in governance, due to complex bureaucratic mechanisms and sometimes intricate – as well shown also by the report of Dr. Jarmo Vehmas, Coordinator of the EUFORIE project. At the conference the institutions were able to explain the delays, companies and associations made their grievances, and this shared moment allowed everyone to understand where they can act faster, where instead bottlenecks due to external agents show up, where the private sector can suggest faster solutions so that institutions might release better directives. This kind of face-to-face, cross-sectoral debate can be a "new" (at least for Italy) and much more effective way to solve critical issues along with all the actors involved.

As for the afternoon, the round table saw the participation of associations, professionals, academy, and some local administrators. Despite a long meeting in the morning, attendance was more than good. The young actors (professionals, researchers) are interested in teaming up with other stakeholders, bigger or endowed with other expertise, to understand and better address all aspects of a sector in continuous renewal. This “market fragmentation” is also an asset, because it allows many local communities to take action on the territory in a more effective and immediate way. The energy efficiency sector seems to be still largely occupied by SMEs, which have always been a resource for Italy, and also represent a "biodiversity" to be preserved. Another important fact is that all participants wanted to describe their work, their mission, their positive experiences and difficulties. This proves that this kind of smaller interactive workshops are likely to create a "healthy competition" between entrepreneurs, motivates them to do more, to establish contacts and to keep them alive. And it also allowed a better information and larger confidence on the importance of the EUFORIE project, and its political, economic, social implications – as well as theoretical.

The Spanish/Catalan workshop: Lessons learned from a critical analysis of European energy directives: Policy implications for Pla de l'Energia i Canvi Climàtic de Catalunya 2012-2020

Organizational aspects

Focus and setting

The Barcelona Stakeholders Workshop focused on the Energy Policy of the Autonomous Community Catalonia. Catalonia's current Energy Plan, el "Pla de l'Energia i Canvi Climàtic de Catalunya 2012-2020" (PECAC), was officially approved by the Government of Catalonia on 09/10/2012. The objectives of the European Energy Strategy 2020 constitute a benchmark for the performance of the Government of Catalonia in terms of energy policy and climate change. On 31 January 2017, shortly before our Stakeholders Workshop, the Executive Council of the Government of Catalonia approved the legal basis of the National Agreement on Energy Transition in Catalonia (Pacte Nacional per a la Transició Energètica) with the objective of achieving 100 % renewable energy by 2050. It was further announced that, in order to implement this Energy Transition, a new energy plan with horizon 2030 will be developed, as well as a Catalonia Energy Prospective 2050 (Prospectiva Energètica de Catalunya 2050 − PROENCAT 2050). These recent activities made that a lot of talk and debates were taking place at the time of the Stakeholders Workshop.

Practical organization

For the organization of the workshop, we leaned on the Associació i Col·legi d'Enginyers Industrials de Catalunya (CEIC), both for the use of their facilities, strategically located in the centre of Barcelona, and to take advantage of their extensive network of players in the energy scene. In addition, in order to engage stakeholders, the UAB team participated in a series of local events in the two months preceding the Workshop, such as 4rt Congrés d'Energia de Catalunya, Barcelona, 14-15 February 2017, and the debate on The Energy Transition in the European Context (La transició energètica en el context europeu − Cicle de debats de transició energètica) organized by the Institut Català d'Energia (ICAEN) of the Catalan Government on 13 March 2017.

Special effort was made to include all stakeholders groups of Quartet Helix: Academia, industries, government, and civil society and citizens/consumers. However, in practice, we found that there is not always a clear distinction among these groups, and notably the members of the CEIC more often than not belong to more than one of these groups at the same time. None of the participants received compensation or incentives for their participation. An agenda of the workshop is enclosed in Annex 4 and a list of participants in Annex 5 of this report.

Apart from the presentation by EUFORIE coordinator Jarmo Vehmas, the workshop was held in the local language (Catalan). The entire workshop was recorded and could be followed in streaming. Twitter live comments were displayed in real-time during the event. The recording can be downloaded from YouTube and the EUFORIE website at http://www.euforie.eu.

Summary of the workshop

Welcome and introduction

José Ma. García Casasnovas (President, Comissió d'Energia del Col·legi d'Enginyers Industrials de Catalunya)

Casanovas opens the workshop and draws attention to the changing EU energy scene: In the EU Winter Package the role of the consumer has changed from being a mere passive participant to active consumer and producer (prosumer). Casanovas underlines the many activities taking place in Catalonia and Spain in relation to these novelties and conveys the interest and commitment of the Associació i Col·legi d'Enginyers Industrials de Catalunya toward being a discussion forum for initiatives related to energy policies.

Jarmo Vehmas (Coordinator EUFORIE, University of Turku, Finland)

Vehmas provides a brief outline of the project EUFORIE, its objectives, scope, main activities, and the series of Participatory Workshops, of which the present one is part.

Public energy policies in the EU context: Results from EUFORIE

Mario Giampietro (ICTA, Universitat Autònoma de Barcelona, PI EUFORIE)

Giampietro opens the discussion with a critical examination of the usefulness of the concept of energy efficiency for setting policy targets and the problematic of scaling up intermittent energy sources. He postulates that at present, with the available statistical data, it is impossible to know which energy carriers are used in which processes in the different (sub)sectors of the economy in relation to the production of specific goods, and that this systemic lack of information hampers an informed discussion over de-carbonization. He presents a novel method of integrated accounting, applied to 27 EU countries (developed in the EUFORIE project), that shows the profile of end-uses of electricity, fuels and process heat, as well as labour and power capacity across sectors and subsectors of the economy. He argues that organization of data in such an 'end-uses matrix' would allow comparison of patterns of energy end-uses across (sub)sectors within a country or across countries and scaling of metabolic characteristics across hierarchical levels. It would also help identifying (and resolving) problems with existing statistics.

Panel reflections on the question: "Do we have a plan B if low-carbon technologies will be unable to replace fossil energy (liquid fuels and electricity) on a large scale in the next 10-20 years?"

Josep Ballart (Comissió d'Energia de l'Associació i Col·legi d'Enginyers Industrials de Catalunya; Director de Operaciones, Endesa Distribución Eléctrica SL [2001-2010])

Ballart agrees on the method of analysis proposed by Giampietro, and emphasizes that the analysis of the energy sector should be more complex considering not only energy, but also labor and power. He underlines that more complexity implies more fragility and lock-in (less adaptability). Therefore, another important element to be considered is resilience. In the ongoing discussion this point calls for policies boosting self-production and selfconsumption. Ballart observes that the electric grid is the largest technical infrastructure existing in the world; an infrastructure that requires very large

investments and therefore many years of pay-back. An electric grid therefore demands very careful choices in relation to long-term investments. Unfortunately careful decisions are very difficult to do in the existing political arena. Facing the complexity of the issue, governments have translated the burden of dealing with energy efficiency to electric operators that in turn have solved the problem by giving discounts to those adopting efficient light bulbs. Again, an electric grid is the largest infrastructure generated by humankind and one of the most complex, and it is not sure that we know well how to govern it. In fact, the more we add to the grid new features and gadgets, the more we make it fragile to perturbations. So we have to be careful on how to interpret the concept of 'smart grids'. But the issue of excessive complexity is not the only one. There is also an issue of scale making it difficult to integrate the production and consumption of small producers and consumers within patterns of production and consumption taking place at a much larger scale in the grid.

Joaquim Corominas (President Associació Congrés d'Energia de Catalunya)

Corominas states that we should not focus on developing a plan B, but on making the energy transition work, by identifying problems (which sectors) and responsible actors, and take full advantage of the wealth of resources and options in the world of renewable sources. What is needed is a change in power structure, making industry, consumers and politicians collaborate to achieve the energy transition, and rigor in the use of concepts in the analysis of the problem (primary energy and final energy use).

Alfons Pérez (Debt Observatory in Globalisation [ODG] & Catalan Network for Energy Sovereignty [XSE])

Pérez questions whether Plan A is credible in the first place, given that the EU is currently investing much more economic resources in building gas infrastructures (pipelines) than in alternative energy sources. An important pillar of the Energy Union Strategy is diversification of energy supplies (energy security). Therefore, the diversification of gas suppliers, to reduce dependence on Russian gas supply, is given great importance. He also emphasizes that currently gas leakages (loss) during processing (notably oceanic transport) cause an amount of GHG emission that exceeds the current Paris targets. Pérez notes that it is necessary to include social aspects in the analysis. Of the four pillars of the Energy Union (established in 2015) only energy security (through pipelines) and the creation of an internal market were implemented. New technologies and decarbonization were never seriously implemented. A diversification based on gas does change the type of primary energy source used but it does not change the fact that it is still fossil energy. Moreover the heavy use of gas increases the emissions not only because of the CO_2 generated when burning the gas but also because of the leakages in the extraction, processing and transportation. Methane emissions in the atmosphere due to the exploitation and use of natural gas are huge.

Francesc Bonvehí (Member of the Taula Inter-Professional de l'Energia)

Bonvehí stresses the importance of considering in an integrated way the different dimensions relevant for sustainability – technical, social, economic and environmental. He argues that it is difficult to say whether a Plan B is possible (let alone available). What he sees is that the transition will be done with the same market institutions we have now. This will represent a problem, because a transition would require a diversification of the markets over local institutions (especially for the production and consumption of local electricity). In general the actual regulations and laws are hampering the transition.

The view from the administration, industry and civil society

Virgina Guinda (Presidenta del Foro Energia del Foment del Treball)

Guinda emphasizes that the industry, where most of the energy consumption takes place (around two thirds of total energy consumption), is likely the most dedicated social actor when coming to investing in energy efficiency measures and reduction in energy consumption given that energy consumption is the most important item among the costs incurred. The Spanish industry is a big consumer of natural gas (2/3 of the total consumption of Spain) and electricity (1/3 of the total consumption of Spain). Another crucial role of the industry is that of generating jobs, something that is extremely important for the recovery of the economy. The new fashion of circular economy may provide some room for investments, but she expects a limited impact. In relation to energy efficiency, after the crisis the exports of Spanish industry increased, but this has been associated with a reduction of employment.

Guinda also presents some considerations from a survey conducted in 2015 regarding the attitude of the industry toward energy efficiency strategies in the industrial sector (the main results of which are reported in the presentation entitled: 'Una indústria més competitive en l'àmbit de l'energia: escenari, perspectives, propostes'): More than 70 % of the industries contacted in the survey say that increasing energy efficiency is relevant, and forecast that they will have to innovate in this field in the next years to come to remain economically competitive. In relation to the acceptability of the pay-back time of investments, 86 % of the industries say that they are willing to accept a pay-back time of the investment of 2-3 years, whereas this was just 1 year (basically maintenance) during the crisis.

Maria Campuzano (Aliança Contra la Pobresa Energètica)

Maria Campuzano's intervention on energy poverty undoubtedly sparks most discussion. Campuzano brings up that energy directives do not properly take into account energy poverty and that it should be avoided that the vulnerable part of the population becomes victim of energy policies. An estimated 11 % of Spanish people are unable to keep the temperature they would like in their homes. The exact number of people whose energy supply has been disconnected for lack of payments is unknown. The Catalan administration only considers two causes of energy poverty: poor energy efficiency and low income. However, Campuzano points out that the people at risk of energy poverty more often than not are not house owners but rent, and that they tend to live in old houses with lack of insulation and have no means to install improvements. Moreover, the electricity bill does not reflect consumption given that most of the bill consists of fixed costs (determined at will by the companies) and taxes. The oligopoly in the electricity distribution market gives too much power to the companies, and the Catalan administration has not been given due importance to the issue of increasing energy bills. European directives require that each state elaborates its own definition of energy poverty and appropriate policies to protect vulnerable consumers. Campuzano favors guaranteeing universal access to energy.

Joan Josep Escobar (Cap de divisió de gestió energètica ICAEN)

Escobar lists negative and positive aspects of the Winter Package released by the EU. Among the negative aspects: (i) very centralized, no room for regional and local diversity and competences; (ii) absence of sanctions for non-compliance (hypocrisy); (iii) the principle of subsidiarity is not sufficiently elaborated (only objectives); (iv) there is progress on the topic of auto-consumption but net-balance is not properly addressed – this limits the generation of energy; (v) subsidies are maintained for fossil fuels by capacity. Positive points about the EU initiative: (i) the formulation "clean energy for all

European citizens"; (ii) the fact that this is the first attempt to generate a common energy policy; (iii) a new citizen-centric model in which citizens are empowered through information and decentralization; the use of the term citizen rather than consumer, emphasizing that citizens are active agents, not only consuming but also producing energy (self-consumption). Escobar argues that we should not have a Plan B: the objective of a quick move to alternative energy is correct, and therefore it does not matter whether or not it can be achieved and how. What is important is to go for it. Among the most promising measures for short-term progress toward the targets of the Winter Package Escobar considers: (i) electric mobility, (ii) self-production and self-consumption, (iii) energy efficiency in constructions/buildings. These points resonate with the initiatives in Catalonia: (i) the "Pla d'energia i canvi climatic" (2012-2020) already centered in the concept of citizen; and (ii) the "Pacte Nacional per la transició energètica" is ambitiously aimed at 100 % renewables.

Round table: Do we need better indicators, more realistic targets or more effective governance structures?

There is a general consensus among the participants that there is no need for additional indicators, there are already too many. What is needed is transparency, information on how current indicators and models are obtained, and on the data used. Both at the European level and Catalan level (ICAEN). The only new indicator that was suggested by Joaquim Corominas (and unanimously accepted) is an indicator to measure the level of knowledge of energetics among policy makers. Despite the plethora of theoretical studies assessing the urgent need of an energy shift to renewables, there is also a general consensus that the energy transition is difficult and will require time and that also it will be unavoidable to have a period during this transition in which renewable and fossil energy sources will be used in an integrated way.

Closure of the workshop

José Mª García Casasnovas closes the workshop, thanking all participants for their contribution and acknowledging the constructive dialogue among the various stakeholder groups.

The German workshop: Beyond energy efficiency

Organizational Note

According to the general role of SERI in the project the workshop had a focus on – but was not limited to – consumption/consumer issues in energy efficiency. For intensive debate the group initially was envisioned to consist of 20 persons. Resulting from further interest finally 26 persons participated. Their background ranged from policy to NGOs, from business via practitioners to decision makers in relevant German faith groups. The workshop was organised with support from Bund für Umwelt und Naturschutz (Friends of the Earth Germany). An agenda of the workshop is enclosed in Annex 6 and a list of participants in Annex 7 of this report.

Summary of the workshop

The workshop combined compact information with deliberately extended time for discussion and further elaboration. In most slots next to a key input presentation a further resource person provided substantial knowledge and background information on the respective topic. The summary given here does not distinguish between the input and the discussion part of the slots but highlights main aspects of the debate where participants achieved consensus, or it documents the arguments where different perspectives were presented and further questions or challenges appeared.

Welcome and introduction

After welcoming the format of the workshop was introduced to the participants including the embeddedness in the EUFORIE project.

Discussing core findings of the EUFORIE research project

It was agreed that despite increases in the installed capacity of renewable energy production, there has been some, but not sufficient reduction of greenhouse gas emissions into the atmosphere in Germany. This calls for stronger engagement among all stakeholders. From the findings presented mainly two aspects raised substantial debate. On one hand shortcomings of the current efficiency policies (including regulation and economic incentives) were discussed. It was agreed that monitoring the use of policy instruments and their impacts is the only way to evaluate their effects. For this behalf, additional indicators are not necessarily a contribution (it was argued that there are already too many), even if different stakeholders preferred different policy instruments and promote corresponding monitoring systems. Enhanced transparency was considered more important including information on how current indicators are obtained, on the data used and on the models applied processing them. This should include a more elaborated database on the costs and benefits of the instruments used.

Energy Efficiency Policy in Germany

Regarding Germany, the audience agreed that specific attention should be given to the energy efficiency in buildings, as the progress had been slow, regulations were not enforced and the financial incentives have proven not to be sufficiently effective (with effects differentiated by house ownership

structures). A common perception was that new buildings already efficient (not least due to the EU Directives), but that due to the large standing stock the turnover of houses is low, and new buildings only incrementally affect the average efficiency. Consequently, while new model buildings provide welcome demonstration examples, the focus will have to be on the renovation ("energetical modernisation") of the standing stock. Technology wise, different materials for enhanced isolation of the building body are available (economic incentives may help directing the choice to more environmentally benign ones), but they should be applied in combination with controlled lighting and ventilation technologies to avoid negative side effects arising from insufficient ventilation (so far support policies do not make that combination mandatory). Regulation ending the current surge of oil heating installation (due to low energy cost) would be helpful as oil – unlike gas – cannot be replaced by renewable substitutes. Combining distance heating or gas with heat pumps seems to be the best available option today.

Consumer awareness is crucial not only for house management (e.g. air circulation), but also when it comes to deciding about the heating system modernisation: the cheapest solution in the short term is not always the economically best one in the longer run. At current interest rates, there should be a surge of investments with higher up-front payments but lower long-term cost, but it isn't. One reason is the lack of information on the consumers' side, another the fact that less than half of all flats in Germany are resident-owned, so conflicts of interest emerge. Consumers and local banks alike hold limited knowledge about the availability of new and more energy efficient technologies and their economic benefits (as is the case for some installation companies, whereas others champion the case of energy efficiency), investment support with payback from energy savings is rare, and the public financial support systems (KfW and others, in particular at the state level) are sufficient in volume but not harmonised and extremely difficult to access. Households' economic calculation is not the same as businesses', with households expecting shorter pay-back periods than companies. Financial models to bridge that gap are rare and have no explicit government support (energy efficiency is not a strategic policy priority but more considered a business task), and households are reluctant to take the risks emanating from the unpredictability of energy prices. This and the insufficient methods for measurement and verification (plus their high cost) make energy saving investments less attractive to owners of multi-family houses, as the return on investment is not always perceived as being guaranteed.

Overall, the German "Energiewende" policy has successfully replaced nuclear energy by renewables (although the rate is slowing), but was so far focused on electricity (neglecting low temperature heat) and neglected energy savings in the housing sector by focusing on industry and to some degree, transport.

Energy efficiency from a household perspective. Findings from the EUFORIE project

The sad starting point was shared by the audience: there is overwhelming reason to doubt that the European and national energy targets will be reached. Whether the focus of energy policies is too much on technological standards or if more standards (and their control) are needed raises some debate and should be discussed without ideological preoccupations, in particular as the situation differs between sectors and fields of application. On the one hand standards seem to be the most effective instruments compared to financial incentives and information provision. On the other hand focusing on them could steer the search for solutions too much into a technology driven direction. While the standards for new buildings are indeed well designed and used, the major problem is in the building stock.

To come forward here effective multi-level governance permitting lower levels to test means of implementation in a niche, with the perspective of upscaling, is relevant to enable adequate experimenting. Next to political decision-makers also a functioning market with adequate competition would help to overcome that traditional but old fashioned solutions are frequently reproduced.

Last but not least, the participants pointed to the importance of sufficiently high energy prices.

Economic implications of different energy policies

One of the most important criteria for efficiency enhancing energy policies is that they must be coherent – a problem in Germany, where government policy tries to implement the "Energiewende" without affecting the coal industry, in particular the lignite mining and incineration. While in the past feed-in tariffs stimulated ration and mobilised private capital (the biggest crowd funding process ever), now government policies try to slow down the growth of renewables, supports (at a cost to the consumers) large off-shore investments, establishes institutional advantages to large scale investors in onshore wind, taxes solar and refuses to start the phase-out of burning lignite, the most carbon intensive fossil fuel. This slowing down of the inevitable structural change reduces job creation and undermines competitiveness in the renewables sector, and increases the cost of electricity (dormant coal fired power plants are paid as "reserve capacity") as both the old and the new system are to be run in parallel for an extended period of time.

The multiple exemptions from energy taxation and certificate payments increase the price households have to pay significantly, reducing consumer expenditure and slowing economic growth, while the beneficiaries (mostly big, export oriented companies) invest their money at the stock exchange rather than in the real economy – another pressure on the labour market.

At the same time, the government's refusal to restore the "eco tax" to its former level (it fell relatively to income and tax revenue as it was based on fixed amounts of payment) and to dynamise it as for instance in Denmark keeps oil cheap and provides incentives for cheap but low energy efficiency products, makes house isolation less attractive, stimulates the installation of oil-fired heating systems and the purchase of gas guzzling cars. Therefore, it was argued, households hold back investments as profitability calculations for energy efficiency investments are difficult given the volatility of the energy markets.

While current policies are intended to but will probably fail the objective of reducing greenhouse gas emissions in line with the long standing 2°C max. global warming objective, the "significantly below" and at best 1.5°C limit, although celebrated politically, has not entered the political discourse in terms of policy measures suggested and discussed. To reach that target, participants raised the point that Germany should be aiming to be carbon emission free by 2040 (instead of 2050-2080), which would imply the last fossil fuel driven cars to be sold by 2025. The car industry, the chemical industry and the energy sector would have to deal with massive stranded assets which the government tries to avoid – but there are also no regulations ending new investments in these sectors to minimise the losses to be anticipated. Even the subsidising of diesel cars through reduced petrol taxes has not been ended, regardless of climate concerns, health warnings, EU clean air standards and Volkswagen criminality.

Business implications of different energy policies

Following on the discussion from the previous session it was claimed that innovative start-ups appear to be the victims of this policy – for instance, the logistics company DHL decided to build its own electric car, designed by the Aachen Technical University, as the car makers could not offer a workable one from their range of models. Management failure to anticipate structural change, and the concern

about jobs once the change is on the agenda were highlighted as one of the most important blockade factors for energy efficiency in Germany in recent years, probably even more than market or state failure. On the positive side examples were given how SMEs can be supported through training and network building towards energy co-operatives. In teams of 8-15 companies regularly meet twice a year. Commonly they decide on energy targets from energy reduction to the increasing use of renewable. The establishment of CO_2 balances or energy management systems contribute to reaching the target. Energy consultants guide the companies through this process which shall last for three year. They provide information about saving potentials and cost-benefit calculations of different measures. The target group of SMEs was seen as especially interesting as still lots of them are neither aware of nor use the broad range of support schemes available for them.

Beyond energy efficiency: which other instruments might be needed

As the discussion on the German situation has confirmed, technical efficiency improvements are indispensable, but insufficient. From the discussion two main strains of arguments emerged:

1. The way technical equipment is used is determined less but the installations and more by the user (staff and visitors in offices, employees in factories, households in their flats) Use patterns determine to which degree the efficiency potential provided by technological solutions is realised in practice, and which rebound effects unfold.
2. Consumers (usually households) decide what to spend their money for – short-lived consumer goods, long-lived investment goods, or not at all, saving money. As a rule of thumb, energy efficiency improvements require a focus on long-lived investment goods, buying energy efficient cars, fridges and the like. Thus it is in the consumers' hands to go for potentially energy efficiency enhancing goods, or not. However, it is in the hand of the banks how money saved is invested, and if this investment is in line with energy efficiency targets. The rules and regulations set by public authorities will no doubt influence the decisions of all other agents.

The Finnish interviews: Energy efficient technologies

Introduction and methodology

The Finnish workshop under the theme "Ènergy efficient technologies" was implemented in a form of thematic interviews of key stakeholders in the Quartet Helix approach. Identification of the variety of relevant efficient technologies might be easier for stakeholders in an interview than in a workshop. Each stakeholder has more time to present his/her views with proper argumentation, which may not be the case in a workshop. Altogether 11 thematic interviews were carried out in May-June 2017. Duration of the semi-structured interviews varied from 1 to 2.5 hours. The interview questions are enclosed in Annex 8 of this report. The interviewees represented the Government and public sector (3), industry (4), academia (4) and citizens and NGOs (2). The sum is 13, because two interviewees were granted a "double role" based on their background and experience in different organizations. The representatives of industry were selected from the energy intensive branches, which are significant energy consumers both from the Finnish and European viewpoints (cf. Blesl et al, 2010). A list of interviewed stakeholders is in Annex 9 of this report.

The objective of this investigation was to perform an analysis of the current state of energy efficiency strategy in Finland by collecting a set of statements and expert opinions from representatives of various stakeholder groups. The information needed for this work was collected by conducting interviews in which 11 experts were asked to discuss several aspects of energy efficiency in Finland. A total of five (5) questions were presented to each participant (see also Annex 8). The topics tackled in each question are presented below:

1. Energy efficiency as a political objective
2. The improvement potential of energy efficiency
3. Obstacles and challenges related to the improvement of energy efficiency
4. Technical solutions for the improvement of energy efficiency
5. Legislative framework and directive measures for the promotion of energy efficiency

Results

Energy efficiency as a political objective

The majority of the interviewees agreed on the importance of energy efficiency as a political objective in addressing climate issues. One participant also pointed out the multiple indirect benefits of improving energy efficiency, namely in the form of increased employment rates and wellbeing. (ref."IEA 2014 – Capturing the Multiple Benefits of Energy Efficiency) Another participant, on the other hand, disagreed about the relevance of energy efficiency as a political objective as such because of its many interlinkages with other key factors in climate issues. Too many interrelated directives (directives on energy efficiency, renewable energy and emissions) can cause overlap and incoherence. Instead, the interviewee suggested the reduction of greenhouse gas (GHG) emissions as a better political objective, within which energy efficiency would be a key component.

Although perceived as an important political objective by most participants, energy efficiency was also found to be a somewhat abstract and confusing concept. According to one participant, energy

efficiency-related definitions and terminology at the EU level are currently overcomplicated and have the potential to be misleading in certain situations, creating a lack of understanding of the different elements of energy efficiency among politicians and citizens alike. Energy efficiency is a complex, multi-dimensional notion that can be described from several different perspectives, namely from the primary energy consumption point of view, eco-efficiency, energy saving, or contribution of renewables to the final energy consumption. Different decision-makers and other players may choose to highlight certain aspects while minimizing others.

Energy efficiency as a political objective was seen as challenging because a "one-solution-fits-all" approach is impossible to apply in the case of all EU member states due to significant differences in the legislation and political structures of countries. The same challenge appears to exist at the country level too, as often energy efficiency-related policies have to take all possible stakeholders into account and it is complicated to prepare laws that will benefit all parties (without harming others) and achieve the best results in terms of energy efficiency.

The interviewees stressed the necessity of creating a clear and flexible framework that promotes energy efficiency at the country level without systematically regulating every aspect of energy efficiency along with other targets such as emissions reduction and renewables. Most of the participants believed that a legislative framework that gives more freedom to member states in the ways to achieve the common objectives is a more functional solution than the current one as it helps avoid inconsistencies.

In Finland, the visibility of energy efficiency as a political objective was perceived as weak and rather undetailed. According to one interviewee, energy efficiency seems to be of secondary importance in Finland, as no strong objectives for its improvement have been set so far. Energy efficiency is a much bigger priority at the EU level, but it should also be prioritized at the country level as pointed out by several participants.

Representatives of industry were generally more critical about energy efficiency as a political objective. They emphasized the importance of clarifying the difference between targets set for energy efficiency and the capping of energy consumption. As industries are generally energy-intensive by nature and it is partly impossible to reduce the amount of energy used in industrial processes, representatives of this sector believe that the minimization of energy use - as a way to increase energy efficiency – entails significant risks and can potentially weaken economic competitiveness. Instead, although energy use may increase in industry, it can in turn be realized without an increase in GHG emissions. In other words, participants are strongly in favour of the continuous improvement of energy efficiency without, however, supporting the establishment of hard limits to the consumption of energy as it may jeopardize competitiveness. In this regard, indicative regulations along with economic incentives were seen as the preferred means of regulation.

Another interesting argument brought up by one participant is that the implications of tying energy efficiency to an upper energy consumption limit may hinder the transition towards a circular economy model. The interviewee says that as the role of materials recycling grows, the energy input required for their reprocessing grows too due to low extractability, which in turn may increase the overall energy consumption of a process. However, the increased energy consumption does not necessarily signify increased GHG emissions.

Potential for improvement in energy efficiency

All participants seem to agree on the abundance of solutions for the improvement of energy efficiency in all sectors. Although improvement initiatives may prove difficult to achieve in certain sectors more than others, the participants believe that energy efficiency has not reached its optimum in any sector of activity. Several participants pointed out that the availability of financial resources strongly correlates with energy efficiency-related improvement endeavours.

According to the interviewees, the sectors with the most potential for improvement include transport, industry, buildings, the service sector and SMEs.

On top of technological advances, the majority of participants emphasized the importance of digitalization as a key driver with a large potential in the improvement of energy efficiency. They believe that a more automated control of energy distribution networks combined with monitoring by utilizing ICT technologies can help optimize energy systems and thus enhance their overall energy efficiency. Another important point that was brought up in several discussions is the large potential – although not free of challenges – present at the individual level. Consumer behaviour can help significantly shape the trends in energy consumption and energy efficiency at the country level through individual actions and decisions. If individual behaviour can be directed in a way that minimizes energy consumption and promotes energy efficiency, visible improvements can be achieved.

In addition to the above-mentioned improvement possibilities, participants also mentioned the role of sound and efficient policies in promoting energy efficiency. For instance, one participant stated municipalities as an example case in which the decision to incorporate energy efficiency as a priority in strategic planning at the municipality level can have a clear positive effect, while leaving it out negatively impacts the municipality's performance in terms of energy efficiency.

According to the participants, another key area of great potential for the improvement of energy efficiency is the flexibility of supply and demand in heating and electricity. As energy production tends to move towards a more decentralized production network, it is important to have a system in place that can utilize the excess energy produced at peak times as efficiently as possible, thus matching supply and demand and minimizing unnecessary production.

Specific energy consumption can always be minimized, but this is not necessarily reflected as a reduction in primary energy consumption. Interviewees mentioned several factors that affect the total energy use of the country; namely population growth, along with the increased use of electric household appliances and the increased mobility of people and goods. Improvements in energy efficiency can be achieved at the societal level through better urban planning and organizational changes. One concrete example stated by one interviewee is the promotion of telecommuting instead of working at the office to reduce energy consumption related to transport.

The potential for energy efficiency improvements in the case of the built environment and the industry is discussed in more detail in the following two sections.

Built environment

Buildings consume considerable amounts of energy. The main areas in which energy is required in a building include heating and cooling, ventilation, warm water, lighting and consumption by home appliances in the form of electricity.

The energy efficiency of buildings has been one of the major focus points at the EU level. Energy efficiency has historically played and continues to play a central role in the construction of buildings in Finland, partly due to climate factors. For this reason, buildings in Finland are often already fairly energy-efficient, which makes further improvements difficult to realize. According to several interviewees, the role of cooling in buildings will increase in importance in the upcoming years due to warmer climate, and energy-efficient solutions that take this aspect into consideration will also have to be developed.

Generally, the improvement of energy efficiency of old buildings is more complicated to accomplish than in new buildings where it is already accounted for in the planning stage. Often however, old buildings are the ones in which energy efficiency can be more significantly improved.

By adding new elements to an existing building during renovation work such as heat pumps for instance, energy efficiency can be improved, although its effect is not immediately visible as the energy payback time may be in the order of several years.

It has been estimated that buildings account for approximately 40 % of the total energy consumption in Finland. For this reason, improving the energy efficiency in buildings is one of the top priorities on the national energy efficiency agenda. Participants brought up public buildings such as schools, hospitals and office buildings as some of the key areas with the most potential for improvement in terms of reduction of energy consumption and improvement of energy efficiency.

In Finland, energy efficiency in buildings is now being looked at from a more systemic point of view where smart control mechanisms (e.g. smart switches and automated monitoring) play a significant role in improving the energy efficiency in built environments. Often, the installation of such control systems does not require a large investment and its effects clearly outweigh the costs. One of the key advantages of such systems is their compatibility with buildings of all ages. In addition, they allow the monitoring of energy use in buildings in real time, which in turn enables fast interventions should a problem arise. Energy regulation through smart management practices is often a more economically favourable option to structural renovation (e.g. addition of insulating layers). In addition, energy savings are achievable immediately. However, smart management tools may require maintenance and frequent substitution. On the other hand, although structural renovation may initially cause additional energy use through indirect energy costs – i.e. construction materials, transport and installation –, thus lengthening payback time, its effect on the energy efficiency of a building is more permanent on the long run and can create energy savings over several decades.

Industry

Industry alone accounts for the largest share of energy consumption in Finland. The improvement of energy efficiency in this sector generally goes hand in hand with cost-efficiency, which makes energy efficiency an attractive topic in this sector of activity. For this reason, industries actively invest in improvements that enhance the energy efficiency of plants and processes.

Industry representatives believe that energy efficiency can always be improved in this sector, although they implied that large improvements only occur through large innovations, whereas energy efficiency can be improved continually but in smaller steps through constant ameliorations. For instance, new improvements in processes or practices can be adopted on the basis of an opportunity for enhancing energy efficiency that is discovered by an employee.

Energy efficiency in industry generally consists of multiple smaller components that, when summed up, can produce large improvements at the plant level. Energy efficiency improves systematically upon improving processes. The best, most energy-efficient equipment available on the market is usually purchased when processes are renewed.

In the chemical industry, it can be challenging to improve energy efficiency through the reduction of energy consumption because the amount of energy required for a process is largely dictated by the nature of the reaction taking place. However, the energy efficiency can be favourably influenced by paying attention to the origin and composition of raw materials for instance. In addition, recent progress in catalyst technology has shown promise in the potential improvement of energy efficiency of chemical processes.

In addition to catalyst technology, several different areas in which potential for improvement exists were brought up by the interviewees, namely waste heat recovery, automation and control of the origin of the energy supply.

As one interviewee pointed out, industry plays the dual role of being an energy-intensive sector of activity while also providing new energy-efficient solutions for their customers. In this regard, there is a large potential for the improvement of energy efficiency through product development that has not yet been seized. For instance, the chemical industry can indirectly improve the energy efficiency of a product by developing better, energy-efficient materials that minimize energy use throughout its lifetime. A few good examples on this issue include lighter composite materials for cars to reduce their fuel consumption, LED lamps that consume far less electricity that their conventional counterparts and, on the energy production end, wind turbines and solar panels, which produce emission-free, renewable energy.

Obstacles and challenges to energy efficiency

All interviewees seemed to agree that technology is no longer a challenge in energy efficiency. The main challenges were believed to be related to economic, organizational and political issues in addition to consumer behaviour.

In the economic context, the challenges that may incumber energy efficiency objectives are mostly related to the lack of resources to invest in the field, combined with a lack of updated knowledge about investment opportunities. According to the interviewees, energy efficiency investments often have lengthy payback periods and do not compete well with other investment options. Especially in the case of companies with other immediate issues to tackle (e.g. financial problems), energy efficiency is not necessarily at the top of the priority list. However, as one interviewee pointed out, although investments made purely for the improvement of energy efficiency may be scarce, energy efficiency is nonetheless an integrated part of most investment decisions, although this is a fact that is difficult to monitor.

In addition, information on investment opportunities and other forms of incentives does not always reach its potential beneficiaries. This is especially true in the case of SMEs, where the limited workforce often lacks time and resources to update their knowledge on such opportunities and may therefore not always be aware of their eligibility for investment support for instance. In other words, the transition towards improved energy efficiency requires economically viable and attractive solutions, in addition to easily accessible information.

In the same way, several participants believe that the lack of proper understanding of energy efficiency in all its complexity can potentially lead to ill-informed decision-making that could potentially harm the ascent towards energy efficiency objectives.

One major challenge from the energy politics point of view is the need to ensure a secure energy supply throughout the country at all times. In this context, it is important to encourage measures that promote energy self-sufficiency as a priority, even when it is not the best option from an energy efficiency point of view.

Another potential challenge is the constant change in the structure of energy production. Due to growing decentralization, energy supply and demand systems have to constantly readapt to these changes, which can create organizational and management-related challenges. Following the same logic, decision-making processes are often subject to similar challenges, as well-established, familiar procedures are usually difficult to change rapidly to respond to the dynamic nature of energy production and consumption patterns.

In addition, several interviewees described energy efficiency-related legislation as too complex and detailed, which can potentially be an obstacle to the improvement of energy efficiency if policies are enforced despite the existence of a better option for improvement measures in specific situations.

Another significant challenge brought up by several interviewees is the influence of consumer behaviour on energy efficiency. When not strictly an obstacle, it is nonetheless seen as an important factor that can greatly effect energy efficiency on a large scale. One important question that arose during an interview was that of personal comfort and the willingness to pursue a lifestyle with “reduced” comfort levels in the name of energy efficiency. As a concrete example, the interviewee pointed at individual choices in terms of indoor temperature or lighting. In this context, the primary function of a living space is safety and comfort, and energy efficiency improvements should be considered in the light of the primary function. In other words, the interviewee suggested that energy efficiency should be considered a tool rather than an end in itself.

Last but not least, the lack of dialogue between different actors involved in the improvement of energy efficiency may hinder its progress, as the complexity of energy efficiency and its different areas of influence require tight cooperation at all levels of society.

More specific details about the challenges encountered in the building sector were collected in the following section.

Buildings

In buildings, one of the most significant challenges was found out to be cost-efficiency. In Finland, energy efficiency in the built environment has already been taken relatively far, and according to several interviewees, improving energy efficiency any further in certain cases is no longer an

economically viable option as the costs of energy efficiency-related improvement work would be tremendously higher than the benefits acquired. When the energy-related payback time of such endeavours is very slow or exceeds the life span of the building, investing in energy efficiency is hard to justify.

In the same context, the 2020 nearly zero-energy building targets set by the EU were found to be somewhat challenging to achieve due to conceptual differences between member states in the way near zero-energy buildings are defined.

According to one participant, another challenge that arises when energy efficiency is excessively improved is the safety of the living environment. As an example to reinforce this claim, when the energy efficiency of a building is improved through additional layers of insulation, higher risks of humidity-induced health hazards such as mold formation can raise concerns in addition to potential structural damage.

Finally, a few participants also mentioned the lack of proper, targeted counselling for energy efficiency-related improvement work in buildings as one potential challenge, as buildings often differ from one another in age, size, building materials, location and so on, thus making building-specific solutions essential for efficient energy management.

Technological solutions

A large number of technologies were mentioned during the discussions with the interviewees. Many participants found it difficult to pinpoint specific technologies that would help promote energy efficiency. They rather emphasized the need for hybrid systems where a combination of complementary technologies is used for the best results. They believe that the right combinations of energy-efficient technologies should be developed on a case-by-case basis where targeted and cost-efficient solutions are sought separately for each situation at hand.

Similarly, they found that energy efficiency should be considered using a holistic approach that looks at a system (e.g. a building) as a whole instead of focusing solely on individual components (e.g. devices). Along the same vein, participants also stressed the importance of developing technologies that do not only consider energy efficiency as the only objective, but also consider other aspects such as emissions reduction potential alongside economic and social sustainability.

On a general level, the most popular technologies mentioned for the improvement of energy efficiency were smart, automated heat and electricity management systems for buildings, alongside heat pumps and waste heat recovery technologies. Nearly all participants believe that there is a large potential for the improvement of energy efficiency through digitalization. Automated heat and electricity management systems, where energy consumption is monitored and regulated in real time, can significantly contribute to the minimization of energy consumption in households and large service buildings alike. One of the main advantages of smart management is the possibility of integrating a sizeable number of different components within the same system; namely lighting, heating, cooling, ventilation and even small-scale energy production. As for waste heat recovery technologies, participants thought that such technologies have versatile application areas and are therefore very useful on a large scale. Here, the role of heat recovery in promoting energy efficiency in the context of a circular economy model was also emphasized. The utilization of waste heat is an especially attractive option in sparsely populated areas where the transport of district heat over long distances creates considerable losses.

Another area that interviewees sought important to develop is energy storage technologies. As energy supply is becoming more diversified and decentralized in Finland and in the EU in general, there is pressing need for the development of storage solutions that take into account the uneven nature of power supply due to increased production using renewable energy technologies. By improving energy storage capacity, losses are minimized during production peaks for instance. Another important aspect to consider is the nature of power supply in the industry, as steady electricity supply is often critical in many industrial processes. Developing efficient energy storage systems that guarantee an uninterrupted power supply in cases where supply does not meet the demand is therefore essential.

In addition to the above-mentioned technologies, participants also cited other ones such as renewable energy technologies, LED lighting, new know-how for carbon sequestration, frequency changers for engines (for both transport and industrial sectors), electric vehicles, hydrogen technologies and passive energy management systems.

Finally, participants also found it important to stay open to all possibilities because often, the best innovations are developed by unexpected parties.

Evaluation of policy measures and instruments for improving energy efficiency

In order to determine the best control tools for the improvement of energy efficiency, interviewees were asked to rate each control tool separately on a scale ranging from 'very useful' to 'very harmful' depending on their personal opinion on the matter. The control tools presented involve normative, economic and informative tools. The results of this survey are presented in Figure 5.

Voluntary energy efficiency agreements were the most popular tool for advancing energy efficiency with 10 out of 11 interviewees rating it 'very useful' (8) or 'useful' (2), closely followed by education and research with 10 out of 11 interviewees considering the tool either 'very useful' (7) or 'useful' (3).

Codes as control tool divided the opinions of participants. While 7 participants thought of the tool as 'useful' or 'very useful', 4 participants regarded the control tool as 'harmful' of 'very harmful'. The arguments behind its potentially harmful nature were mostly related to the removal of flexibility in the ways to improve energy efficiency. Participants argued that because normative regulations encompass a large number of stakeholders, the objectives set cannot be very demanding (they are meant to be followed by everyone), and therefore do not encourage ambitious improvement measures. According to the more sceptical participants, codes can improve energy efficiency momentarily, but can equally inhibit the development of new, innovative solutions if implemented inadequately.

Standards, on the other hand, were found to be a much more popular tool among participants. They were described as a helpful tool that promotes good decision-making and provides a large package of valuable information in a concise form. Standards were said to be especially relevant in the industry, where they provide an efficient framework for performance assessment.

Energy taxation divided opinions similarly to the first control tool. If taxation is adjusted correctly, interviewees believe that is can positively effect energy efficiency. However, industry representatives strongly disagreed on the matter as they saw taxation as a potentially harmful tool. According to them, additional taxes can weaken the economic competitiveness of businesses and potentially drive production away from the country, in turn harming the national economy.

As an economic tool for the improvement of energy efficiency, efficiency-based tax deductions were found to be relatively ineffective, although they were seen as potentially useful in the case of households. A much more useful tool according to the interviewees was the efficiency-based investment support. It was considered especially helpful in the case of SMEs where resources are usually tight. Several interviewees thought that investment supports could help direct investment-decisions towards operations that improve energy efficiency if they entail economic benefits. One successful example that demonstrates the role of investment support in the improvement of energy efficiency is the popularization of heat pumps in Finland.

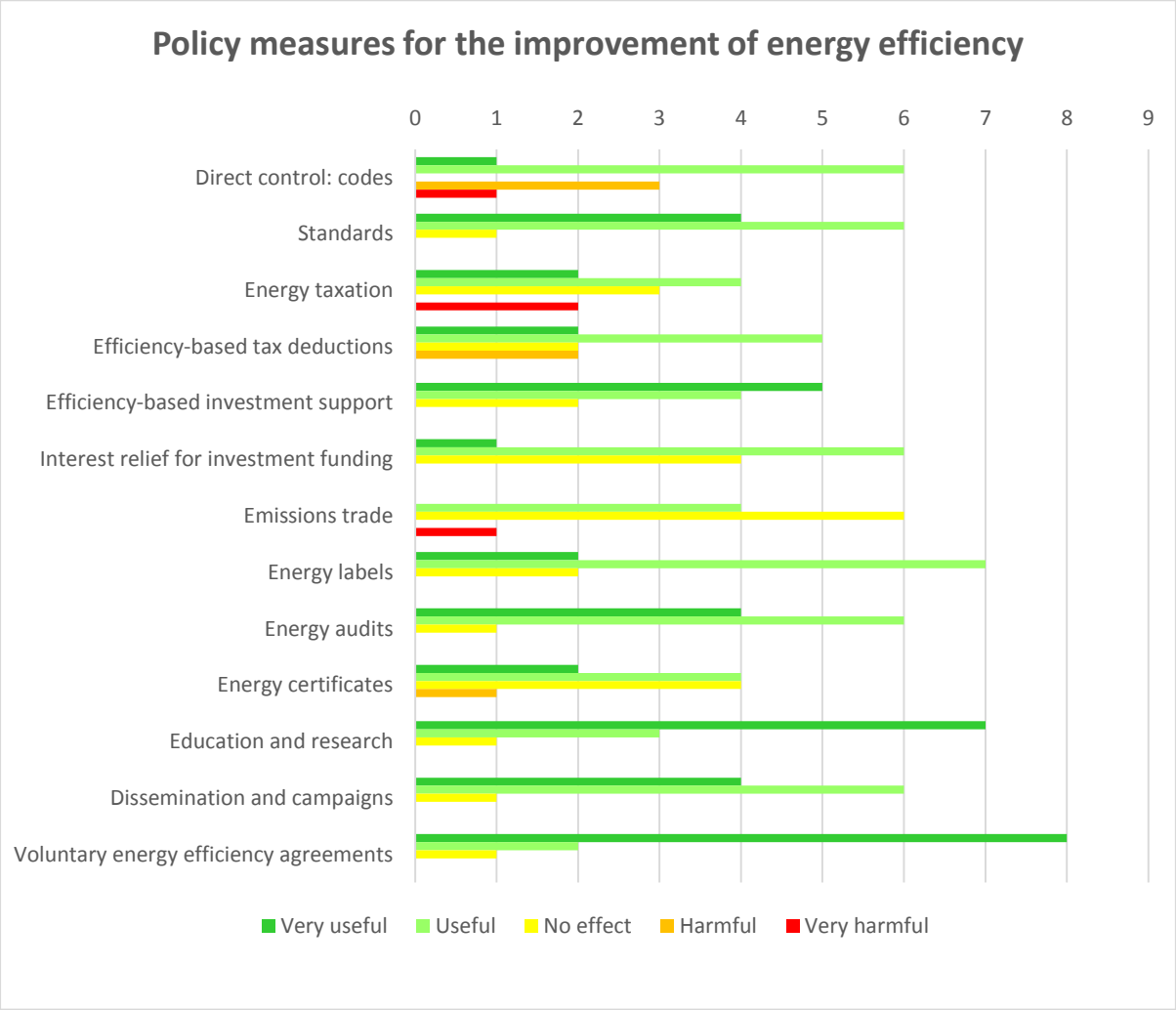


Figure 5. Results of the survey on control tools for the improvement of energy efficiency.

Other economic control tools, namely interest relief on investment funding and emissions trade schemes were found rather inefficient in promoting energy efficiency. One argument that was brought up on several occasions in the case of interest relief is that interest rates are low at the moment and therefore any relief would not be an economically attractive option, therefore giving the tool no real power in controlling energy efficiency related decisions. As for emissions trading, a number of participants pointed out that although a good idea a priori, the tool has not worked as well as initially

predicted. Among suggested reasons for its failure was its complexity and overlap with other currently used tools.

As for energy labels, the majority of interviewees found them to be useful, especially from the consumer's point of view as they provide a standard scale for the comparison of different electric devices and home appliances in terms of their energy efficiencies. However, a few participants expressed scepticism, arguing that energy labels have suffered an inflation over the years, meaning that current labelling suggests that there are no significant efficiencies (e.g. between A++ and A+++), while prices still differ. If no meaningful difference in energy efficiency is perceived by the buyer of a certain device, price is usually the critical factor in the decision-making.

Energy audits were one of the most popular tools in this survey, with 10 out of 11 interviewees regarding them as 'useful' or 'very useful'. Energy audits have a long history in Finland and are generally considered to be useful and to promote energy efficiency. According to one interviewee, energy audits can be helpful tools for SMEs because they provide a clear overview of all energy-related issues within a company and can help identify areas where improvements can be made in the future. Energy certificates, on the other hand, were not deemed as efficient in promoting energy efficiency, mainly because they are perceived to cause unnecessary additional costs and bureaucracy.

Education and research was the second most popular control tool according to the results of this survey. Although it was not seen as an efficient tool on its own, education and research were believed to be the backbone for energy efficiency and an important enabler of new innovative solutions. Its effect as a control tool was perceived as relatively slow, but essential nonetheless. According to one participant, it is through the expansion of new knowledge and expertise on energy efficiency that decision-makers with a good understanding of the issue will be able to make well-informed decisions that promote energy efficiency in the future. Along the same lines, campaigns and the dissemination of information in general were considered to be an important tool for the achievement of energy efficiency objectives. Here again, the tool was not considered to work effectively on its own, but rather as a reinforcement for other tools. When new innovations are developed, it is important that the information reaches the public too.

Voluntary energy efficiency agreements were perceived as the most useful tool for the promotion of energy efficiency - and for many reasons. Since its implementation in Finland, the results have very promising as large energy savings have been observed in nearly all sectors. According to the interviewees, the popularity of this tool can be attributed to several features of the agreement, namely its voluntary, non-binding nature, in addition to the creation of a cooperative basis for energy efficiency discussions and actions between businesses and the government. When companies and organizations sign the agreement voluntarily, there are no legal obligations on either side, which makes the structure of the agreement much lighter and pleasant to both parties, ensuring a higher level of motivation for the implementation of energy efficiency improvements. In addition, voluntary agreements encourage the transparent reporting of energy-related figures in companies because there are no hard regulations and the primary beneficiaries are the companies themselves. Moreover, voluntary agreements give companies the freedom needed to progress towards energy efficiency goals on their own terms and pace.

Finally, a few additional control tools suggested by interviewees that could potentially promote energy efficiency, namely the improvement of targeted advising and counselling services, financial support for energy audits, and the competition-based commercialization of new technologies.

Most interviewees seemed to agree on the fact that no single control tool is effective on its own, but that the best option is to work with a combination of tools that complement each other and do not create overlap. In the economic sector, flexible and market-oriented tools that promote investments and a dynamic economic scene are preferred.

Results from EUFORIE questionnaires

The Italian questionnaire

The project European Futures of Energy Efficiency (EUFORIE) is a target-oriented project aiming at providing multiple results and impacts supporting sustainable development and competitiveness. The project EUFORIE is based on a multi-scale analysis and participatory approach. It is designed according to the European Union´s political targets 20-20-20, Europe's Energy Efficiency Plan and Energy Efficiency Directive 2012/27/EU (EC 2012), and the goals of the Horizon 2020 R&D program. The strategic content and idea of the project are closely linked to central EU policies in the fields of sustainable development, low carbon society policies and EU renewable energy strategy. EUFORIE meets the FAROUT rating criteria[1]: it is (1) future oriented, (2) accurate, (3) resource effective, (4) objective, (5) useful and (6) timely. These six scientific criteria of excellence, guide all research activities and work packages of the project. Because of the FAROUT criteria, which affect the implementation of the project, the specific objectives for the EUFORIE project will be clearly measurable, realistic and achievable in both content and timeliness. The central strategic goal of the project is to provide useful and accurate information and knowledge to the European Commission and EU Member States in the field of energy efficiency. This strategic goal will be met by means of a comprehensive participatory foresight process and in public hearings dialogue.

The most important reason to recommend energy efficiency is that it has the greatest potential to limit future energy demand and face energy shortages. The International Energy Agency (IEA) estimates around 30 % increase in the global primary energy demand by the year 2040, and this increase will be covered quite equally by renewables and fossil fuels (IEA, 2016). However, worldwide economies are not fully exploiting the potential of energy efficiency activities to save energy for the future generations. IEA estimates that energy efficiency may account for as much as 70 % of the reduction in global energy demand, assuming that nations keep recent commitments to energy efficiency policies. Most Governments have implemented a wide range of policies and programmes to accelerate the development and adoption of energy efficiency measures. Energy efficiency advocates also argue that efficiency improvements can provide social benefits such as increased productivity and employment, reductions in the high-energy cost burden faced by low-income households, improved comfort and public health, enhanced national security, and conservation of finite resources such as oil and natural gas. For this reason, it is important to engage all the stakeholders and make them the main actors of these policies and programmes. Many countries use a strategy development or action planning process as a means to engage stakeholders, build consensus and activate action on energy efficiency. These strategies and action plans help guide and encourage energy efficiency policy development and implementation by: *placing energy efficiency policy within the broader policy context; allocating resources across the range of possible energy efficiency policies; capturing synergies between policies; engaging stakeholders and building political consensus; and assigning responsibility for policy development, implementation and oversight* (IEA, 2010). National energy efficiency strategies play an important role as they provide a high-level

[1] The FAROUT Rating System is copyrighted to The MindShifts Group Pty. Ltd. (https://legacy.wlu.ca/documents/22445/06_Fleisher_%26_Bensoussan____A_FAROUT_Way.pdf)

overview of how a country can meet economy-wide goals. The European Union's 20-20-20 target aims for a 20 % reduction in primary energy use compared with projected levels by 2020. An energy efficiency strategy should also be comprehensive in describing the approach to and rationale for energy efficiency policies and programmes.

As with the previous case studies and EU projects, we used questionnaires as a major tool to investigate stakeholders' opinions and allow them to express their feelings about policies and barriers they face in daily activities on the topic. An energy-efficiency oriented questionnaire was sent to a group of around 200 selected stakeholders from October 2016 and the consultation was stopped at the end of the year. We received 83 replies. The aim of this consultation was to understand the level of engagement of stakeholders on energy efficiency and their knowledge about this issue.

The questionnaire was composed by 29 questions, some of which general questions about energy efficiency and stakeholder's behaviour and some more technical, linked to the EUFORIE project. The first set of questions were meant to investigate what stakeholders think about energy efficiency and what they know about it. In the second part, we also tried to assess their present engagement or how they could be engaged in the future. Questionnaire were proposed by means of personal interviews, contacts during specialized meetings and online compilation. In several questions respondents were asked to mark more than one answer. For this reason, the sum of achieved percentages most often overcomes 100 %. We will, however, still express results as percentage, because this allows at least a comparison among the answers related to each individual question. The total set of questions is listed in Annex 10.

Figure 6 deals with the definition of the energy efficiency concept. Many respondents (83.3 %) show a lifestyle-oriented definition of the concept, aiming at consuming less and spending less, without decreasing the quality of life. This points out what is the most important result to be achieved, namely providing technologies and organization forms that do not affect the present living standard. Very likely policies that force lifestyles to decrease would not meet stakeholders' acceptance.

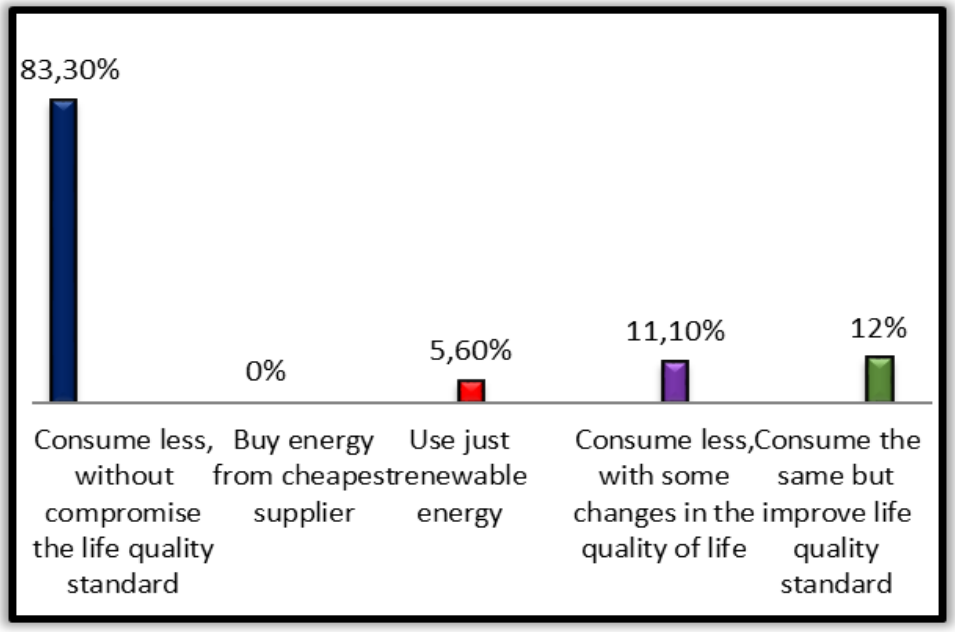


Figure 6. What does Energy efficiency mean?

The need for additional information about energy efficiency seems a crucial issue also in the minds of stakeholders. For this to be achieved, they identify the need to spread the concept via media (66.7 %), schools (55.6 %), public offices (55.6 %) that act as contacts for stakeholders, promotion activities. This would certainly require a planned strategy by policy-makers and an investment of resources. Surprisingly, self-managed tools such as "social networks" are not considered a potential solution, very likely due to the need for expert advice, that stakeholders attribute to Institutional planning and intervention (Figure 7). Stakeholders think that it is important to inform more people, via media (66.7 %) or schools (55.6 %), or to open some offices in charge to inform about the existing energy efficiency solutions (55.6 %) or to promote the concept through events, contests or other ways (55.6 %).

In fact, lack of information was identified as the main barrier to the implementation of energy efficiency by all respondents, together with insufficient action by public administration (Figure 8): the latter is considered the second most important barrier (62 %), followed by some confusion between energy efficiency and renewable energy (39 %), lack of financing tools (14 %), and lastly the idea that in Italy we have other more urgent needs to take care of, instead of talking about energy efficiency (12 %). Surprising, stakeholders attribute a small importance to the technical aspects (considered not to be a barrier) and the financial aspects (likely the existing incentives are considered sufficiently attractive). The possibility to save money is not the only solution that governments should consider to reduce consumption.

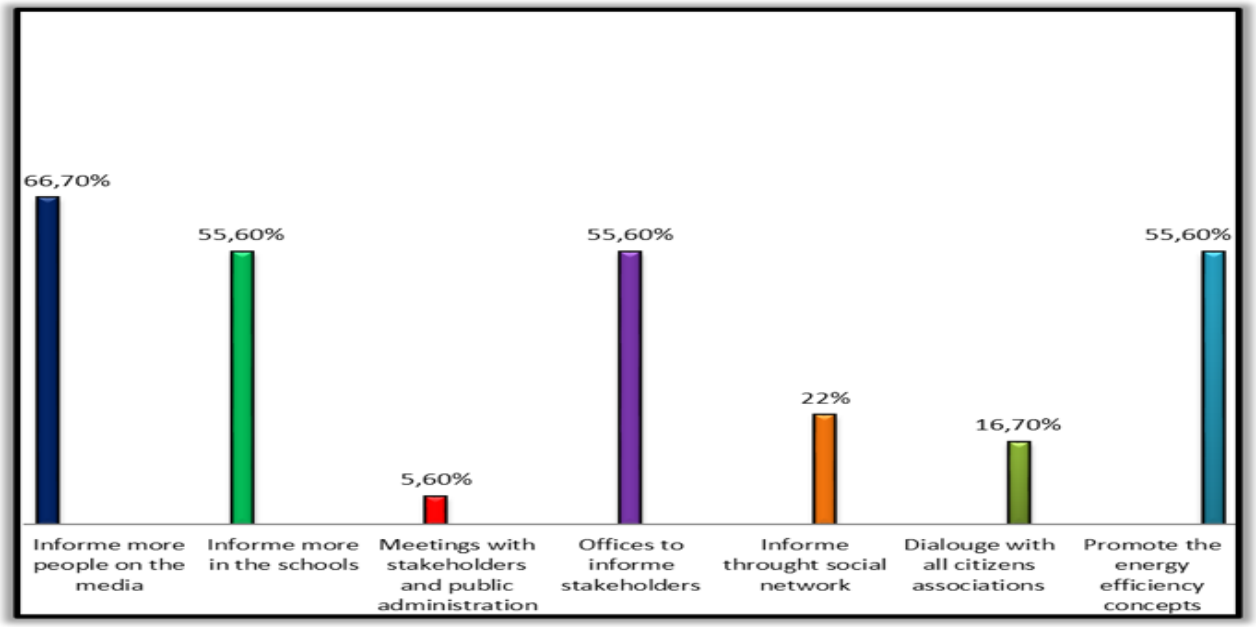


Figure 7. How to promote the energy efficiency concept?

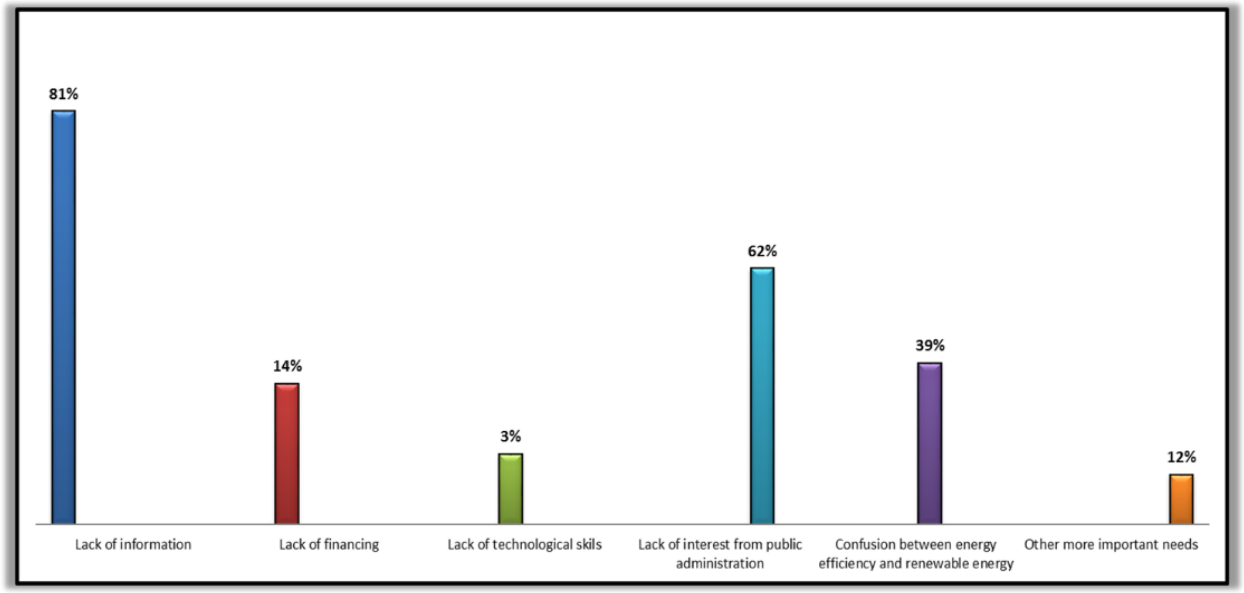
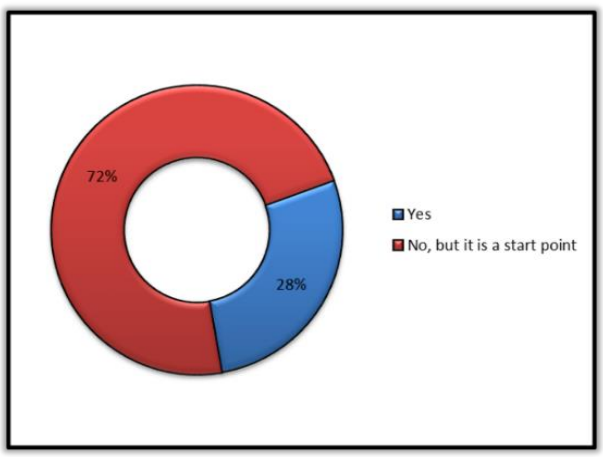


Figure 8. What are the main barriers to energy efficiency?

Figure 9 shows that 72 % of respondents think that incentives are not the only way, although all of them agree that they are a good starting point to support effective changes in stakeholders' behaviours. Concerning stakeholders' awareness about Italian subsidies and regulations regarding the energy efficiency matter, Figure 10 points out that the 55.6 % of respondents declare to be aware of the financial aids provided by the Italian government, and the 44.4 % of stakeholders think they only know a part of them, in this case respondents could trace one answer. Going into further details, we explored to what extent stakeholders were informed of some specific incentives.



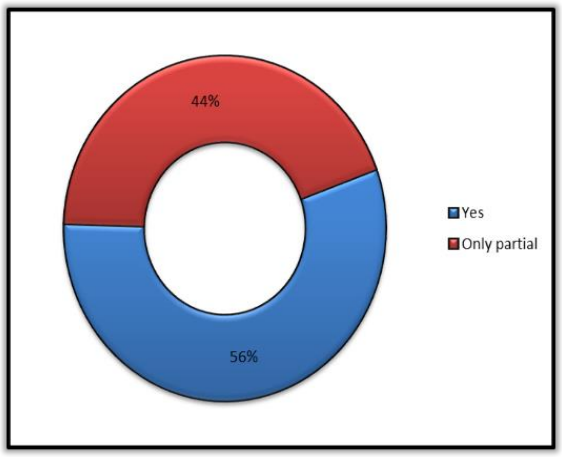


Figure 9 (left). Are subsidies and incentives the only solution to achieve energy efficiency?
Figure 10 (right). Are you aware of the existence of subsidies and incentives within the Italian regulations?

A question about tax reductions related to actions to improve the efficiency in buildings and houses leads to 88.9 % of respondents declaring to be fully informed, while only 11.1 % appear not informed

(Table 4, question 1), further confirmed by answers to question 3, related to other incentive measures and regulations; in Table 4, the question No. 2 explores the availability to invest personal sources of funding to improve the energy efficiency of the apartment yielding about 80 % of answers in favour of such action, depending on the solutions to be adopted. These results might suggest that people are becoming more aware of energy efficiency options and that they care about the possibility to implement energy saving strategies and tools by using the available tools.

Table 4. Usefulness of subsidies and tax deductions for energy efficiency promotion

1. Are you aware of the possibility of a tax deduction of 65% for measures to improve energy efficiency and seismic upgrading of buildings, recoverable in 10 years?		Yes	I heard about it and I may do something in the future
		88.9 %	11.1 %
2. Would you invest a sum of your personal budget to adapt your home and become more efficient?	Yes	It depends on the extent of benefits	It depends on the budget I need to spend
	38.9 %	38.9 %	22.2 %
3. Are you aware of other regulations and incentives for energy efficiency in Italy, a part from tax deduction?		Yes	Yes, but not well informed about
		55.6 %	44.4 %

When asked about so-called White Certificates (Energy Efficiency Certificates – EEC, Table 5, question 4) – a proof of the energy savings achieved through energy efficiency improvement initiatives and projects - stakeholders declared to be well informed about them. When asked about ESCo's (Energy Service Companies, Table 5, question 5) the majority said they knew them (83.3 %), some of them did not know anything (11.1 %), just a few heard about them but did not know any details (5.6 %). Such apparent awareness of the existing technical tools for an energy efficiency market is not fully in agreement with the daily experience of ESCo's, as it emerges from our strict collaboration with them (in particular with FEDERESCO, the Italian Federation of ESCo's, http://www.federesco.org/en/). These energy efficiency companies suffer from several regulatory delays and small market acceptance, which calls for increased governmental regulation, promotion and support of the energy efficiency matter, market and actors.

Table 5. ESCo's and White Certificate

4. Do you know what White Certificates are?		Yes	No
		84 %	16.7 %
5. Do you know what does ESCo mean?	Yes	No	I heard about it, but I don't know much

	83.3 %	10 %	6.4 %

Another general question explored how stakeholders were informed about energy efficiency (in order to understand the most effective sources of information). Figure 10 indicates that the 61.1 % of respondents refer to technical documents for professional reasons: this percentage might depend on the fact that the questionnaire was also sent to experts and people who work in this field or in environmental organizations; social networks and newspaper got the same score, 11.1 %, and the answer "other" was indicated by 16.7 % of respondents.

After these general questions, additional focus was placed on stakeholders' participation and the possibility to get them involved in some decision-making process. For this reason there is a figure of roadmap (see Annex 10 of this report), developed within the Parthenope research team, with the main elements, steps and interactions of a decision-making toolkit based on an integrated approach. The application of the decision-making roadmap is expected to provide sufficient technical and social evaluation indicators that may allow conflict prevention and final implementation. It seems clear that participatory decision-making approaches need to start from a real demand for specific services and then develop towards the optimum solution (or optimum compromise) through a series of technical details transparently made available, discussed, evaluated across a variety of points of view and finally accepted or rejected.

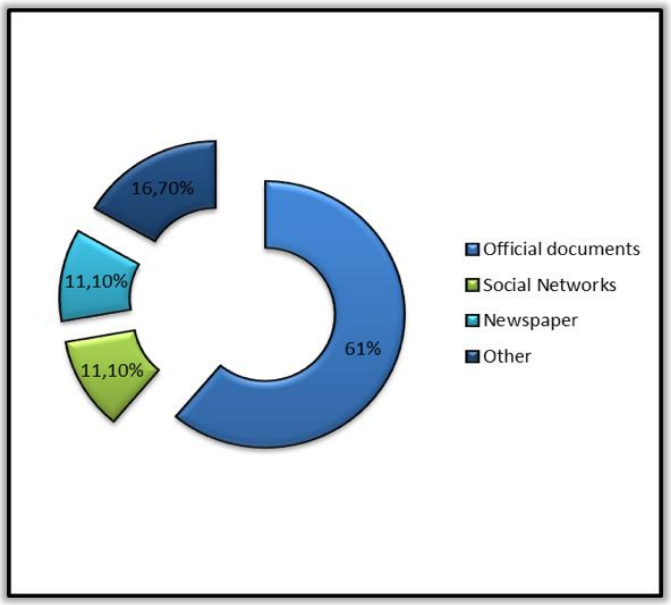


Figure 11. Where did you find information about energy efficiency?

We made the roadmap scheme (as shown in Annex 10) available to the interviewed stakeholders and asked them if the roadmap was sufficiently clear and which were the most important steps of the participatory process in their opinion. Stakeholders identified the conflict analysis of the different "stakes" (Step 2) as one of the most important steps for this process (44.4 %) and pointed out that in general stakeholders should always be involved (33.3 %). Then we kept on asking questions about the engagement of stakeholders in the participatory process, their level and extent of engagement and their availability to get involved in the process personally. Questions 6 and 7 in Table 6 express the

stakeholders' trust of the participatory process, pointing out the importance of defining carefully the steps of the participatory process and the interests of the different stakeholders. This is a very important point: if interests and procedures are well defined and transparent, the risk for hidden interests and conflicting decisions is decreased. The largest majority of stakeholders would appreciate being involved in the decision-making process (Table 6, question 8) and the reason is not, as it might be inferred, that they do not trust policy-makers (Table 6, question 9), but more than that stakeholders think that they may be able to provide points of view and solutions that experts and policy-makers will hardly notice. However, stakeholders identify meetings as the best tool to participate, which is a clear signal of availability to get involved personally in the roadmap and the process.

Table 6. Stakeholders' Engagement in decision making processes

6. About roadmap, do you think that participation process could help the harmonization of interests of different stakeholders involved?	Yes, but each part of the participatory process must be defined	Maybe, changing some part of the roadmap	Yes	I don't think so
	43 %	33.3 %	16.7 %	12 %
7. Do you think it is important to consult all the stakeholders involved, or just the experts that might help public administration to take decision?	Public administrations have to listen all the stakeholders involved	Just experts must help public administrations	Even if it is complicated, everybody must be involved	
	38.9 %	35 %	22.2 %	
8. Would you like to be involved in decision making related to the problems of your city?	Yes	No, I prefer that just experts think about these problems		
	77.8 %	17 %		
9. Why would you like to be involved in the problems of your city?	Because to change situations everybody has to give their contribution	Because for some problems we don't need just technological solution	Because I don't trust public administration	
	40 %	29 %	26.7 %	
10. Would you like to participate to meetings on energy efficiency?	Yes	It depends on the meetings	No, I prefer to get informed in other ways	
	77.8 %	17.3 %	7.8 %	

After exploring the issue of roadmap implementation and stakeholders' involvement, we enquired about the possibility to promote this way of taking decision and who should be the principal actors in this process. Figure 11 presents the different answers: the 72.2 % of stakeholders said public

administration, 50% said all together, each one with his personal capacity, the 38.9 % of respondents think the public administration that are in charge of a particular problem, 16.7 % technical experts and 5.6 % said citizens. The meaning is clear: in spite of claimed lack of trust in administrators, yet stakeholders assign to Institutions and experts the main role to promote a participatory process. This means that institutional roles are not void of importance to the eyes of stakeholders.

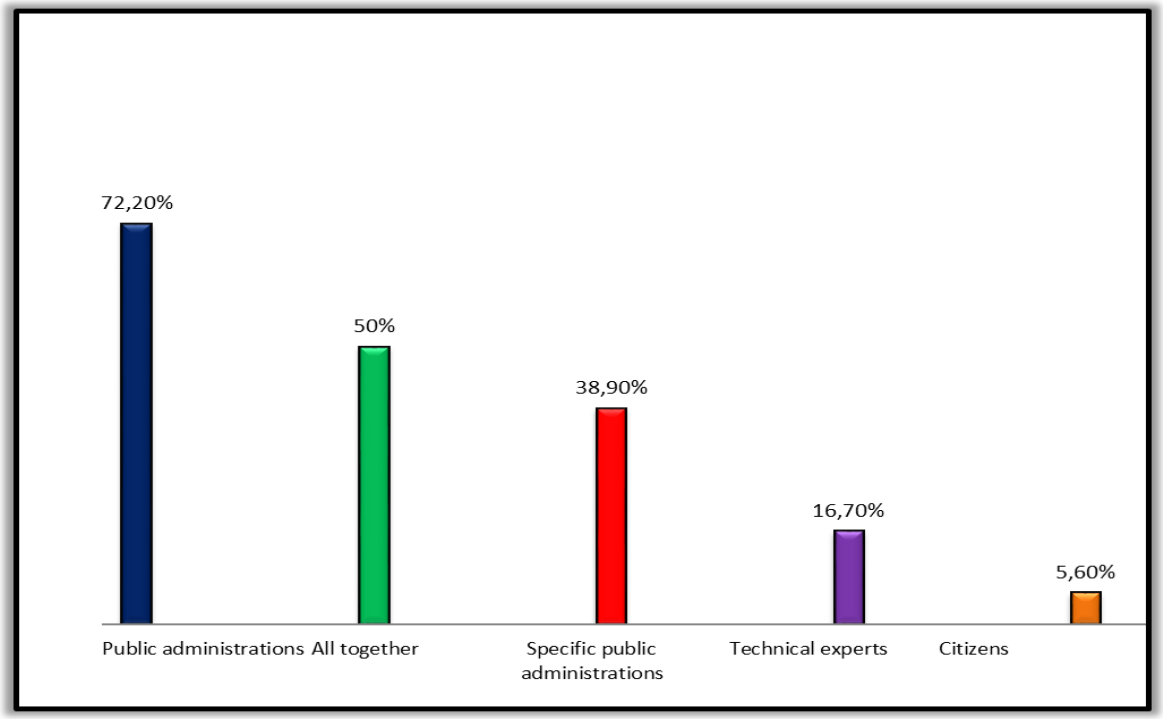


Figure 12. Who should promote participatory process?

After the above questions about participation and stakeholders' engagement, the second part of the questionnaire is more strictly linked to the EUFORIE project. A preliminary survey of what stakeholders consider "energy efficiency" and what are their daily actions (Table 7) provides very telling information.

Table 7. Concept of Energy Efficiency and daily life habits

11. Which one of the following options characterizes the concept of energy efficiency in your opinion?	Windows' thermal insulation	Ceiling and walls' thermal insulation	Intensify Public transportation use	Change lifestyle and reduce food waste	Purchase class A + appliances	Solar modules for electricity and water heating
	55.6 %	50 %	44.4 %	38.3 %	27.8 %	11.8 %

12. Which one of the following options do you already adopt in your daily life?	Windows' thermal insulation	Change lifestyle and reduce food waste	Intensify Public transportation use	Purchase class A + appliances	Ceiling and Walls' thermal insulation	Solar modules for electricity and water heating
	50 %	57.3 %	55.4 %	43.8 %	11.1 %	9.6 %

Stakeholders look at a mix of technical solutions (thermal insulation, more efficient appliances) and lifestyle changes (reduction of waste, increased use of public transportation). Their preference to photovoltaic and thermal solar devices is expressed, but correctly the majority of respondents does not consider them as a form of energy efficiency.

As a practical way to address aspects of energy efficiency and be personally involved, the Parthenope University invited the local stakeholders in Naples to give rise to the so-called Urban Wellbeing Laboratories, i.e. monthly meetings among environmental associations, professors and researchers, students, professionals and administrators, in order to stress topics of interest for the city separately from the need to take decisions immediately. This kind of preventive action was very well accepted (Table 8, question 13) and the motivations, once again, were not the lack of reliability of public authorities, but instead the willingness to contribute and the hope to decrease the conflicts (Table 9, question 14).

Table 8. Urban wellbeing laboratories

13. Do you think that Wellbeing Laboratories could be useful to discuss the problems of your cities?	Yes	Maybe, but we should do something practical, not just talk about problems	Yes, but University shouldn't be the promoter of the Laboratories
	50 %	36 %	17.6 %

Table 9. Motivations behind stakeholders' involvement

14. Do you think that today stakeholders' involvement is more important because public authorities are not reliable?	It is not because they are not reliable, but because every stakeholder has to be involved in public decision making	Stakeholders' involvement reduce conflict and increase social wellness	Others
	50 %	41 %	11.3 %

After these more general questions, we raised a number of specific, very detailed questions mainly about technical aspects (Tables 10-15). These Tables are very telling concerning specific choices, preferences, knowledge. In each question, we asked to provide a grade from 1 to 10 to the different items, in order to understand how the most important tools and strategies might become more

efficient and effective. Questions in Tables 10-15 should be read in the light of previous answers in Tables 4-9 and Figures 5-9 as well as Figure 10. These previous Figures set the stage for understanding the relation between general policy aspects and specific implementation actions. Stakeholders assign higher grades to those actions that they find more useful or where they identify the existence of barriers. Accurate consideration of the entire set of stakeholders' answers and availability to contribute may provide a good starting point to assess future energy efficiency policies. For the sake of clarity and help reading Tables 10-15, we have highlighted in bold the largest percentages of stakeholders for the grades assigned to specific energy efficiency measures, as a proof of consensus in judging that measure. For example, issuing Regulative actions: laws" was considered a good measure (score: 8) by 40 % of responses. Other responses indicated a lower ranking, also characterized by lower consensus. Instead, measures to improve "awareness and behavioural patterns" were judged of intermediate quality and effectiveness (score: 6) by 58 % of responses, in so underlining the limited consensus on these measures. We may therefore judge the quality of measures, by cross-checking responses and percentages. Once consensus is monitored, policies may be based on a mix of the most accepted measures, or efforts might be displayed to explain the less accepted measures and try to change the behaviour of stakeholders.

Table 10. Main energy efficiency measures implemented in Italy and Europe (Score from 1 to 10, 1 less important – 10 really important)

Grades	**1 (%)**	**2 (%)**	**3 (%)**	**4 (%)**	**5 (%)**	**6 (%)**	**7 (%)**	**8 (%)**	**9 (%)**	**10 (%)**	**Sum (%)**
Regulatory Actions: Laws					33	15	12	**40**			100
Reduce Energy Imports	10				16	30		**32**		12	100
Increase environmental quality and reduce pollution						15		**75**		9	100
Reduce Energy Costs		7		19		**48**	22			4	100
Energy Service Price				4		19	**77**				100
Increase the proportion of renewable energy			9			**46**	45				100
Environmental protection challenges		3		2	11	5	21		**57**		100
Social and cultural pressure							25	**37**	23	15	100
Awareness and behavioral patterns		3				**58**		16	22	1	100
Laws and regulation						33	**67**				100
Increase in real estate value						**42**	32	26			100
Governments' helps to reduce			3				48	**50**			100

energy consumption											

Table 11. Factors that could help Energy Efficiency Implementation (Score from 1 to 10, 1 less important – 10 really important)

Grades	**1 (%)**	**2 (%)**	**3 (%)**	**4 (%)**	**5 (%)**	**6 (%)**	**7 (%)**	**8 (%)**	**9 (%)**	**10 (%)**	**Sum (%)**
Energy Availability							**45**	31	16	8	100
Reduce Energy Importation	3	2			8		23	27	**31**	5	100
Increase environmental quality and reduce pollution			5	7		13		**62**		14	100
Reduce Energy Costs	2			14				29	**46**	9	100
Energy Service Price					3		**39**	27	16	16	100
Increase the proportion of renewable energy							39		**61**		100
Environmental protection challenges		1		10	**32**	26			12	19	100
Social and cultural pressures						12	22	**33**	20	13	100
Awareness and behavioral patterns		3				35		**53**		9	100
Laws and regulations		16					**84**				100
Increase in real estate value							**72**	28			100
Governments' helps to reduce energy consumption							15	**58**	43		100

Table 12. Energy Efficiency Policies (Score from 1 to 10, 1 less important – 10 really important)

Grades	**1 (%)**	**2 (%)**	**3 (%)**	**4 (%)**	**5 (%)**	**6 (%)**	**7 (%)**	**8 (%)**	**9 (%)**	**10 (%)**	**Sum (%)**
Energetic Audit					39			**61**			100
Cost Benefit Analysis for energy system						**59**			41		100
Label and energetic certification					21		**75**			4	100

Information Offices for energy efficiency solutions							31		20	**49**	100
Subsidy for energy production						5	16	25	**31**	23	100

Table 13. Technological Tools for energy efficiency in households (Score from 1 to 10, 1 less important – 10 really important)

Grades	**1 (%)**	**2 (%)**	**3 (%)**	**4 (%)**	**5 (%)**	**6 (%)**	**7 (%)**	**8 (%)**	**9 (%)**	**10 (%)**	**Sum (%)**
Smart Thermostat					36		20		**43**		100
Led Lighting							22	24	**31**	23	100
Energy Management						17	12	**48**	23		100
Energy Start Disposal					6			**49**	45		100
Electric Charge Station			18			**48**	34				100
Smart Power Strip					**32**	24	31	14			100

Table 14. Energy efficiency policies in buildings (Score from 1 to 10, 1 less important – 10 really important)

Grades	**1 (%)**	**2 (%)**	**3 (%)**	**4 (%)**	**5 (%)**	**6 (%)**	**7 (%)**	**8 (%)**	**9 (%)**	**10 (%)**	**Sum (%)**
Building regulations								28		**72**	100
Information on energy system							38	**63**			100
Subsidies on energy efficiency buildings						14		**86**			100
Training and networking on industry construction						**56**	6	36	3		100
Promotion of energy services in efficient buildings							8	37	**48**	7	100
Research and development and use of best technologies for building construction						20		**45**	36		100

Table 15. Energy efficiency policies in transportation (Score from 1 to 10, 1 less important – 10 really important)

Grades	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)	7 (%)	8 (%)	9 (%)	10 (%)	Sum (%)
Smart Tire							19	23	**58**		100
Policy on fuel for cars					8		30	27	**35**		100
Policy on fuel for heavy goods vehicles					19			**41**	40		100
Eco-driving technologies							26	30	**44**		100
Best information on vehicles certifications						31			**69**		100
Tax subsidies for efficient energy systems						**45**	18	9	28		100

Further calculations where the importance of individual items in Tables 10-15 has been ranked, is available in Annex 11 of this report.

The Spanish/Catalan questionnaire

In the context of the Spanish/Catalan workshop, an on-line questionnaire was developed in Spanish and English using Google forms (see Annex 12). The link to the questionnaire was distributed to all participants shortly before the event. A reminder to complete the questionnaire was given during the event, and another reminder was sent out by email shortly after the event. A total of twenty people completed the questionnaire, 15 in Spanish and 5 in English. The results to the questionnaire are presented below in Tables 16-24 and explained shortly.

Table 16 shows that the participants did not rate energy policies very high at all. European energy policy got higher grade (4) than the Catalan policy (2). The most common grade for Spanish energy policy was the lowest possible one (1), and the share of 'no opinion' (50 %) was remarkable high.

Table 16. How do you rate the energy policies of the following public institutions?

Energy policies	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)	7 (%)	8 (%)	9 (%)	10 (%)	No opinion (%)	Total (%)
European Union Policies		14	14	**50**	14						9	100
Spahish state	**32**	9	9								50	100
Generalitat de Catalunya	23	**32**	18	18							9	100

In general, the availability of information was not considered very good (Table 17).

Table 17. How do you rate the availability of information regarding the energy issues?

Energy information	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)	7 (%)	8 (%)	9 (%)	10 (%)	No opinion (%)	Total (%)
Availablity of information	5	5	**18**	9	**18**	14	9	9			14	100

In an open question on missing information, the respondents brought out their specific information needs:

- Information on power and gas cuts
- Consumption per type of energy production
- Production costs of energy
- Updated, coherent, detailed and reliable statistical data
- Information packages that are clear, accessible and adapted to citizens as target audience
- Unified reference indicators on energy efficiency
- Information on actions that can be taken at an individual level to promote energy efficiency
- Counselling in best available technologies and practices

- Methods and tips for energy management at all levels.

Table 18 shows that economic issues shape the European energy (efficiency) policies more than environmental policies. Social issues are quire rarely seen affecting European energy efficiency policies. The importance of social issues and the need to consider them more was discussed also in the Italian and German workshops. The Italian workshop highlighted the significance of social parameters in the decision-making of cost-effective solutions in energy production.

Table 18. In your opinion, how do the following issues affect the European Policies on energy efficiency? Please rate each of the following issue on a rating scale of 1-10, where 1 is 'not at all' and 10 is 'very much'.

Issues affecting European policy on energy efficiency	**1 (%)**	**2 (%)**	**3 (%)**	**4 (%)**	**5 (%)**	**6 (%)**	**7 (%)**	**8 (%)**	**9 (%)**	**10 (%)**	**No opinion (%)**	**Total (%)**
Environmental issues		5	5		14	14	**32**	18	5		9	100
Social issues			**23**	**23**	9	18	**5**	9	5		9	100
Economic issues			5		9	5	9	**27**	23	14	9	100

The importance of different energy efficiency policies and measures is considered in Table 19. The most common grade of the different policies and measures varies between 5 and 9, and the highest received grade was 8 or 9 for all policies and measures. 'Taxes', 'Energy audits', 'Smart meters and billing information', 'Tax deductions', and 'Subsidies' are the Top-5 most important policy measures of energy efficiency in Catalonia (see Annex 13 for details).

Table 19. Please rate each of the following energy efficiency policies and measures on a rating scale of 1-10, where 1 is 'not at all important' and 10 is 'very important'.

Energy efficiency policies and measures	**1 (%)**	**2 (%)**	**3 (%)**	**4 (%)**	**5 (%)**	**6 (%)**	**7 (%)**	**8 (%)**	**9 (%)**	**10 (%)**	**No opinion (%)**	**Total (%)**
Codes	5		5		9	18	**23**		18		23	100
Standards				18	5	**23**	18		14		23	100
Taxes			5	5	9	14	18	**23**	18		9	100
Subsidies		5	5	5	18	23	5	5	**27**		9	100
Tax deductions			5	9	14	**18**	**18**	14	14		9	100
Credits	5		5	5	**27**	23	9	14			14	100
Permits			5	9	9	**27**	14	14	9		14	100
Tradable obligations			5	14	5	**32**	14	9			23	100
Labels			5	9	5	**27**	23	14	5		14	100

Energy audits		5		5	9	**36**	14	14	14		5	100
Smart meters and billing information	5		5	5	9	18	9	**23**	14	5	9	100

Regarding motivation factors for improving energy efficiency, the differences are quite small (Table 20). The grade with largest share of responses varies between 5 and 9 per motivation factor, and the highest grade was 9 or 10 for all of them. Top-5 motivation factors include 'Increase environmental quality and lower pollution, climate protection', 'Environmental protection targets', 'Energy demand reduction of imports', 'Increasing share of renewables', and 'Raise awareness and be a positive role model for others' (see Annex 13).

Table 20. Please rate each of the following motivation factors for energy efficiency on a rating scale of 1-10, where 1 is 'not at all important' and 10 is 'very important'.

Motivation factors for energy efficiency	**1 (%)**	**2 (%)**	**3 (%)**	**4 (%)**	**5 (%)**	**6 (%)**	**7 (%)**	**8 (%)**	**9 (%)**	**10 (%)**	**No opinion (%)**	**Total (%)**
Safeguarding energy availability		5	5	9	9	18	**23**	14	18			100
Energy demand reduction of imports			5		5	27	14	**32**	14	5		100
Increase environmental quality and lower pollution, climate protection					5	9	18	**32**	18	18		100
Reducing energy costs			9	5	9	14	14	14	**23**	9	5	100
Price of energy utilities			5	9	**23**	18	9	14	14	5	5	100
Increasing the share of renewables				5	9	18	18	**27**	18	5		100
Environmental protection targets					9	9	**45**	5	18	14		100
Social and cultural pressure				9	9	**32**	23	9	14	5		100
Raise awareness and be a positive role model for others					18	18	**27**	9	9	18		100

Increased property value of houses and buildings		5	9	14	14	**23**	18	18			100
State incentives to save energy consumption			9	14	**27**	18	18	9	5		100

Table 21 deals with instruments, i.e. practical actions which increase energy efficiency. There is an overlap between Tables 19 (policies and measures) and Table 21. However, grade with the largest share of responses vary between 6 and 9 per instrument, and the highest individual grade received is 10 for all except 'energy audits' which received only 9. 'Consumer information systems' and 'CBA of energy systems' are the most important instruments (See Annex 13 for details).

Table 21. Please rate each of the following energy efficiency instruments on a rating scale of 1-10, where 1 is 'not at all important' and 10 is 'very important'.

Energy efficiency instruments	**1 (%)**	**2 (%)**	**3 (%)**	**4 (%)**	**5 (%)**	**6 (%)**	**7 (%)**	**8 (%)**	**9 (%)**	**10 (%)**	**No opinion (%)**	**Total (%)**
Energy audits				9	18	**23**	14	**23**	14			100
CBA of energy systems			5		14	14	18	**23**	18	9		100
Energy certificates and labels				9	9	**32**	14	18	14	5		100
Consumer information systems about energy efficient solutions and applications		5			5	14	27	9	**32**	9		100
Subsidies for energy efficient production		5	5	9	9	14	18	9	**18**	14		100

Tables 22-24 focus on the importance of technological and policy means to save energy in three different sectors, i.e. in households (Table 22), in transport (Table 23), and in buildings (Table 24), which are among the key sectors from the perspective of an increasing energy consumption trend.

Table 22 shows that all energy saving technologies for households received quite a large range of grades. The grades with largest share of responses vary between 6 and 8. Three most important technologies in the opinion of the respondents are 'Energy management systems', 'High-tech smart thermostats' and 'Home-automatic lighting with LEDs' (see Annex 13).

Table 22. Please rate each of the following energy saving instruments for households on a rating scale of 1-10, where 1 is 'not at all important' and 10 is 'very important'.

Energy saving technologies in households	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)	7 (%)	8 (%)	9 (%)	10 (%)	No opinion (%)	Total (%)
High-tech smart thermostats			5		14	23	9	**32**	14	5		100
Home-automatic lighting with LEDs			9	5	9	14	14	**32**	9	9		100
Energy management systems				5	9	**27**	18	14	14	14		100
Energy Star appliances and certified products		5	5	5	9	18		**32**	14	9	5	100
Charging stations		5		5	23	**27**	14	14	5		9	100
Smart power strips		9	5	9	14	**18**	14	14	9	5	5	100

Table 22 shows the results for energy saving instruments for transport. The grades with largest share of responses per instrument vary a lot, between 4 and 9. Three most important instruments include 'Modal shift in transportation systems', 'Energy efficient freight transport', and 'Fiscal incentives for energy efficient systems'. For all these instruments, the most common grade given was 10 (see Annex 13).

Table 23. Please rate each of the following policy instruments for transport on a rating scale of 1-10, where 1 is 'not at all important' and 10 is 'very important'.

Energy efficiency policies in transportation	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)	7 (%)	8 (%)	9 (%)	10 (%)	No opinion (%)	Total (%)
Fuel-efficient tyres				**23**	14	**23**	**23**	5	9		5	100
Fuel economy of light-duty vehicles				5	**23**	14	14	14	23	9		100
Fuel economy of heavy-duty vehicles				9	18	5	14	**23**	**23**	9		100
Eco-driving technologies			5	5	18	18	14	**27**	9	5		100
Better information through				9	14	**32**	18	9	5	14		100

vehicle labeling											
Fiscal incentives for energy efficient systems			5	5	14	14	**27**	9	**27**		100
Modal shift in transportation systems	5			5	9	9	14	27	**32**		100
Energy efficient freight transport			5	5	14	14	18	18	**27**		100

In Table 24, the grades given to different policy instruments for buildings are shown. The grades with highest share of responses vary between 8 and 10 per policy instrument, so all of them are considered as important by the respondents. Top-3 instruments include 'Promoting of energy services for buildings', 'Incentives and financing of energy efficient buildings', and 'Transparency and information about energy solutions' (see Annex 13).

Table 24. Please rate each of the following policy instruments for construction/buildings on a rating scale of 1-10, where 1 is 'not at all important' and 10 is 'very important'.

Energy efficiency policies in construction/buildings	**1 (%)**	**2 (%)**	**3 (%)**	**4 (%)**	**5 (%)**	**6 (%)**	**7 (%)**	**8 (%)**	**9 (%)**	**10 (%)**	**No opinion (%)**	**Total (%)**
Regulation of buildings			5	9	9	14	5	**36**	14	9		100
Transparency and information about energy solutions					18	18		23	**32**	9		100
Incentives and financing of energy efficient buildings			5		9	14	5	**23**	**23**	**23**		100
Capacity building and networking in building industry				5	9	9	27	**32**	14		5	100
Promoting of energy services for buildings					9	5	9	**36**	32	9		100
R&D and BAT (Best Available Technology) promotion in building industries			5		14	9	9	**27**	23	9	5	100

Input for the next step of WP7: EUFORIE Roundtable

The purpose of this deliverable was to provide the most important results from the national participatory workshops carried out in the beneficiary Member States as input for the next step of EUFORIE WP7, the roundtable discussion in Brussels related to a possible “European energy efficiency vision and strategy”.

The results presented in this deliverable deal with workshop-specific topics; biophysical and financial aspects of energy efficiency, energy efficiency planning and policy, energy efficient technologies, and energy sufficiency. Some of the results strongly reflect the national context of the Member States and views from EUFORIE beneficiaries and stakeholders in Finland, Italy, Spain, and Germany where the workshops and other EUFORIE WP7 activities have been implemented.

In addition, there are more generic but still context-influenced views on energy efficiency and related policies. The input for the roundtable will include the key messages presented in the beginning of this deliverable, but also other selected EUFORIE results based on other EUFORIE WPs (WP2-WP6 and WP8).

The input for the roundtable will be discussed with the project advisers from the EASME.

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Annex 1. The workshop format suggested for the partners

EUFORIE WP7 Participatory Stakeholder Workshop on Energy Efficiency

EUFORIE Participatory Stakeholder Workshop is planned to have five steps:

1. STEP 1. Identify drivers, target and endpoint
2. STEP 2: Define obstacles and opportunities.
3. STEP 3: Define milestones and interim objectives of new energy policy
4. STEP 4: Identify key policy actions, and
5. STEP 5: Towards robust strategies for new energy policy

Because the context of a transformation is defined by the long-term target (e.g. energy savings or energy efficiency targets level in 2020 or 2040), the scenarios will be constructed following the so-called backcasting approach: looking back from a future where a desired goal has been met, and creating decisive steps and pathways from that vision back to the present day.

The EUFORIE Workshop includes also evaluation of key aspects of energy saving and energy efficiency issues. The format of evaluation task is enclosed in this document. One key report package for participants of the EUFORIE Workshop is ***National Energy Efficiency Action Plans and Annual Report*.** All EU Member States have this report (see https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-efficiency-directive/national-energy-efficiency-action-plans).

Timetable of the workshop:

STEP	**How (P=presentation, G=group work)**	**Activities**	**Descpription**	**Goals**
	P	Welcome	Brief introduction of EUFORIE, venue and local organizers Short introduction of the workshop agenda Introductions of participants	Make purpose of the EUFORIE project and Workshop clear for the participants, ice breaking, stakeholder information
	P	Presentation of trends of energy use and targets for energy saving/ energy efficiency	Present the business as usual scenario on energy use. Inform participants about EU and national energy efficiency targets	Introduction of relevant starting points of the workshop activities
	P	From forecasting scenarios to back-casting: Explain general setup of the EUFORIE workshop exercise	Tell participants what will happen in the EUFORIE Workshop. What is the goal of the exercise, and what steps (1-5) will be taken.	Motivation and information of participants about the concepts of forecasting and backcasting scenario
	P	Identify drivers, target and endpoint	Participants evaluate energy policy instruments for energy saving and energy efficiency in their country (evaluation formats are delivered, evaluations are done in group) and discuss end point(s) with stakeholders (policy targets). What does it look like in the future?	Understanding key drivers and issues of energy efficiency. Have a clear definition of the end point that needs to be reached in potential policy-relevant backcasting scenarios

STEP 2	P	Obstacles and opportunities 2a: Familiarize with backcasting scenario	Identify the national energy saving/energy efficiency target and the implementation gap between the target and the forecasting scenario	Familiarize with expected policy gap between fore-casting and backcasting scenarios Increase policy relevance of energy saving/energy efficiency policy
	G	Obstacles and opportunities 2b: Identify main things that need to change	Look at the end point and backcasting scenario and the description of current situation. What are the main things that need to change in order to reach the target7end point?	Identify main building blocks of energy efficiency policy for step 2c
	G	Obstacles and opportunities 2c: Identify obstacles and opportunities	Participants will discuss what kind of obstacles and opportunities they identify in energy policy relevant for energy saving and energy effi-ciency. Group discussion about obstacles and opportunities. What opportunities and obstacles occur when you want to reach your goal?	Timeline with opportunities and obstacles
STEP 3	G	Define milestones and interim object-ives of new energy efficiency policy	Define concrete but rather general action and intermediate goals and map them on timeline	Energy efficiency policy timeline with all milestones and interim objectives
	G, leaders	Summary of previous sessions	Energy saving/energy efficiency roadmaps	Summary of STEPs 1-3
STEP 4	G	Identify key policy actions	Identify policy actions and map them on timeline Focus on middle and long run (2016-2030)	Clear idea of what actions need to be taken now and in the short and middle term in order to reach goal(s)
STEP 5	G	Towards robust strategies: 5.a: Plenary presentations (based on LINDA model) and discussion of backcastings and time trends	Discussion on timeline for backcasting target scenario(s). Encourage participants to present comments and critical insights. Backcasts need to feel policy relevant from stakeholders. Grand strategic architecture of energy saving and energy efficiency policies.	Communication of backcasts and consensus on content of backcasting scenarios and strategies
	G	Towards robust strategies: 5.b: Comparison of time lines and identification of gaps, differences and differences	What are main similarities and differences between policies and other actions? Any policy actions that need to be taken in each scenario? What are major differences between current policies and policies which needed to reach targets associated with backcasting scenarios?	Identification of candidates for policy actions and policy -the Government policy? -industrial and service economy policy? -consumer policy? -science, tech and innovation policy?
	G	Towards robust strategies: 5.c: Agree robust strategies	Final discussion about robust strategies How things are done in the future?	Identify concrete policy agendas and agree about strategies
	P	Reporting and finalizing workshop results	Reporting guidelines, feedbacks from stakeholders, policy dialogue	Delivering summary report from EUFORIE workshop
	P (chairing person)	End and final remarks of the EUFORIE Workshop	Information about further activities and expected outcome	Relevant information for stakeholders, Stakeholder feedbacks needed, informed decision making in the future

Evaluation tasks in the EUFORIE workshops (Importance, evaluation 1-10)

Most common energy efficiency policies in Europe (Markandya et al. 2014; ODYSSEE-MURE 2017)

- Command and control, Codes
- Command and control, Standards
- Price instrument, Taxes
- Price instrument, Subsidies
- Price instrument, Tax deductions
- Price instrument, Credits
- Price instrument, Permits
- Price instrument, Tradable obligations
- Information instrument, Labels
- Information instrument, Audits
- Information instrument, Smart meters and billing information

Motivation factors for energy efficiency (Jentsch et al 2011; Langheim et al 2014)

- The safeguarding of energy availability
- Energy demand reduction of imports
- Increase environmental quality and lower pollution, climate protection
- Reducing energy costs
- Price of energy utilities]
- Increasing the share of renewable energy
- Environmental protection targets
- Social and cultural pressures
- Raise awareness and be positive role model for others
- Law and regulations
- Increased property value of houses and buildings
- State incentives to save energy consumption

Energy efficiency policy instruments (TEM 2016)

- Energy efficiency contracting
- Energy audits
- Cost-benefit analyses about energy systems
- Energy certificates and labels
- Consumer information systems about energy efficient solutions and applications
- Subsidies for energy efficient production

Energy saving technological instruments in households (Saul-Rinaldi et al 2014; ODYSSEE-MURE 2017)

- High-tech smart thermostats
- Home-automation lighting with LED lighting
- Energy management systems
- Energy Star appliances and certified products

- Charging stations
- Smart power strips

Policy instruments for energy efficiency in transportation (IEA 2010; ODYSSEE-MURE 2017)

- Fuel-efficient tyres
- Fuel economy of light-duty vehicles
- Fuel economy of heavy-duty vehicles
- Eco-driving technologies
- Better information through vehicle labelling
- Fiscal incentives for energy efficient systems
- Modal shift in transportation systems
- Energy efficient freight transport

Policy instruments for energy efficiency in buildings (Wuppertal Institute 2014; ODYSSEE-MURE 2017)

- Regulation of buildings
- Transparency and information about energy solutions
- Incentives and financing of energy efficient buildings
- Capacity building and networking in building industries
- Promoting of energy services for energy efficient buildings
- R&D and BAT (Best Available Technologies) promotion in building industries

Annex 2. Agenda of the Italian workshop

Workshop Internazionale

Costi e benefici dell'efficienza energetica.

Gli scenari in Italia e in Europa

18 novembre 2016 - Sala Auditorium, GSE, Viale Maresciallo Pilsudski 92, 00197 Roma

9.30 **Introduzione e saluti**

- Claudio Ferrari, Presidente Federesco

9.40 **Scenari europei dell'efficienza energetica**

- Jarmo Vehmas, Finland Future Research Centre, Turku School of Economics, University of Turku, Finland, Coordinatore del progetto Europeo EUFORIE

10.00 **L'efficienza energetica come strumento di sviluppo**

- Sergio Ulgiati, Università Parthenope di Napoli e Università Normale di Pechino, Presidente F.I.F. Federesco International Foundation

10.20 **Primi orientamenti per una nuova direttiva per l'efficienza energetica degli edifici**

- Roberto Moneta, ENEA

10.40 **Le normative italiane per l'efficienza energetica**

- Mauro Mallone, Ministero dello Sviluppo Economico

11.00 Discussione

11.20 Coffee Break

11.40 Francesco Sperandini, GSE

12.00 Sebastiano Serra, Ministero dell'Ambiente

12.20 **La riqualificazione energetica del palazzo della Farnesina a Roma**

- Tonino Castrichino, Ministero degli Esteri

12.40 Antonello Pezzini, Comitato europeo Confindustria

13.00 Discussione

13.20 **Conclusioni**

- Antonio Vrenna, Vice presidente Federesco e F.I.F

13.30 Pranzo

Sessione A: Metodi di misura e valutazione dell'efficienza energetica

14:30 **Metodi di valutazione dell'efficienza materiale ed energetica (C.E.D. – Cumulative Energy Demand; LCA – Life Cycle Assessment)**

- Sergio Ulgiati, Università Parthenope di Napoli

14:50 **La Validazione dei Progetti Energetici**

- Giovanni Maraviglia, Responsabile Tecnico VPE S.r.l.

15:10 – 17:30 **Presentazione di progetti e realizzazioni di efficienza energetica da parte dei partecipanti (ESCO, Amministratori, ONLUS & ONG, Ricercatori, Associazioni).**

Discussione.

Sessione B: Riunione interna degli aderenti a Federesco (14.30-16-30)

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Annex 3. Participants of the Italian workshop

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Annex 4. Agenda of the Spanish/Catalan workshop

EUFORIE
European Futures for Energy Efficiency

Stakeholders Workshop

Lessons learned from a critical analysis of European energy directives:
Policy implications for *Pla de l'Energia i Canvi Climàtic de Catalunya 2012-2020*

Friday, 24 March 2017, 09.30 – 14.00

Venue: Col.legi d'Enginyers Industrials de Catalunya, Via Laietana 39, Barcelona

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09.30 **Welcome and introduction**

Ferran Tarradellas (Head of the Representation of the European Commission in Barcelona);
Jarmo Vehmas (Coordinator EUFORIE, University of Turku, Finland)

10.00 **Public energy policies in the EU context: Results from EUFORIE**

How useful is the concept of energy efficiency for setting policy targets? How reliable is the scaling up of intermittent energy sources?

Mario Giampietro (ICTA, Universitat Autònoma de Barcelona)

10.30 **Panel reflections**

Do we have a plan B if low-carbon technologies will be unable to replace fossil energy (liquid fuels and electricity) on a large scale in the next 10-20 years?

Panelists: Francesc Bonvehi (Member of the Taula Inter-Professional de l'Energia), Marcel Coderch (President, Autoritat Catalana de la Competència), Joaquim Coromines (President Associació Congrés d'Energia de Catalunya), Josep Ballard (Comissió d'energia de l'Associació d'Enginyers Industrials de Catalunya) (t.b.c), Alfons Perez (Xarxa per la Sobirania Energètica), Pep Puig (Director d'Ecoserveis)

Moderator: Cristina Soler (Responsable Grup de Treball d'Eficiència Energètica, EIC)

11:30 **Coffee break**

11:45 **The view from industry and civil society**

Virgina Guinda (Presidenta del Foro Energia de Foment del Treball),
Maria Campuzano (Aliança Contra la Pobresa Energètica)

12.15 **Round table**

Do we need better indicators, more realistic targets or more effective governance structures?

13.15 **Questions from the public**

13.45 **Closure of the workshop**

José Mª Garcia Casasnovas (President of the Energy Commission, Col·legi d'Enginyers Industrials de Catalunya)

Event open to the public – registration required here

UAB
Universitat Autònoma de Barcelona

Annex 5. Participants of the Spanish/Catalan workshop

	Name and Surname	Organization	Categoria
1	Albert Avellaneda	Generalitat de Catalunya. DTES. DGQACC	Government
2	Albert Casals	ingenierio	Private Company
3	Alexandre Ramon Corrales	Coop GEENI	Cooperative
4	Alfons Pérez	Observatori del Deute en la Globalització	NGO
5	Ansel Renner	ICTA-UAB	Academia
6	Carlos Chica	Colegio de Ingenieros de Caminos, Comisión Agua-Energía	Professional Association
7	Cristina Soler	Grup de Treball d'Eficiència Energètica EIC	Professional Association
8	Eloi Pareja Seca	Som Energia	Cooperative
9	Fabiana Corcelli	University of Naples Parthenope (EUFORIE)	Academia
10	Francesc Bonvehí	Taula Inter-Profesional de l'Energia	Professional Association
11	Giovanna Apice	Parthenope university (EUFORIE)	
12	Jari Kaivo-oja	University of Turku (EUFORIE)	Academia
13	Jarmo Vehmas	University of Turku (EUFORIE)	Academia
14	Jaume Puigdueta	Associació Enginyers Industrials de Catalunya	Professional Association
15	Javier Alcala	Enermed Renovables SL	Private Company
16	Joan A. Pérez Rodríguez	Energy Expert	Private Company
17	Joan Josep Escobar Sánchez	ICAEN- Generalitat de Catalunya	Government
18	Joan Xufre	Energy comission of COEIC	Professional Association
19	Joaquim Corominas	Associació Congrés d'Energia de Catalunya	NGO
20	Jose Mª Casasnovas	Col·legi Enginyers	Professional Association
21	Josep Ballart	Comissió d'Eenrgia de l'Associació d'EIC	Professional Association
22	Juanjo Iraegui Navarro	Fundació ENT	Private Foundation
23	Júlia Botella	Holaluz	Private Company
24	Katerina Zalamova	CREA IDEA LAB	Private Company
25	Laura Pérez Sánchez	UAB	Academia
26	Lluís Bassas	Self-employed	Private Company
27	Lluis Gasull Poch	Generalitat de Catalunya	Government
28	Maddalena Ripa	UAB (EUFORIE)	Academia
29	Maria Campuzano	Aliança Contra la pobresa Energètica	NGO
30	Mario Giampietro	ICREA/ICTA-UAB (EUFORIE)	Academia
31	Michele Manfroni	UAB-ICTA	Academia
32	Muriel Prieto	Holaluz	Private Company
33	Oriol Llorens	Universitat de Barcelona	Academia
34	Pep Puig	Ecoserveis	Private Company
35	Raúl Velasco-Fernández	ICTA-UAB (EUFORIE)	Academia
36	Renato Rallo	Parthenope university (EUFORIE)	Academia
37	Rodrigo Ramírez-Pisco	F-3i2e	Private Company
38	Roger Sallent Cuadrado	Banco Inter-Americano de Desarrollo	Government
39	Samuele Lo Piano	ICTA-UAB	Academia
40	Sandra Bukkens	ICTA-UAB (EUFORIE)	Academia
41	Teresa Sanjuan	None	Civil Society
42	Xavier Corbella Martinez	Enginyer Industrial	Private Company
43	Zora Kovacic	ICTA-UAB	Academia

Annex 6. Agenda of the German workshop

Energy Efficiency and beyond
Workshop held in contribution to WP 7 of the EUFORIE Project
Frankfurt, Kal, Kasseler Str. 1, Freitag, 2. Juni

11:00 Welcome and introduction
(Dr. Joachim H. Spangenberg, Vice Chair, SERI Deutschland)

11:10-11:30 Presenting core findings of the EUFORIE research project
(Dr. Jarmo Vehmas, coordinator EUFORIE, University of Turku, Finland) (English language)

11:30-11:45 Energy Efficiency Policy in Germany
(Dr. Werner Neumann, Chairman, Energy Policy Commission, BUND Germany)
- Where are we and where are knowledge and action deficits?
- Where to go for meeting the 1,5°C target of the Paris agreement?
- How much energy conservation is necessary, what can energy efficiency contribute and what are the potentials of renewable energy?

11.45-12:15 Discussion

12:15-12:30 Energy efficiency from a household perspective. Findings from the EUFORIE project
(Dr. Sylvia Lorek, Chair, SERI Germany)
(Resource Person: Leon Leuser, ifeu Institut Berlin)

12:30-13:00 Diskussion

13:00-14:00 Lunch break

14:00-14:10 Introduction to the afternoon sessions
(Dr. Joachim H. Spangenberg)

14:15-14:45 Economic implications of different energy policies
(Prof. Dr. Rudi Kurz, UN Initiative Principles for Responsible Management Education)
(Resource Person: Prof. Dr. Felix Ekardt, Forum Energy Efficiency)

14:45-15:30 Discussion

15:30-16:00 Coffee break

16:00-16:20 Business implications of different energy policies
(Prof. Dr. Werner Wild, Bavarian Program for Environmental Counseling and Auditing; Governing Board Juergie eG Neumark)

16:20-17:00 Discussion

17:00-17:20 Beyond Energy Efficiency: which other instruments might be needed?
(Dr. Sylvia Lorek, Vorsitzende, SERI Deutschland)
(Resource Person: Prof. Dr. Angelika Zahrnt, Founding member of the German Council for Sustainable Development)

17:20-18:00 Discussion

18:00-18:30 Résumé

Annex 7. Participants of the German workshop

	Name	First name	Organisation
	Baumann	Barbara	
	Buschmann	Rolf	BUND, Berlin
	Colago	Irmela	BUND, Berlin
Dr.	Constein	Daniel	Federal Environment Agency, Dessau
	Ebinger	Katharina	Zeppelin University, Friedrichshafen
	Ellen	Enslin	Eco-Fair Consulting,
Dr.	Gebauer	Jana	Die Wirtschaft der Anderen, Berlin
	Hertzke	Achim	BUND NRW, Düsseldorf
Dr.	Vehmar	Jarmo	University of Turku
Dr.	Kraus	Jobst	Oecomenical Energy-Cooperation, Bad Boll
Dr.	Leuser	Leon	ifeu, Berlin
Dr.	Lorek	Sylvia	SERI Deutschland, Köln
Dr.	Lührsen	Wolfgang	Energy Industry Consultant
	Meindorf	Johann	Social Insurance, Bavaria
Dr.	Neumann	Werner	Frankfurt Energy Agency
Dr.	Rudi	Kurz	UN Initiative Principles for Responsible Management Education, Pforzheim
	Schäfer	Insa	Plurale Ökonomie, Oldenburg
Dr.	Schmalz	Dieter	Institut for Public Law, Münster
Dr.	Schreiner	Jörg	Global Challanges Network
Dr.	Spangenberg	Joachim	SERI Deutschland, Köln
	Steffen	Arne	Werk.Um Architekten
	von Bützingslöwen	Wolf	Energetical Quarter Restoration, Werra-Meißner
	Welz	Tobias	Environment Protection Officer, Archbishopric, Köln
Dr.	Wild	Werner	Governing Board Juergie eG Neumark
Dr.	Zahrnt	Angelika	Founding Member German Council for Sustainable Development
Dr.	Zieschank	Roland	Environmental Policy Research Center, Berlin

Annex 8. Questions of the Finnish semi-structured interviews

Question #1

How do you see energy efficiency as a political objective? What are the current challenges attributed to energy efficiency in this context?

Question #2

What is the improvement potential of energy efficiency (a) in general; and (b) in the sector you represent? In which sectors or divisions do you see the most potential for improvement?

Question #3

Are there any challenges or obstacles related to the improvement of energy efficiency?

Question #4

Which are, in your opinion, the technologies that can best improve energy efficiency?

Question #5

How would you rate the effect of the following control tools on the improvement of energy efficiency on a scale from 1 to 5 (1=very useful; 2=useful; 3=no effect; 4=harmful; 5=very harmful)?

1. Normative tool: codes
2. Normative tool: standards
3. Economic tool: energy taxation
4. Economic tool: efficiency-based tax deductions
5. Economic tool: efficiency-based investment support
6. Economic tool: interest relief for investment funding
7. Economic tool: emissions trade
8. Informative tool: energy labels
9. Informative tool: energy audits
10. Informative tool: energy certificates
11. Informative tool: education and research
12. Informative tool: dissemination of information and campaigns
13. Informative tool: voluntary energy efficiency agreements

Annex 9. List of interviewed stakeholders in Finland

Name of participant	Position	Stakeholder category
Kari Alanne	Aalto University Energy Efficiency and Systems	Academia
Karoliina Auvinen	Aalto University Smart Energy Transition and FinSolar, Project manager	Academia, NGO / Citizens
Patrick Frostell	Technology Industries of Finland Electricity and IT technologies	Industry / industrial organization
Juhani Heljo	Tampere University of Technology, Civil engineering Project manager	Academia
Päivi Laitila	Motiva Oy, Department director Energy efficiency	Government / Public sector
Peter Lund	Aalto University New Energy technologies	Academia
Kalevi Luoma	The Association of Finnish Local and Regional Authorities Energy efficiency	Government / Public sector, NGO / Citizens
Sami Nikander	The Chemical Industry Federation of Finland Energy, climate and sustainability	Industry / industrial organization
Timo Ritonummi	Ministry of Economic Affairs and Employment Energy efficiency and emissions trade	Government / Public sector
Kati Ruohomäki	Confederation of Finnish Industries Energy Efficiency	Industry / industrial organization
Tuomas Tikka	Finnish Forest industries Energy and emissions trade	Industry / Industrial organization

Annex 10. The Italian questionnaire

ENERGY EFFICIENCY: Costs, benefits, problems

The University 'Parthenope launched, starting in May 2016, an initiative of collaboration between institutions, the research community and civil society, aimed at greater participation and collaboration on issues of pressing environmental and social relevance. This initiative, called Beauty Urban Laboratory, takes place in the context of European projects SMACC (Smart City Coaching) and euphoria (EUropean Futures of Energy Efficiency).

This questionnaire aims to focus on the point of view of a qualified group of users and experts in preparation for the two events to be held in November on the subject of energy efficiency:

Urban Wellbeing Workshop 3 - The energy efficiency in everyday life - Naples, November 8, 2016, Universita 'Parthenope, Business District.

Workshop "Costs and Benefits of Energy Efficiency - The Scenarios", November 18, 2016, GSE Auditorium, Viale Marshal Pilsudski, 92, Rome.

The energy efficiency

1. What does it mean, in your opinion, energy efficiency?
   - Consume less energy without reducing the current living standards
   - Consume less energy even if this means some reduction in living standards
   - Only use renewable energy
   - Purchase energy from sources more competitive from the economic point of view
   - Consume the same amount of energy, but improve their standard of living
   - .....

2. In your opinion, which of the following possibilities characterize the concept of being energy efficient? (It can take up to 3 answers)
   - Windows thermal insulation
   - Install photovoltaic solar panels
   - Buy only appliances class A +
   - Install gas central heating
   - Use a smaller passenger car
   - Use as much as possible by public transport
   - Put the counters of heat to the radiators
   - Go by bicycle
   - Change their lifestyle, avoiding waste
   - Reduce food waste
   - Reduce waste
   - ……

3. Which, among the possibilities listed in the previous question, she already adopts in its daily practice? (It can take up to 3 answers)
    - Windows thermal insulation
    - Install photovoltaic solar panels
    - Buy only appliances class A +
    - Install gas central heating
    - Use a smaller passenger car
    - Use as much as possible by public transport
    - Put the counters of heat to the radiators
    - Go by bicycle
    - Change their lifestyle, avoiding waste
    - Reduce food waste
    - Reduce waste
    - ……

4. Are you aware that for the renovation of the house or new buildings, there is a tax deduction of 65% for measures to improve energy efficiency and seismic upgrading of buildings, recoverable in 10 years?
    - Yes
    - No
    - I have heard about, but without go deep
    - I have heard about and I will get more information about
    - I have heard about but it doens't seem good

5. Do you believe that an economic incentive represents the optimal solution for achieving greater energy efficiency?
    - Yes
    - No
    - Yes, but just if there are good benefits
    - Yes, buti t couldn't be the only solution

6. What other forms of awareness do you think are appropriate? (Can give up to three answers)
    - Inform more media
    - Inform more in school
    - Periodic meetings between citizens and administrators
    - Open doors for efficiency in a decentralized
    - Inform via social networks
    - Open a dialogue with all associations at the city level
    - Promote events, competitions, contests, prizes, and all other forms of advertising to popularize the concept of energy efficiency
    - ……

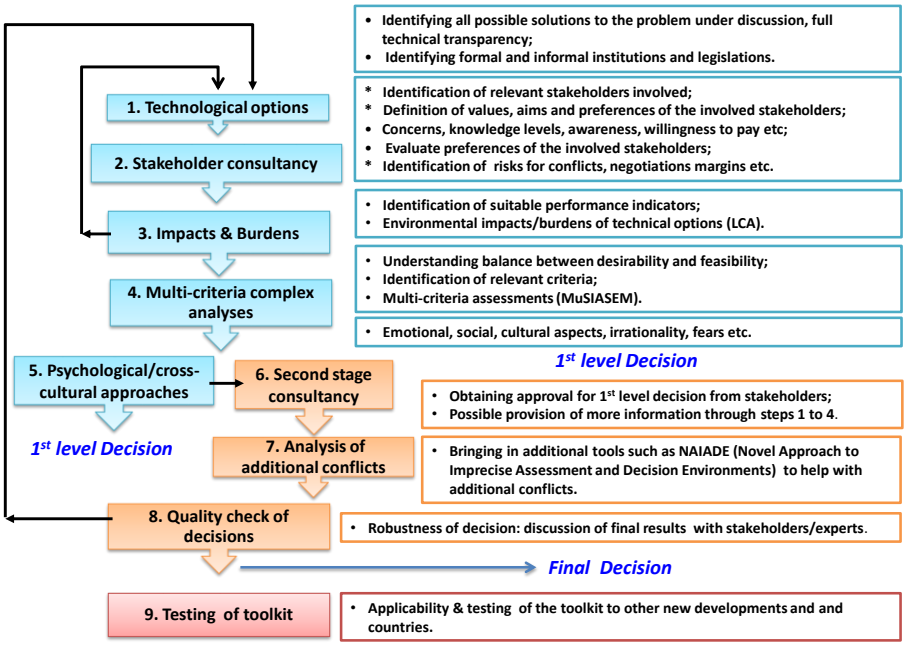
7. Would you invest a sum of your personal budget (family, business) to increase to energy efficiency home (or business)?
    - Yes
    - No
    - It depends on the extent of achievable benefits
    - It depends on the amount needed

8. Are you aware of the regulations and incentives for energy efficiency in Italy?
    - Yes

- No
- Just a part
- I don't know where find the new regulations

9. What, in your opinion, the major obstacles to energy efficiency in our country? (Can give up to three answers)
    - Lack of information
    - Lack of funding
    - Lack of technical skills
    - Disinterest of the authorities
    - The price of oil has become too low
    - It mingles energy efficiency with renewable energy
    - There are too many other more important issues
    - ……
10. Do you know what ESCo means?
    - Yes
    - No
    - I have heard about but I don't what does mean
11. Do you know what White Certificate means?
    - Yes
    - No
12. What have been your sources of information about energy efficiency?
    - Newspapers and magazines
    - Websites and social networks
    - Friends and acquaintances
    - Reading of official documents for professional reasons
    - TV
    - ……
13. Would you like to participate in in-depth meetings on energy efficiency?
    - Yes
    - No
    - It is depended on the procedure
    - No, I would prefer other information tools (news, web, etc)

Implementation and enforce participatory processes. The following figure is a result of a European project on the management of municipal waste in the city of Naples, recently concluded. It proposes a roadmap to increase the degree of participation of all parties interested in a possible decision on the management of a problem (and therefore also for the problem of energy efficiency). Please observe carefully before answering the following questions.



14. Can you tell us if the path outlined in the figure's clear enough?
    - You, very clear
    - Yes, but not enough. Other explanations should be added
    - No, I do not understand the connection between the different steps
    - No, it is not clear at all

15. Which phases is the most important?
    - The phase concerning the transparency of Technological Options
    - The phase of consultation of the interested parties (stakeholders)
    - The ability to use scientific methods of rating, for example come LCA
    - The multi-criteria analysis, as well as Put Together Different Points of View
    - The approach to degree Also consider Psychological Aspects, Social and Cultural
    - The possibility of a second consultation of stakeholders downstream of the analysis process and before the final decision
    - Analysis of Possible Conflicts, of the people involved and diversification among the collective interests and all the Individual Actors involved in the participatory process

16. Who thinks must be the promoter of this participatory process?
    - Public authorities
    - Citizens in person
    - The committees and / or citizens' associations
    - Technical experts
    - All together

17. Do you think this process of participation is a real possibility of harmonizing the various interests of all parties involved?
    - Yes, if it were implemented as presented
    - No, it is too complex to implement and so it is not easy to reach a compromise that works for all
    - I do not know

- Perhaps, changing some passages (can you tell us which ones?)
- No, the benefits achievable by each component should be identified and clarified

18. Do you think it is important to have the views of all parties involved and believes that it is only necessary to consult the experts and leave the public administrations in partial autonomy?
    - Experts should help governments
    - The administration should listen more to all parties involved
    - You cannot involve everyone in the decision process
    - Although difficult, we must involve everyone in the decision process, but only after listening to the expert advice

19. Why would you want to be involved in decision making related to your city porblems?
    - Because only thanks to the contribution of all is feasible optimal solution
    - Why it is the right choice and democratic
    - Why public authorities alone are not reliable
    - Because the technological solutions alone are not enough

20. If yes, how much time would be willing to spend for such involvement?
    - A meeting one afternoon a week
    - A meeting per month
    - Fill out a questionnaire of satisfaction monitoring, once a month
    - Fill out a questionnaire of satisfaction monitoring, once every six months

21. Do you believe that theme periodic meetings, as proposed by Parthenope University Urban Wellbeing, can be useful to monitor, discuss and solve specific problems?
    - Yes
    - Noit would be another waste of time among people who can not make decisions
    - Perhaps, but there is the risk of increasing words without matched by action
    - Yes, but it should not be initiated by the University, but the city administration

22. Who do you think should be the promoter of these forms of collaboration town? (Can take up to 2 answers)
    - The city administration
    - The social and cultural associations
    - The neighborhood committees
    - Trade unions and political parties
    - Consumer associations
    - Public schools and universities
    - The local libraries

23. Do you think that today the involvement of stakeholders is more important, because public authorities are less reliable?
    - It is not a question of reliability but of participation in the search for solutions
    - Yes, today they are less reliable than before
    - I do not know
    - Public authorities have never been reliable and probably not in the near future
    - The authorities are reliable, but the problem is complex, needs new tools

24. Main energy efficiency measures implemented in Italy and Europe (score from 1 to 10, 1 less important – 10 really important)

- Regulatory Actions: Laws
- Reduce Energy Imports
- Increase environmental quality and reduce pollution
- Reduce Energy Costs
- Energy Service Price
- Increase the proportion of renewable energy
- Environmental protection challenges
- Social and cultural pressure
- Awareness and behavioral patterns
- Laws and regulation
- Increase in real estate value
- Governments' helps to reduce energy consumption

25. Factors that could help Energy Efficiency Implementation
    - Energy Availability
    - Reduce Energy Importation
    - Increase environmental quality and reduce pollution
    - Reduce Energy Costs
    - Energy Service Price
    - Increase the proportion of renewable energy
    - Environmental protection challenges
    - Social and cultural pressures
    - Awareness and behavioral patterns
    - Laws and regulations
    - Increase in real estate value
    - Governments' helps to reduce energy consumption

26. Energy Efficiency Policies (score from 1 to 10, 1 less important – 10 really important)
    - Energetic Audit
    - Cost Benefit Analysis for energy system
    - Label and energetic certification
    - Information Offices for energy efficiency solutions
    - Subsidy for energy production

27. Technological Tools for energy efficiency in buildings (score from 1 to 10, 1 less important – 10 really important)
    - Smart Thermostat
    - Led Lighting
    - Energy Management
    - Energy Start Disposal
    - Electric Charge Station
    - Smart Power Strip

28. Energy efficiency policies in transportation (score from 1 to 10, 1 less important – 10 really important)
    - Building regulations
    - Information on energy system
    - Subsidies on energy efficiency buildings
    - Training and networking on industry construction

- Promotion of energy services in efficient buildings
- Research and development and use of best technologies for building construction

29. Energy efficiency policies in buildings
    - Smart Tire
    - Policy on fuel for cars
    - Policy on fuel for heavy goods vehicles
    - Eco – driving technologies
    - Best information on vehicles certifications
    - Tax subsidies for efficient energy systems

Annex 11. Calculated top-lists from selected questions in the Italian questionnaire

Methodology: The importance of the items included in Tables 10-15 of the Italian questionnaire has been calculated by multiplying each grade (1-10) by the corresponding share in percentage (0-100%) of responses, and summing up the results (max=1000). See the corresponding chapter of the Italian questionnaire above, especially Table 10-15 for which the calculation has been carried out.

Importance of energy efficiency policy measures, calculated from Table 10:

Policy measure	Importance, max=1000
Social and cultural pressure	828
Increase environmental quality and reduce pollution	780
Environmental protection challenges	759
Governments' helps to reduce energy consumption	745
Awareness and behavioral patterns	690
Increase in real estate value	684
Energy Service Price	669
Laws and regulation	667
Regulatory Actions: Laws	659
Reduce Energy Imports	646
Increase the proportion of renewable energy	618
Reduce Energy Costs	572

Importance of motivation factors, calculated from Table 11:

Motivation factor	Importance, max=1000
Governments' helps to reduce energy consumption	956
Increase the proportion of renewable energy	822
Energy Service Price	808
Social and cultural pressures	800
Reduce Energy Costs	794
Energy Availability	787
Increase environmental quality and reduce pollution	757
Reduce Energy Importation	753
Awareness and behavioral patterns	730
Increase in real estate value	728
Environmental protection challenges	656
Laws and regulations	620

Importance of energy saving instruments, calculated from Table 12:

Energy saving instrument	Importance, max=1000
Information Offices for energy efficiency solutions	887

Subsidy for energy production	851
Cost Benefit Analysis for energy system	723
Energetic Audit	683
Label and energetic certification	670

Importance of energy efficiency technologies in households, calculated from Table 13:

Technology	**Importance, max=1000**
Led Lighting	855
Energy Start Disposal	827
Energy Management	777
Smart Thermostat	707
Smart Power Strip	633
Electric Charge Station	580

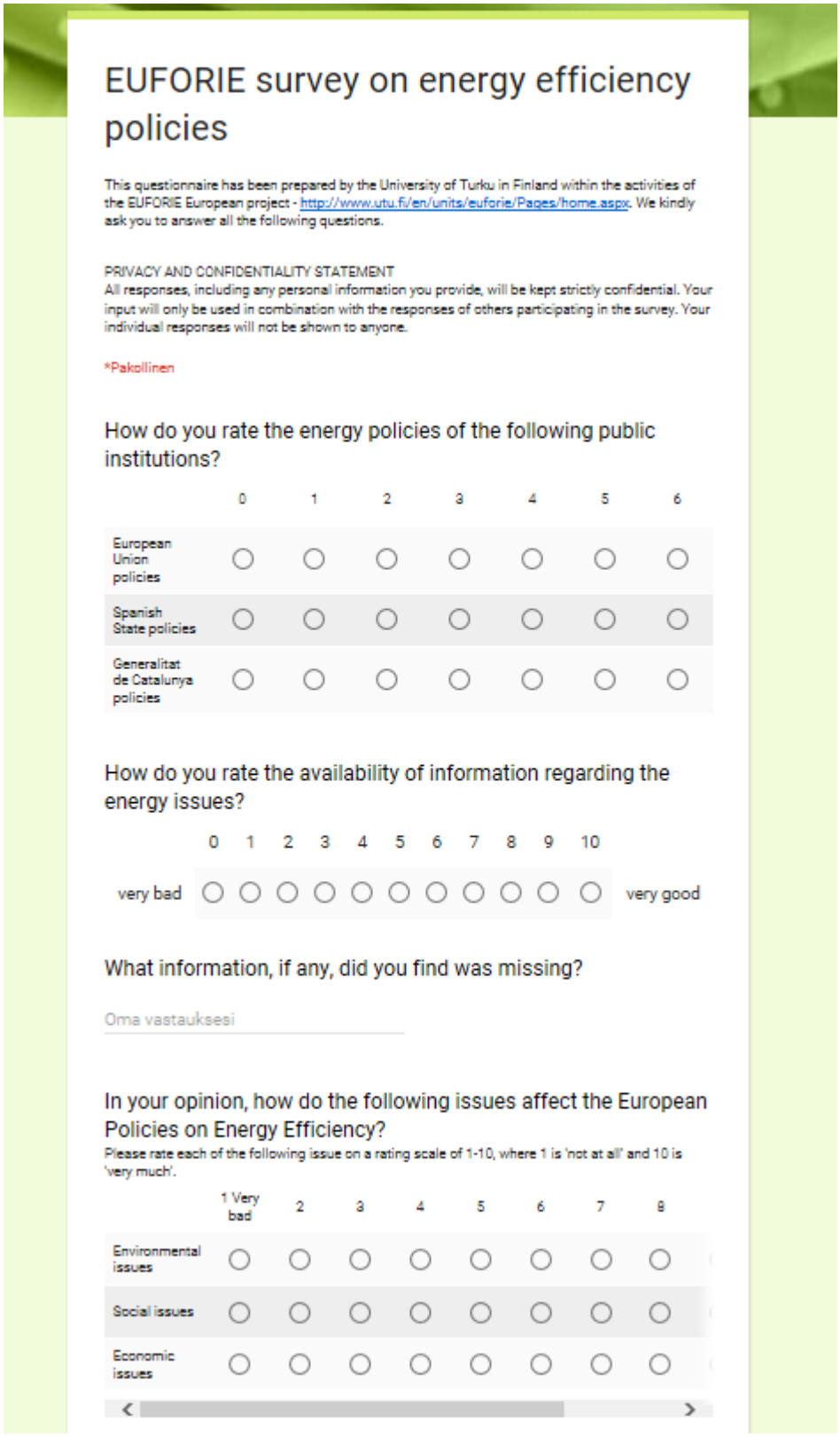
Importance of energy efficiency instruments in transport, calculated from Table 14:

Instrument	**Importance, max=1000**
Smart Tire	839
Eco-driving technologies	818
Best information on vehicles certifications	807
Policy on fuel for heavy goods vehicles	783
Policy on fuel for cars	781
Tax subsidies for efficient energy systems	720

Importance of energy efficiency instruments in buildings, calculated from Table 15:

Instrument	**Importance, max=1000**
Building regulations	944
Promotion of energy services in efficient buildings	854
Research and development and use of best technologies for building construction	804
Subsidies on energy efficiency buildings	772
Information on energy system	770
Training and networking on industry construction	693

Annex 12. The Spanish/Catalan questionnaire



EUFORIE survey on energy efficiency policies

This questionnaire has been prepared by the University of Turku in Finland within the activities of the EUFORIE European project - http://www.utu.fi/en/units/euforie/Pages/home.aspx. We kindly ask you to answer all the following questions.

PRIVACY AND CONFIDENTIALITY STATEMENT
All responses, including any personal information you provide, will be kept strictly confidential. Your input will only be used in combination with the responses of others participating in the survey. Your individual responses will not be shown to anyone.

*Pakollinen

How do you rate the energy policies of the following public institutions?

	0	1	2	3	4	5	6
European Union policies	○	○	○	○	○	○	○
Spanish State policies	○	○	○	○	○	○	○
Generalitat de Catalunya policies	○	○	○	○	○	○	○

How do you rate the availability of information regarding the energy issues?

	0	1	2	3	4	5	6	7	8	9	10	
very bad	○	○	○	○	○	○	○	○	○	○	○	very good

What information, if any, did you find was missing?

Oma vastauksesi

In your opinion, how do the following issues affect the European Policies on Energy Efficiency?
Please rate each of the following issue on a rating scale of 1-10, where 1 is 'not at all' and 10 is 'very much'.

	1 Very bad	2	3	4	5	6	7	8
Environmental issues	○	○	○	○	○	○	○	○
Social issues	○	○	○	○	○	○	○	○
Economic issues	○	○	○	○	○	○	○	○

Please rate each of the following energy efficiency policies on a rating scale of 1-10, where 1 is 'not at all important' and 10 is 'very important'. *

A. Most common energy efficiency policies in Europe (source Project ODYSSEE-MURE, Anil Markandya Xavier Labandeira & Ana Ramos (2014) Policy Instruments to Foster Energy Efficiency)

	3	4	5	6	7	8	9	10	op
1. Command and control, Codes	○	○	○	○	○	○	○	○	(
2. Command and control, Standards	○	○	○	○	○	○	○	○	(
3. Price instrument, Taxes	○	○	○	○	○	○	○	○	(
4. Price instrument, Subsidies	○	○	○	○	○	○	○	○	(
5. Price instrument, Tax deductions	○	○	○	○	○	○	○	○	(
6. Price instrument, Credits	○	○	○	○	○	○	○	○	(
7. Price instrument, Permits	○	○	○	○	○	○	○	○	(
8. Price instrument, Tradable obligations	○	○	○	○	○	○	○	○	(
9. Information instrument, Labels	○	○	○	○	○	○	○	○	(
10. Information instrument, Audits	○	○	○	○	○	○	○	○	(
11. Information instrument, Smart meters and billing information	○	○	○	○	○	○	○	○	(

Tämä kysymys vaatii yhden vastauksen kullekin riville.

Please rate each of the following motivation factors for energy efficiency on a rating scale of 1-10, where 1 is 'not at all important' and 10 is 'very important'. *

B. Motivation factors for energy efficiency (see e.g. Marc Jantsch, Marco Jahn, Ran'a Reiners, Uwe Kirschenmann (2011), Collecting Factors for Motivating Energy-Saving Behavior, Ria Langheim, Georgina Arreola and Chad Reese (2014) Energy Efficiency Motivations and Actions of California Solar Homeowners, ACEEE 2014 Summer Study on Energy Efficiency in Buildings).

	1	2	3	4	5	6	7	8
1. The safeguarding of energy availability	○	○	○	○	○	○	○	○
2. Energy demand reduction of imports	○	○	○	○	○	○	○	○
3. Increase environmental quality and lower pollution, climate protection	○	○	○	○	○	○	○	○
4. Reducing energy costs	○	○	○	○	○	○	○	○
5. Price of energy utilities	○	○	○	○	○	○	○	○
6. Increasing the share of renewable energy	○	○	○	○	○	○	○	○
7. Environmental protection targets	○	○	○	○	○	○	○	○
8. Social and cultural pressures	○	○	○	○	○	○	○	○
9. Raise awareness and be positive role model for others	○	○	○	○	○	○	○	○
10. Law and regulations	○	○	○	○	○	○	○	○
11. Increased property value of houses and buildings	○	○	○	○	○	○	○	○
12. State incentives to save energy consumption	○	○	○	○	○	○	○	○

Please rate each of the following energy efficiency instruments on a rating scale of 1-10, where 1 is 'not at all important' and 10 is 'very important'. *

C. Energy efficiency policy instruments (TEM 2016).

	1	2	3	4	5	6	7	8	9
1. Energy audits	○	○	○	○	○	○	○	○	○
2. Cost-benefit analyses about energy systems	○	○	○	○	○	○	○	○	○
3. Energy certificates and labels	○	○	○	○	○	○	○	○	○
4. Consumer information systems about energy efficient solutions and applications	○	○	○	○	○	○	○	○	○
5. Subsidies for energy efficient production	○	○	○	○	○	○	○	○	○

Please rate each of the following energy saving instruments on a rating scale of 1-10, where 1 is 'not at all important' and 10 is 'very important'. *

D. Energy saving technological instruments in households

	1	2	3	4	5	6	7	8	9
1. High-tech Smart Thermostats	○	○	○	○	○	○	○	○	○
2. Home-Automation Lighting with LED Lighting	○	○	○	○	○	○	○	○	○
3. Energy Management Systems	○	○	○	○	○	○	○	○	○
4. Energy Star appliances and certified products	○	○	○	○	○	○	○	○	○
5. Charging Stations	○	○	○	○	○	○	○	○	○
6. Smart Power Strips	○	○	○	○	○	○	○	○	○

Please rate each of the following policy instruments on a rating scale of 1-10, where 1 is 'not at all important' and 10 is 'very important'. *

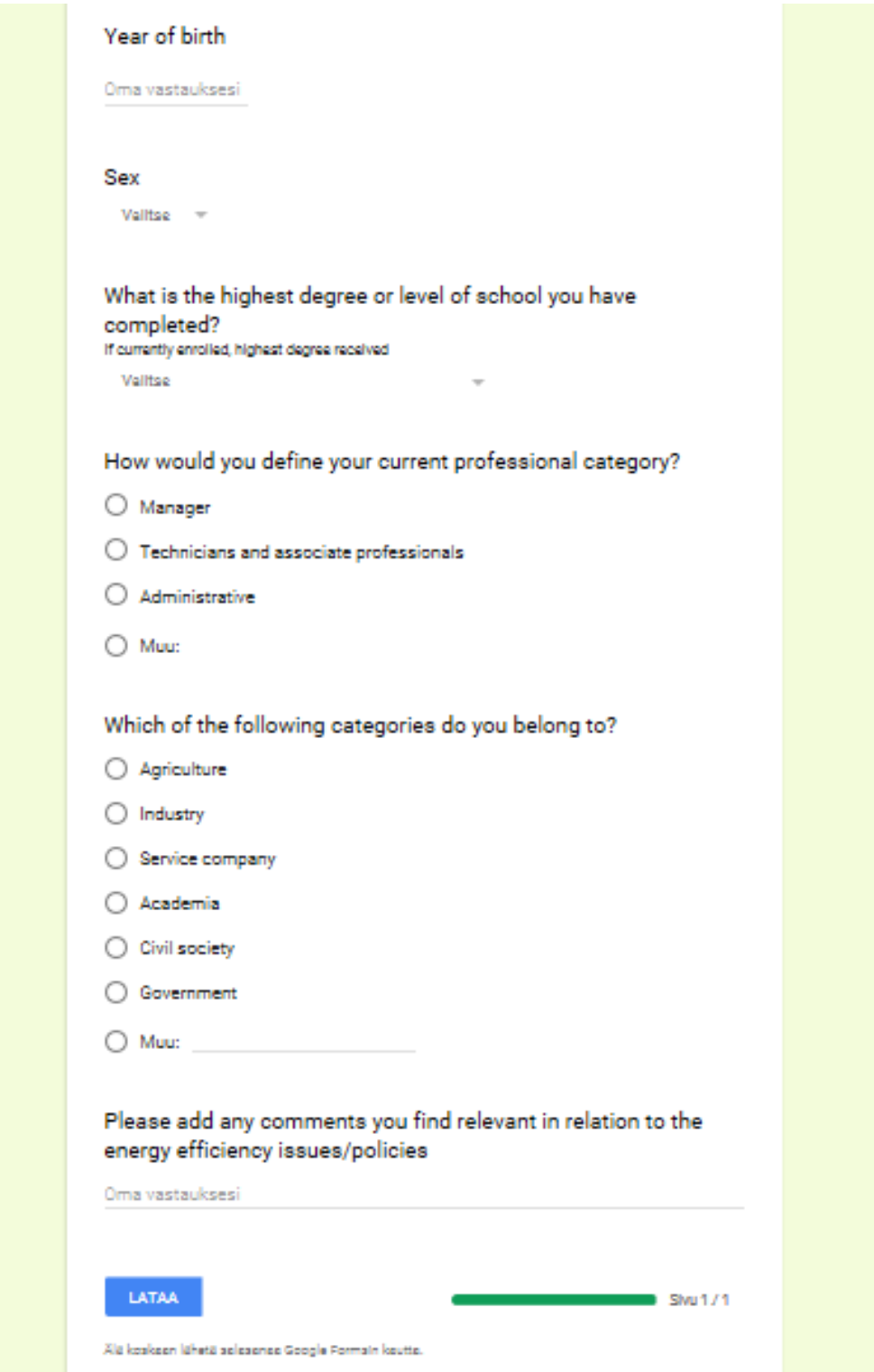
E. Policy instruments for energy efficiency in transportation (IEA classification, modified)

	1	2	3	4	5	6	7	8
1. Fuel-efficient tyres	○	○	○	○	○	○	○	○
2. Fuel economy of light-duty vehicles	○	○	○	○	○	○	○	○
3. Fuel economy of heavy-duty vehicles	○	○	○	○	○	○	○	○
4. Eco-driving technologies	○	○	○	○	○	○	○	○
5. Better information through vehicle labelling	○	○	○	○	○	○	○	○
6. Fiscal incentives for energy efficient systems	○	○	○	○	○	○	○	○
7. Modal shift in transportation systems	○	○	○	○	○	○	○	○
8. Energy efficient freight transport	○	○	○	○	○	○	○	○

Please rate each of the following policy instruments on a rating scale of 1-10, where 1 is 'not at all important' and 10 is 'very important'.

F. Policy instruments for energy efficiency in buildings (Wuppertal Institute (2014) classification, modified, http://www.bigee.net/media/filer_public/2015/02/06/bigee_brochures_energy_efficiency_policy_for_appliances.pdf)

	1	2	3	4	5	6	7	8
1. Regulation of buildings	○	○	○	○	○	○	○	○
2. Transparency and information about energy solutions	○	○	○	○	○	○	○	○
3. Incentives and financing of energy efficient buildings	○	○	○	○	○	○	○	○
4. Capacity building and networking in building industries	○	○	○	○	○	○	○	○
5. Promoting of energy services for energy efficient buildings	○	○	○	○	○	○	○	○
6. R&D and BAT (Best Available Technologies) promotion in building industries	○	○	○	○	○	○	○	○



Year of birth

Oma vastauksesi

Sex

Valitse

What is the highest degree or level of school you have completed?

If currently enrolled, highest degree received

Valitse

How would you define your current professional category?

- Manager
- Technicians and associate professionals
- Administrative
- Muu:

Which of the following categories do you belong to?

- Agriculture
- Industry
- Service company
- Academia
- Civil society
- Government
- Muu:

Please add any comments you find relevant in relation to the energy efficiency issues/policies

Oma vastauksesi

LATAA

Sivu 1 / 1

Älä koskaan lähetä salasanoja Google Formsin kautta.

Annex 13. Calculated top-lists from selected questions in the Spanish/Catalan questionnaire

Methodology: The importance of the items has been calculated by multiplying each grade (1-10) by the corresponding share of responses in percentage (0-100 %), and summing up the results (max=1000). The calculations have been carried out for Tables 19-24 in the Spanish/Catalan questionnaire; see the corresponding chapter on the Spanish/Catalan questionnaire above.

Importance of energy efficiency policy measures, calculated from Table 19:

Policy measure	**Importance, max=1000**
Taxes	636
Energy audits	627
Smart meters and billing information	616
Tax deductions	593
Subsidies	591
Labels	556
Permits	549
Codes	496
Credits	488
Standards	487
Tradable obligations	458

Importance of motivation factors, calculated from Table 20:

Motivation factor	**Importance, max=1000**
Increase environmental quality and lower pollution, climate protection	803
Environmental protection targets	756
Energy demand reduction of imports	732
Increasing the share of renewables	727
Raise awareness and be a positive role model for others	720
Reducing energy costs	683
Social and cultural pressure	682
Increased property value of houses and buildings	672
State incentives to save energy consumption	669
Safeguarding energy availability	649
Price of energy utilities	625

Importance of energy saving instruments, calculated from Table 21:

Energy saving instrument	**Importance, max=1000**
Consumer information systems about energy efficient solutions and applications	758
CBA of energy systems	731

Energy certificates and labels	691
Subsidies for energy efficient production	690
Energy audits	672

Importance of energy efficiency technologies in households, calculated from Table 22:

Technology	**Importance, max=1000**
Energy management systems	731
High-tech smart thermostats	718
Home-automatic lighting with LEDs	701
Energy Star appliances and certified products	670
Smart power strips	588
Charging stations	562

Importance of energy efficiency instruments in transport, calculated from Table 23:

Instrument	**Importance, max=1000**
Modal shift in transportation systems	827
Energy efficient freight transport	803
Fiscal incentives for energy efficient systems	794
Fuel economy of heavy-duty vehicles	735
Fuel economy of light-duty vehicles	726
Better information through vehicle labeling	681
Eco-driving technologies	678
Fuel-efficient tyres	582

Importance of energy efficiency instruments in buildings, calculated from Table 24:

Instrument	**Importance, max=1000**
Promoting of energy services for buildings	804
Incentives and financing of energy efficient buildings	800
Transparency and information about energy solutions	760
Regulation of buildings	719
R&D and BAT (Best Available Technology) promotion in building industries	715
Capacity building and networking in building industry	690