

# GREEN ENERGY IN SMART BUILDINGS INVESTMENTS

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## ABSTRACT

The Institute of Radio and Information Systems (IRIS) – Association based in Vienna, Austria, whose staff has extensive experience in scientific work and organizing international conferences in various countries, publishes its own scientific journals and has a book publishing house. We plan to build our actions within the Smart Finance for Smart Buildings (SFSB) initiative and the methodology used in SEI Forums to bring together a wide range of participants, developing it in direction: most of the energy consumed by buildings is spent on space heating including air required for ventilation. Advocacy and development of programs for financing the expansion of the use of air heat pumps with energy recovery of heated (in summer cooled) ventilated air will reduce energy costs for heating by almost 4 times with a quick payback period. In 5 years after project are provided: primary energy savings triggered by the project; investments in sustainable energy triggered by the project; reduction of the greenhouse gases emissions. To create national roundtables on energy efficiency investments as multilateral discussion forums bringing together government, local and regional authorities, financial sector, ESCOs, homeowners, industry, construction sector and SME sector, we propose to engage professionals from our conference partners: Technische Universität Wien; IEEE Technology Center GmbH (Wien); Politische Akademie der ÖVP (Wien); Aspern Smart City Research GMBH & CO KG. Our proposals relate mainly to Austria however, they include a share of events in Czech Republic, Slovakia, Hungary, Slovenia which we can successfully organize with help of the IEEE Technology and Engineering Management Society Central Europe Chapter from our partner IEEE Austria Section as well as exchange with roundtables throughout Europe which will be coordinated by Commission services. The proposed project consist of blocks: Information-statistical, Training, Expert, and Legislative initiatives.

**KEYWORDS:** *Policy making on energy efficiency; Energy efficient buildings; Air ventilation; Energy recovery; Heat pump; Space heating.*

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## 1. Introduction

Access to private finance for energy efficiency and integrated renewables remains challenging. One obstacle is the lack of common understanding of the topic between government, public sector, private sector, and the financial sector. The Smart Finance for Smart Buildings initiative [1] has proposed a comprehensive approach based on the more effective use of public funds, aggregation and project development assistance, and de-risking. However, this approach still needs to be rolled out and shared with all stakeholders at the national level.

The project proposes to create national roundtables focused on energy efficiency investment, as permanent multilateral discussion forums gathering the relevant stakeholders, including but not limited to government, local and regional authorities, financial sector, ESCOs, homeowners, industry sector, construction sector and SME sector. The focus of the roundtables will include existing private and public buildings, industry and SME's; they will also include the renovation of street lighting, district heating and transport infrastructures [2]. Integrated renewable energy sources will be part of the focus when combined with energy efficiency measures.

- Expected exploitation and impact of the project consists in achieving the following indicators by the end of the project / 5 years after the end of the project:
- Primary energy savings triggered by the project (GWh / year): 136.875 / 2190;
- Investments in sustainable energy triggered by the project (million EUR): 16.4 / 262.4;
- Reduction of the greenhouse gases emissions (tCO<sub>2</sub>-eq / year): 54750/876000.

## 2. Relation to the work programme of the Energy Efficiency Call for Proposals

The Institute of Radio and Information Systems (IRIS) is an Association based in Vienna, Austria, whose staff has extensive experience in organizing and holding international conferences in various countries, publishes its own journal and has a book publishing house [3, 4, 5].

To create national roundtables on energy efficiency investments as permanent multilateral discussion forums bringing together government, local and regional authorities, financial sector, ESCOs, homeowners, industry sector, construction sector and SME sector, we propose to engage professionals from our conference partners: Technische Universitaet Wien; IEEE Technology Center GmbH (Wien); Politische Akademie der ÖVP (Wien); Aspern Smart City Research GMBH & CO KG.

The roundtables will (among others) analyze the possibility to upscale existing best practices from the national and European level, develop strategies, roadmaps and action plans, propose improvements in the national policy frameworks and measures, and follow their implementation, develop jointly template documents and contracts leading to a better functioning of the market. The roundtables will act as a forum where all stakeholders can learn from successful market initiatives, and can provide input into the policy making process.

## 3. Concept and methodology: quality of the measures

We plan to build our actions within the Smart Finance for Smart Buildings (SFSB) initiative and the methodology used in SEI Forums to bring together a wide range of different types of participants, developing it in following direction: most of the energy consumed by buildings is spent on space heating including air required for ventilation [6]. Advocacy and development of programs for financing the expansion of the use of air heat pumps with energy recovery of heated (and in summer cooled) ventilated air will reduce energy costs for heating by almost 4 times with a quick payback period.

Our activities will build on the activities of the Sustainable Energy Investment Forums initiative [7, 8, 9, 10]. Our proposals relate mainly to Austria however, they include a share of events in Czech Republic, Slovakia, Hungary, Slovenia which we can successfully organize with help of the IEEE Technology and Engineering Management Society Central Europe Chapter from our partner IEEE Austria Section as well as exchange with similar roundtables throughout Europe which will be coordinated by Commission services.

The proposed project will consist of blocks: Information-statistical (promotion), Training, Expert (regional development strategies), and Legislative initiatives. If similar proposals will be submitted, we will join our efforts to complete these projects.

**Expected impacts:**

- Establishment of national energy efficiency investment roundtables.
- Informing the participants of the round tables and the development of draft legislative acts will allow the project to achieve the goals of attracting investments, which will give a powerful self-developing effect over the next five years after the project is completed.
- Estimations of the main relevant impacts of our project, including primary energy savings and investments in sustainable energy triggered by the project, is given in the table:

Project Performance Indicator	Quantification		Measurement unit
	within project duration	5 years after project ends (if a different time horizon is proposed, please specify)	
Primary energy savings triggered by the project	136.875	2190	GWh/year
Investments in sustainable energy triggered by the project	16.4	262.4	million EUR
Reduction of the greenhouse gases emissions	54750	876000	tCO2-eq/year

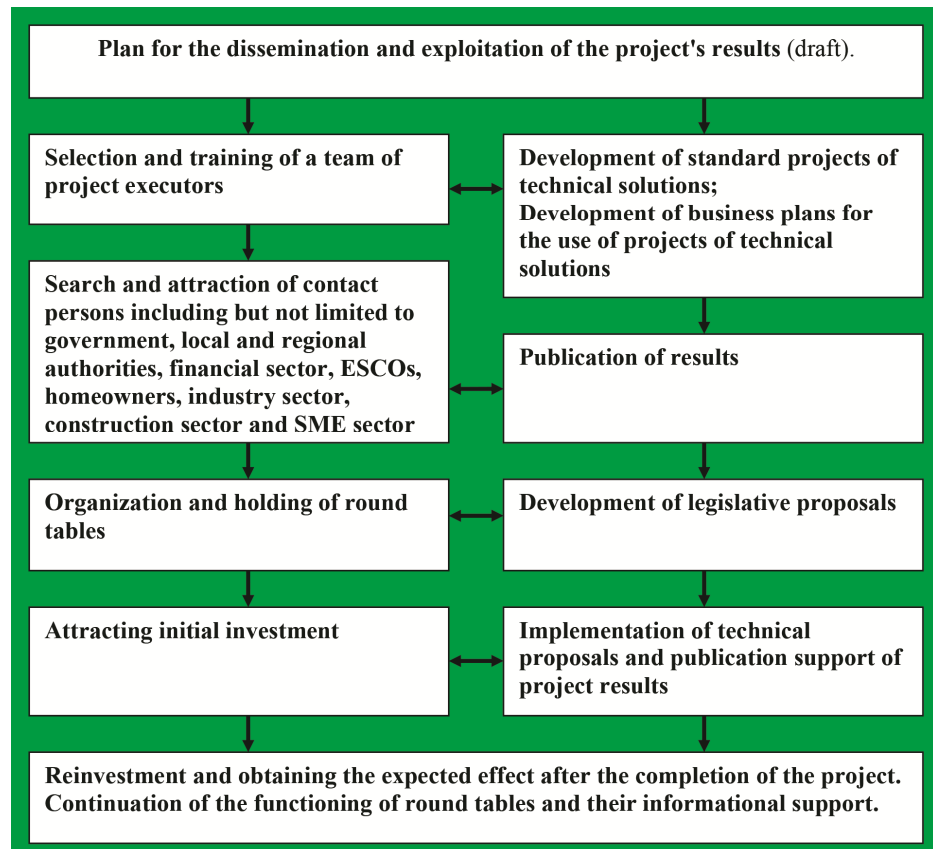
The calculation steps are given below:

- Space heating is the most important end-use in the residential sector (68%) ([https://ec.europa.eu/energy/eu-buildings-factsheets\\_en](https://ec.europa.eu/energy/eu-buildings-factsheets_en)). In most countries, the share of space heating represents 60-80% of the total energy consumption. At the EU level, the average annual specific consumption per m2 for all types of residential buildings was around 180 kWh/m2.
- Non-residential buildings are on average 40% more energy intensive than residential buildings (250 kWh/m2 compared to 180 kWh/m2).
- Assuming the area of residential and non-residential buildings covered by the project is equal, the average energy consumption is 215 kWh/m2. Of these, energy consumption for space heating (68%) will amount to 146 kWh/m2.
- One medium air-to-air heat pump (4 kW of heating capacity with COP = 4) is capable of heating 50 square meters with an electricity consumption of 1 kW.
- Thus, the average energy savings per device will be  $146 * 50 * 3/4 = 5475$  kWh per year.
- At a cost of electricity of € 0.3 per kWh, the annual savings amount to € 1,640, which will cover the equipment costs in one year.
- Profit investing allows you to double the amount of equipment every year without additional capital investment.
- Thus, from each unit of equipment installed at the beginning of the project, 16 units will be in operation by the end of the 5th year.
- Consequently, if, as a result of the project, funding is secured for 10,000 pieces of equipment (16.4 million EUR, energy savings of 54.75 GWh), then by the end of the 5th year their number will be 160,000 with electricity savings of 876 GWh.
- Primary energy savings (with a default EU factor of 2.5) will be 136.875 GWh at the end of the project and 2190 GWh five years after completion.
- Investments in sustainable energy, initiated by the project, will amount to 262.4 million EUR.

- An additional positive effect will be the reduction in greenhouse gas emissions. If we take the average values of greenhouse gas emissions during generation equal to 400 grams per 1 kWh, then reduction of the greenhouse gases emissions (in tCO<sub>2</sub>-eq/year) triggered by the project will be 54750 tCO<sub>2</sub>-eq/year by the end of the project and 876000 tCO<sub>2</sub>-eq/year five years after its completion. The resulting reduction value will be about 1.5% of all emissions in Austria.

#### 4. Measures to maximise impact

Plan for the dissemination and exploitation of the project's results (draft):



#### Communication activities

- The publication of project proposals and results will be carried out in the peer-reviewed scientific journal "SYNCHROINFO JOURNAL" published by our association, ISSN 2664-066X (Print), ISSN 2664-0678 (Online), included in the ERIH PLUS Index and freely available online. We also plan to publish results in other gold open access journals.
- We also plan to make presentations at the international scientific and technical IEEE conference in Vienna "Engineering Management of Communication and Technology" (EMCTECH) organized by our association. Wide coverage of the project is planned in the local press and on the Internet, including on the website of our association.

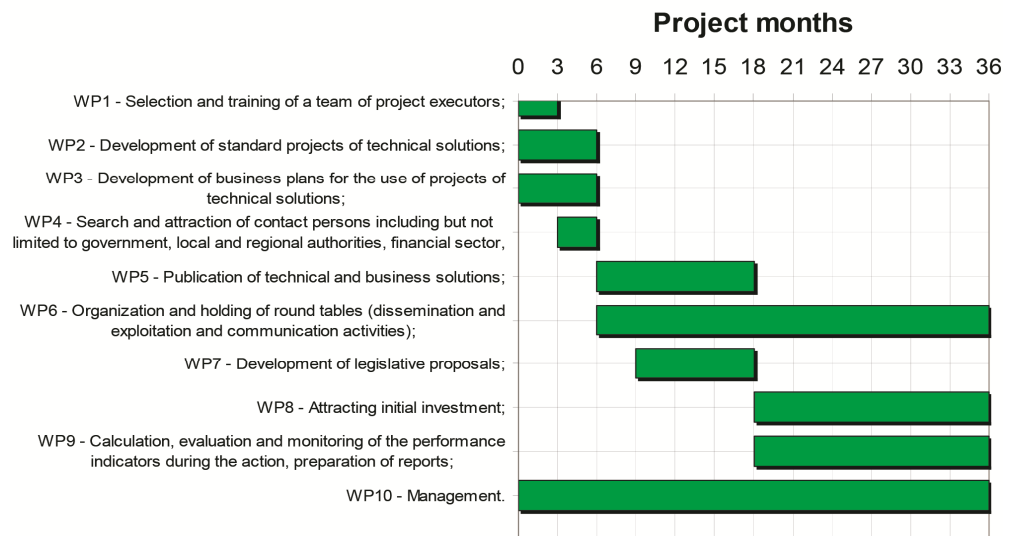
#### 5. Work plan: work packages and deliverables

The overall structure of the work plan consists of 10 work packages:

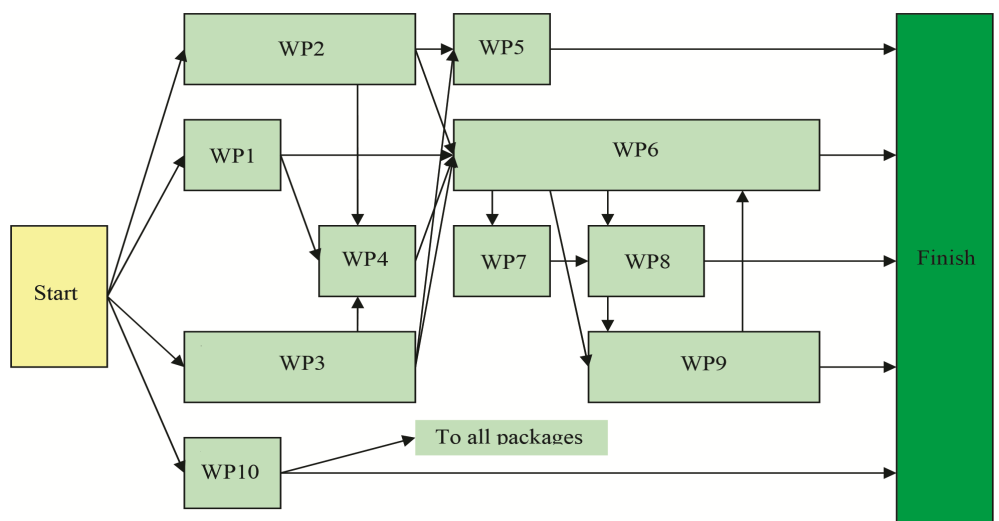
- Selection and training of a team of project executors;
- Development of standard projects of technical solutions;
- Development of business plans for the use of projects of technical solutions;

- Search and attraction of contact persons including but not limited to government, local and regional authorities, financial sector, ESCOs, homeowners, industry sector, construction sector and SME sector;
- Publication of technical and business solutions;
- Organization and holding of round tables (dissemination and exploitation and communication activities);
- Development of legislative proposals;
- Attracting initial investment
- Calculation, evaluation and monitoring of the performance indicators during the action, preparation of reports;
- Management.

Timing of the different work packages (Gantt chart):



- detailed work description, i.e.:
  - a list of work packages;
  - a description of each work package
  - a list of major deliverables;
- Graphical presentation of the components showing how they inter-relate, in a given situation (with using feedback to correct the results based on the achieved indicators) and using the preliminary results of some packages to start the execution of others (2-4; 3-4; 6-7) goes beyond the classic Pert chart:



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## 6. Conclusion

The organizational structure and the decision-making process is simple and straightforward due to the sole contractor of the project.

This project does not imply intensive research that needs to be carried out in cooperation of several organizations. On the contrary, this project is aimed more at carrying out organizational activities, which are more expedient to be managed from one decision-making centre. This is a relatively small project carried out within a single country. For these reasons, the single-player organizational structure and the corresponding decision-making mechanism are entirely appropriate to the complexity and scale of the project.

Conferences and round tables can be organized via videoconferencing, as we are already successfully doing at present for international scientific conferences and we already have extensive experience in organizing events in this format. The consortium consists of a single member. This is enough to solve the assigned tasks. The required specialists will be recruited on a part-time basis.

## REFERENCES

- [1] T. Serrenho, J. Stromback, P. Bertoldi, E. Streng, "Smart Financing for Smart Buildings, Virtual One Stop Shops and IT Tools," EUR 30713 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-37944-7, doi:10.2760/410729, JRC116498.
- [2] M.L. Lode, G. te Bovelddt, T. Coosemans and L. Ramirez Camargo, "A transition perspective on Energy Communities: A systematic literature review and research agenda", *Renewable and Sustainable Energy Reviews*, vol. 163, 2022.
- [3] S. S. Dymkova, "Identifying and Implementing Successful Scientific Projects, in the Framework of "IEEE Technology and Engineering Management Society" Events," *2020 International Conference on Engineering Management of Communication and Technology (EMCTECH)*, Vienna, Austria, 2020, pp. 1-7, doi: 10.1109/EMCTECH49634.2020.9261533.
- [4] S. S. Dymkova, "Methods of Indicators Analysing for Universities Publication Activity by discipline "Radio engineering", *2022 Systems of Signals Generating and Processing in the Field of on Board Communications*, 2022, pp. 1-8, doi: 10.1109/IEEECONF53456.2022.9744312.
- [5] S. Dymkova, "Collaboration enhancing between industry staff and university researchers in international scientific communications system," *2022 International Conference on Engineering Management of Communication and Technology (EMCTECH)*, Vienna, Austria, 2022, pp. 1-7, doi: 10.1109/EMCTECH55220.2022.9934069.
- [6] European Commission, Joint Research Centre, J. Jiménez Navarro, B. Boza-Kiss, J. Carlsson et al., "Workshop on regional heating and cooling priorities and financing in the framework of the Smart Specialisation Platform," (S3P-E H&C), Publications Office, 2018, <https://data.europa.eu/doi/10.2760/003178>
- [7] D. Proto, "Renewable Energy Communities as an Enabling Framework to Boost Flexibility and Promote the Energy Transition", *Energies*, vol. 15, no. 23, pp. 8874, Nov. 2022.
- [8] A. Mar, P. Pereira and J. Martins, "Energy Community Flexibility Solutions to Improve Users' Wellbeing", *Energies*, vol. 14, no. 12, pp. 3403, Jun. 2021.
- [9] R. Trevisan, E. Ghiani and F. Pilo, "Economic Benefits Redistribution Methodology for Renewable Energy Communities", *The 13th Mediterranean Conference on Power Generation Transmission Distribution and Energy Conversion (MEDPOWER)*, 2022.
- [10] Maria Luisa Di Silvestre, Mariano Giuseppe Ippolito, Eleonora Riva Sanseverino, Giuseppe Sciumè, Antony Vasile "Energy self-consumers and renewable energy communities in Italy: New actors of the electric power systems", *Renewable and Sustainable Energy Reviews*, 2021. <https://doi.org/10.1016/j.rser.2021.111565>