

MICROGRID REPLICATION GUIDE

**REPLICATING &
CAPITALIZING PROJECT
RESULTS**



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ABOUT THIS GUIDE

WHY THIS GUIDE?

This guide has been developed in the Alpine Space project ALPGRIDS where the main objective is to increase the uptake of Renewable Energy Sources in the Alps through microgrid solutions. In particular, ALPGRIDS focuses on developing a common understanding of Microgrids and their benefits, creating an enabling policy environment for Microgrids, replicating the Microgrid model in the AS and beyond.

To achieve these goals, the project builds on 7 existing pilot sites in 5 countries and takes them to the next steps in order to develop 3 key outputs:

- an alpine Microgrid model for Energy Communities and project developers,
- a policy package for national, regional and local policy makers to improve their energy and climate plans,
- a replication programme involving organisations outside the consortium in relation with EUSALP AG9 on energy.

The replication programme has been based on bi-lateral exchanges designed to support target groups outside the consortium (emerging energy communities, local public authorities and energy agencies) in facilitating the setting up of energy communities and microgrid projects.

In particular, 13 Promoting Organisations of the Alpine Space have been involved in bi-lateral exchanges with ALPGRIDS partners. This guide describes the results of these bi-lateral exchanges and it is based on a transferability process that will help transfer microgrids knowledge to other Alpine territories allowing them to be more resilient.



WHO IS THE GUIDE FOR?

This guide is for

- Renewable Energy Communities (REC), Citizen Energy Communities (CEC) and Energy Communities that don't fully qualify as REC or CEC, but are about to be established or aim at extending their activities, and want to set up a Microgrid
- local and regional public authorities willing to support the creation or development of local Energy Communities
- energy agencies, municipalities, engaged citizens, and stakeholder networks
- energy utility stakeholders such as network operators, energy regulators, and service companies
- engineering firms
- policy and decision-makers
- higher education and research institutions
- the general public

HOW CAN IT HELP YOU?

This guide describes the process of exchange of experiences among ALPGRIDS Partners and 13 Promoting Organisations located in the Alpine Space in the deployment of renewable energy projects and energy transition. Some best practices that could be replicated in the Alpine Space have emerged during these exchanges. This guide may provide information on forthcoming new opportunities for local energy self-sufficiency, sustainability, resilience, communities of citizens, farmers, and small enterprises

FIND OUT MORE

Read more about the ALPGRIDS project by visiting the project website:

<https://www.alpine-space.org/projects/alpgrids/en/home>

You can also join a dedicated LinkedIn group for sharing tools and experience

Sign up now: <https://www.linkedin.com/groups/8910047/>

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BILATERAL EXCHANGES

OUTCOMES BILATERAL EXCHANGES



PROCESS OF REPLICATION ACTIVITIES

13 Promoting Organisations outside the consortium that are interested in supporting microgrid solutions and capable of influencing regional and local decision makers have been selected through an open call process and involved in bilateral exchanges with all Partners. The Promoting Organisations have been selected using the following criteria:

1. Level of commitment
2. Previous experience on Microgrids or Energy Communities
3. Clearly defined challenges
4. Political role
5. Clear objectives identified
6. Good transferability potential
7. Resources identified
8. Potential of the context
9. Previous working relationship with ALPGRIDS partner



This is the list of the Alpgrids Partners and their Promotion Organisations:

ALPGRIDS PARTNERS	ALPGRIDS PROMOTING ORGANISATIONS
Auvergne-Rhône-Alpes Energie Environnement (FR)	Territoire Energie 38 (FR)
IRE S.P.A. (IT)	Agenzia per l'Energia del Friuli Venezia Giulia (IT)
Weizer Energie- Innovations-Zentrum (AT)	Varicon solutions (AT)
Energetsko podnebna agencija za Podravje (SI)	Energy Agency South Tyrol – CasaClima (IT)
4ward Energy Research GmbH (AT)	Municipality Thannhausen (AT)
4ward Energy Research GmbH (AT)	EOS Powersolutions (AT)
Design and Management of Electrical Power Assets (IT)	Lombardy Region (IT)
B.A.U.M. Consult GmbH München (DE)	Association des Centrales Villegeoises (FR)
Rothmoser GmbH & Co. KG (DE)	Business organisation Weiz- St. Ruprecht (AT)
Compagnie Nationale du Rhône (FR)	Centrales Villageoises Gervanne-Raye (FR)
Comune di Udine (IT)	FEDERCONSUMATORI UDINE APS (IT)
Občina Selnica ob Dravi (SI)	Provincia autonoma di Trento (IT)
Università degli Studi di Genova (IT)	Regione Piemonte– Sustainable Energy Sector (IT)

The selected Promoting Organizations had the opportunity to deepen the themes of microgrids and energy communities through joint exchanges with a partner of the ALPGRIDS project, identified on the basis of the needs expressed by the candidates through an ad hoc questionnaire. ALPGRIDS partners provided tailor-made technical assistance to selected candidates, knowhow about microgrids solutions and policy instruments to develop sustainable energy communities. In particular, candidates benefitted from onsite visits to the ALPGRIDS partner's premises. Some partners instead, due to the Covid-19 emergency, faced some difficulties in the organisation of bilateral exchanges in person so they participated on line. During the bilateral exchanges in person, the promoting organisations have been able to visit the existing pilot site of the assigned Partner and discuss concrete implementation measures and results.

Bilateral exchanges are described below and include the presentation of the replication candidate, one short summary of the topics discussed and future plans. Best practices have emerged that could be replicated in the Alpine Space, as well as the strengths and weaknesses of the replication process.

AUVERGNE-RHÔNE-ALPES ENERGIE ENVIRONNEMENT (FR) - TERRITOIRE ENERGIE 38 (FR)

Territoire Energie 38 is a local public operator acting on the Isère Department. They include all the municipalities of Isère and develop services for them on public lighting, energy purchase, electric grids, open data, etc. In particular, they represent the licensing authority for electric grids. It means that the municipalities which own the electric network lines delegate TE38 with the management of the contract with the DSO (ENEDIS, national DSO, in most of the cases). TE38 is increasingly concerned by energy transition issues and is quite often asked for some advice by the municipalities. Collective self-consumption is one of the rising issues, and since the activities of AURA-EE in Alpgrids were co-financed by a similar public operator in the Drôme department, it seemed interesting to have a bilateral exchange with TE38, in order to transfer the results from one department to another.

Within the ALPGRIDS programme, AURA-EE had the opportunity to realise feasibility studies on 6 pilot sites in Drôme: 4 of them with collective self-consumption projects led completely by municipalities and 2 of them with collective self-consumption projects led by energy communities. Since there are many energy communities in the Isère department, AURA-EE proposed to focus on this business model and invited TE38 to participate to a meeting in one of the pilot sites (La Chapelle-en-Vercors) on March 10th. The aim of this meeting was to present the results of the study to the pilot site (some elected representatives of the municipality and the local citizen-owned cooperative) and to TE38. The results included both technical and legal considerations. It was the opportunity for TE38 to understand better

- The legal framework of collective self-consumption
- The energy balance that can be reached between production and consumption at the scale of a village, thanks to PV production
- The reduction of bills that can be gained on public buildings thanks to this business model
- The legal contracts that have to be implemented between municipalities and energy communities in such cases
- The questions that a municipality can ask and the way the elected representatives appreciate such a new model for their own buildings

To complete this replication process AURA-EE was invited to present the different business models on photovoltaics at the headquarters of TE38 on March 8th in Grenoble in front of the elected representatives of many municipalities of Isère during a steering committee on energy. Collective self-consumption (CSC) was one of the models presented, on the basis of ALPGRIDS results, together with other business models like individual self-consumption of local PPA. Several communities were interested in CSC and asked for more information to be given later.

The replication process was well appreciated by TE38 who gained knowledge and expertise on collective self-consumption and can now provide more relevant advice to the municipalities of Isère. Nevertheless, AURA-EE proposed several times to TE38 to select a pilot site in Isère so that the replication process could also be tested on a local scale. No project with enough advancement was identified, and AURA-EE could only complete the exchange with TE38 giving a few additional answers to theoretical questions.

IRE S.P.A. (IT) – AGENZIA PER L'ENERGIA DEL FRIULI VENEZIA GIULIA (IT)

Agenzia Per l'Energia del Friuli Venezia Giulia (APE FVG) is an energy management agency that works with operational capacity in the field of energy efficiency, renewable energy systems and energy planning. It provides guidance on EU policies and promotes the uptake of EU strategies locally. Its main competences are: engagement of stakeholders in sustainable energy projects, dissemination of best practices, increase of energy knowledge and empowerment of policymaking processes.

APE FVG supports the fight against climate change by setting targets for GHG reduction and provides independent advice to public and private subjects developing sustainable energy investment initiatives. The area of action is the Friuli Venezia Giulia region, in the Northeast of Italy.

The exchange meeting between IRE and APE FVG took place on March 23rd 2022 at the Campus in Savona during the workshop on microgrid and energy communities organised by the University of Genova and IRE Liguria. Both the promoting organisations of the University of Genova (Region of Piemonte) and IRE were invited to participate in the event in order to have a more effective discussion about microgrid and energy communities in different institutions.

APE FVG illustrated the experience of the REC of San Daniele del Friuli and presented the RECOCER project even if it was not directly involved in the constitution.



Figure 1 – Representative of APE FVG, Regione Piemonte, Università di Genova, IRE at Savona Campus

The RECOCER project <https://recocer.eu/>

Using the instrument of «Concertation», the Autonomous Region of Friuli Venezia Giulia (FVG) has allocated and assigned 5.4 million euros to be spent by 2023 to the “Comunità Collinare del Friuli” (CCF). These resources will serve not only to create RECs, but to enable a control room for the processes of REC development. RECOCER will enable the management of an “industrial” process of building projects: a sort of “gymnasium” also for the Italian PNRR - Recovery and Resilience Plan. The size (15 municipalities, 50,000 inhabitants) could make the “Comunità Collinare del Friuli” an example for regulatory bodies to better understand the implementation scenarios of the rules for the definitive transposition of the RED-II Directive. The Municipality of San Daniele del Friuli will soon start with a legally established REC. Within the RECOCER Project, an ability to independently design and manage REC is being built by focusing on lower costs and a capacity for independent evaluation of suppliers with the aim of “creating value and leaving it on the territory”. With the RECOCER Project, the “Comunità Collinare del Friuli” is creating a management capacity for REC that could take on a regional approach. From a Recovery and Resilience Plan perspective (2.2 billion euros for REC) this would make the experience of the “Comunità Collinare del Friuli” available to the Municipalities in the FVG Region.

During the workshop, IRE and the University of Genova offered a synthesis of the main topics covered in the Alpgrids project and during the round table. Potential advantages and the main critical issues of the Energy Communities compared to the model adopted in Italy were analysed.



Figure 2 – Representatives of APE FVG, Regione Piemonte, Università di Genova, IRE during the workshop about microgrid and energy communities in Savona Campus

WEIZER ENERGIE- INNOVATIONS-ZENTRUM (AT) - VARICON SOLUTIONS (AT)

The promoting organisation Varicon Solutions offers businesses and private customers tailor-made solutions and services in the field of electrical and automation technology. Varicon specializes primarily in the field of industrial automation and building automation.

The interests of Varicon are to increase the competencies and resources to implement building management systems and similar electrical systems efficiently in accordance with standards and functionality. This is an important aspect especially for the implementation area of the project (WEIZ and Thannhausen pilot) as there are hardly any standard solutions here, but individual solutions that were to planned and implemented in cooperation with the Austrian partners.

Meetings with all Austrian and the replication partners took place on the on the 29th of July and 13th of August 2021. The company Varicon is a good replication partner and is willing to discuss the further development of the best practice example provided here in WEIZ and Thannhausen. The meetings were held in person in the municipality of Thannhausen with the main focus on our 2 microgrid pilots which were established in Weiz and Thannhausen and how we could develop these ideas further in other projects. The pilot Weiz focused on the implementation of a direct connection of two buildings with the implementation of two different types of storages, which are monitored by our replicant partner Varicon. The discussion in these two meetings were mainly focussed on the replication of our two pilot projects in contrast with the defined energy communities in Austrian energy laws. Our grid operator was also present during these meetings. We evaluated the advantages of a direct connection in comparison to a renewable energy community through the public grid of the grid operator. Furthermore, the replication of our Pilot grids in other settings has been discussed. Concerning the replication of the WEIZ grid, the existing installed grid and the installed pilot storages (one redox flow battery and one lithium ion battery in comparison) can be used as best practices for the realisation of such a project and increase of collective own consumption in a semi urban setting.

ENERGETSKO PODNEBNA AGENCIJA ZA PODRAVJE (SI) - ENERGY AGENCY SOUTH TYROL - CASA CLIMA (IT)

The CasaClima Agency is a centre of excellence for energy-efficiency, sustainable construction and renovation that is widely recognised throughout Italy and now increasingly also on an international level. As a pioneering institution in this field, CasaClima has been constantly evolving its standards since 2002, and has created a wide range of quality seals for building products and building certifications that describe sustainable construction using a more holistic approach.

In 2014, CasaClima was expanded to become the Energy Agency South Tyrol - CasaClima, a public body of the Autonomous Province of Bolzano - South Tyrol. Since then, the fields of action and competences of the Agency have expanded constantly and new initiatives have been started, such as the programmes KlimaGemeinde in the field of municipal climate protection.

CasaClima has always been strongly committed to awareness-raising and consultancy activities for building owners and citizens. A very central pillar is also the education and training of planners and craftsmen on the topics of energy-efficiency and sustainable construction. So far, more than 40,000 participants have made use of the Agency's broad range of training courses.

An important area is the constant exchange and institutional cooperation with public and private stakeholders, professional institutions, trade associations, consumer protection offices and other interest groups. CasaClima is also getting increasingly engaged at an international level. For example, it coordinates the energy sector of the European Macroregional Strategy for the Alpine area (EUSALP) and is continuously involved in numerous international research projects.

Through on-line meetings the partners have exchanged information about microgrids and energy communities. ClimaCasa has expertise in the topic and they already have some examples to be studied and visited.

4WARD ENERGY RESEARCH GMBH (AT) - MUNICIPALITY THANNHAUSEN (AT)

The Municipality of Thannhausen is a small, energy-conscious and innovative community with about 2,500 inhabitants on approximately 33 km². Extensive efforts to optimize energy supply have already taken place in recent years. What has already been started is now being coordinated more closely and is to be incorporated into a modern energy concept in the long term. Targeted subsidies and energy management are just as important as consulting services for households, businesses and individuals. In order to advance these efforts, the municipality is very interested in the results and findings developed in the course of the ALPGRIDS project.

There was one meeting with the Municipality Thannhausen on the 13th of August 2021, where also other partners and promotion organisations were present. Generally, the Municipality of Thannhausen turned out to be a good replication partner which was more than willing to discuss the further development or replication of the best practices provided by the ALPGRIDS project. The meeting was held in person in Thannhausen with a focus on the micro-grid pilot that was established in Thannhausen and how it could be developed further or replicated. A total of 8 people from 5 different companies participated in the meeting.

The discussion focussed mainly on the replication of the WEIZ or Thannhausen pilot in contrast to the possibility of emerging energy communities as defined in the Austrian energy laws. As the local grid operator was also present, the issue of grid effects caused by the operation of a direct-line-system which can maintain a connection to the public grid and switch users between micro-grid and public-grid supply was discussed. Furthermore, the replication of the Thannhausen Microgrid in other settings has been discussed, as has the further development of the approach. Concerning the new approach of energy communities, the conclusion was drawn that the Thannhausen Pilot could be a potential alternative to energy communities if the right setting, such as proximity of the buildings and relatively large energy consumption as well as no bituminised areas between the buildings to reduce the costs for digging, were fulfilled. Nevertheless, the discussion needs to be had, whether the use of additional lines is worth the effort of using the public grid. The conclusion was, that when an off-grid operation is in the interest of the participating users, the answer would be yes. Furthermore, the substantial administrative efforts resulting from the founding of an energy community in connection with the limited degrees of freedom regarding the distribution of energy were also discussed as arguments relating to the benefits of a direct-line system.

Concerning the negative grid effects, the Thannhausen pilot can be seen as best practices for replication as it had very limited negative effects on the public grid, due to the setup of the line-controls as well as the general setup of the consumers and generation capacities.. This factor however, does need to be considered for any replication approaches.

Concerning the replication of the Thannhausen Microgrid, while the existing installed microgrid can be used as a best practice for the realisation of such a project and the increase of collective consumption in a semi-urban setting, a replication within Thannhausen will not be the goal of the municipality of Thannhausen. The Thannhausen pilot was implemented due to the preferable parameters found at the demonstration site. A site with such parameters is unique in Thannhausen and could not be found a second time, as the municipality lacks the size.

Concerning the further development of the existing pilot, the discussion resulted in the decision to investigate the implementation of additional flexibilities and the consideration of black out supplies to the pilot projects.

As for the replication in the Alpine Region, the Thannhausen pilot was discussed and the potentials for a replication identified. Some aspects of the Thannhausen pilot can be categorised as best practices, such as the overall involvement of the microgrid users in the development process. The user involvement played a crucial role for the success of the pilot and the operation of the microgrid as it reduced the barriers for deployment and increased the acceptance of the technology itself. This insight should be considered in any replication approach. Furthermore, the use of direct lines could act as a best practice but there are, apart from the parameters already discussed, some drawbacks that need to be discussed. First off, the issue of using additional raw materials for more electricity lines, when there is a local grid available which already provides energy with a high supply availability. Furthermore, the costs of this approach depend strongly on the geographical setup of the consumers and producers, which could be an issue in the alpine region, as population density is rather low and digging trenches in alpine regions could be a substantial cost factor. Another potentially important limiting factor would be the national regulations as the Thannhausen pilot is basically moulded to Austrian regulations and energy laws, which differ to a great extent from other nations laws.

The major strengths of the Thannhausen and Weiz pilots and therefore any replications that are made with them in mind are that they can, from a technological perspective be easily replicated as the technologies implemented at the pilot sites were developed in a modular fashion. Any replication would only cause a minimal adaptation of the components to properly work.

4WARD ENERGY RESEARCH GMBH (AT) - EOS POWERSOLUTIONS (AT)

The promoting organisation EOS, who was also involved in the Weiz and Thannhausen pilot, was an excellent promotion partner, as the approach of microgrids reflects very well on their own expertise and business model.

EOS Power Solutions GmbH was founded in 2018 and is a small company located in Graz Austria with focus on development and distribution of energy management systems (EOS Energy Manager) and battery storage systems for households and enterprises. The EOS Energy Manager provides the possibilities to increase selfconsumption by controlling flexible loads and also enables users to participate in micro grids via direct line systems. The capability of the EOS Energy Manager for micro grid systems has been proven in two demonstrations sites in Weiz and Thannhausen.

A total of two meetings were held, one on the 29th of July 2021 from 10:00 to 13:30 in person in Thannhausen, Austria, the second meeting was on the 13th of August 2021 from 10:00 to 12:00 also in person but in Weiz, Austria. The second meeting was already described in section 3.1.6. The main topic of that meeting was the technical development of the solutions provided in the Thannhausen and Weiz pilot, which was developed and provided by the promoting organisation itself. The topics that were discussed were the general replication of the micro grid approach in different settings, the further development of the existing pilots and the potentials for development of the technology involved.

Concerning the general replication of the micro grid approach, the promoting organisation has decided to consider taking the micro grid solution into their business portfolio which would enable the reproduction of the approach in different settings. The main issues described in section 3.1.6 were also discussed during this session although the potentially negative effects on the grid were not part of the discussion. Concerning the further development of the existing pilots there was an intense discussion on the possibility of involving storage capacities to allow islanding operation of the Thannhausen micro grid and on the increase of storage capacity at the Weiz pilot to provide additional services, for instance grid services, to increase the financial yield of storage operation.

Concerning the development of technology, a discussion was had to implement additional intelligence in the system which would allow it to use forecasts to better distribute the energy within the microgrid.

As for the replication in the Alpine Region, the Thannhausen pilot and the technology that is used were discussed. The strength of the technology is its versatility as it can be implemented at a single building or within a microgrid system. Also, the possibility to better control one's flexible loads in dependence of the available energy can be seen as one of the key strengths of the solution. Finally, one of the key success factors is the possibility to positively affect one's consumption of renewable energy.

One of the key weaknesses of the solution discussed were the costs and the necessary communication infrastructure that is needed to operate on a satisfactory level. When used in a microgrid setting the same restrictions that were already described in section 3.1.6 apply.

DESIGN AND MANAGEMENT OF ELECTRICAL POWER ASSETS (IT)- LOMBARDY REGION (IT)

The Lombardy Region plan has a target of 32 % of final energy consumption from renewable sources by 2030. Among the actions that are planned to achieve this result, are collective self-consumption schemes in condominium buildings and renewable energy communities, both according to the national law n.8-2020.

It must also be said that in this context the establishment of renewable energy communities during the years 2020-2021 were very limited and related to local initiatives without a reference framework.

Starting from this fact meetings were held online between the Climate and Air Quality Office of the Environment and Climate Direction and DeMEPA with the aim of highlighting the existing barriers to the development of energy communities.

Some obstacles are present in the national law concerning the renewable energy community, such as:

- the limit of 200 kW of renewable source's maximum installable power,
- all members of the community must be supplied by the same LV substation,
- the numerous authorisation steps required to establish the energy community (the verification with local DSO of the same substation supplying all the community members, the registration to GSE- the national agency supporting renewables, the operation permit from the Customs Agency) which end up postponing by more than 6 months the starting of any operation of the community since the completion of the renewables installation.

In addition to these impediments which to a large extent are known to the contact people of the Promoting Organisation, DeMEPA pointed out other aspects:

- the impossibility for the community members to effectively size the renewable plant to be installed in relation to their own energy consumption; the national law provides the community definite incentives related to shared electricity that are defined for each hourly slot as the minimum between community consumption and local generation; but the members of the community do not have information on their consumption over time (they have only monthly statements); the possibility to repay through incentives the investment on the installed renewable sources is a key element for joining the community;
- there are no reference schemes for the establishment of the community, as a private legal entity, nor reference rules for the operating modalities (governance, incentives allocation among members, exit and entry of members from the community).

The Lombardy Region representatives did mention some items they were considering:

- the financing of energy communities, in particular supporting the communities aimed at mitigating problems of energy poverty,
- the activation of information campaign towards local authorities, enterprises (in particular SME) and citizens on the energy and environmental advantages achievable through the renewable energy communities and some effective ways for their establishment and operation.

These proposals have found place in the recent regional law n.2 of 23 February 2022 that provides for:

- the funding of 22 million euros aimed at supporting the establishment of a number between 3 and 6 thousand of renewable energy communities (corresponding to new installation of renewable sources between 600 and 1.300 MW) in Lombardy in the next 5 years, in order to promote:
 - renewable energy community in a cooperative form (considered to be the easiest solution),
 - the use of locally available resources in case of mountain areas,
 - the use of local storage systems (in so increasing energy self-sufficiency),
 - the installation of infrastructure for the charging of vehicles;
- the establishment of a permanent structure able of providing administrative, technical and legal support to the energy community, especially in the early stages, as well as to monitor their spread on the regional territory.

Based on the experience gained during the performed bilateral exchange it can be stated that a public organisation devoted to:

- define and communicate validated models of local generation and self-consumption schemes,
- a continuous information on the most successful practices in energy community building and operation, may be a significant booster to foster energy community in Alpine Space.

B.A.U.M. CONSULT GMBH MÜNCHEN (DE) - ASSOCIATION DES CENTRALES VILLEGEOISES (FR)

Association des Centrales Villageoises (ACV, Association of Village Power Plants) is an Association of local energy supply companies, “Centrales Villageoises”, whose shareholders are mainly citizens, local municipalities and local companies. Their aim is to develop renewable energy and energy efficiency projects, at a territorial scale, taking into consideration the local stakes (integration into landscape, economic local development, social link, etc.).

The “Centrales Villageoises” concept was born in 2010 and originates from an experimental project which was launched by the regional energy agency of Auvergne-Rhône-Alpes (AURA-EE) and 5 natural regional Parks, which received European and regional funding. From 2010 to 2014, the concept was tested at 8 pilot sites and progressively led to the elaboration of local citizen-owned companies which developed and financed some first photovoltaic plants. Then, the entire technical and legal framework was consolidated and enabled the concept to be replicated at other sites. The model of “Centrales Villageoises” quickly spread all over the Auvergne-Rhône-Alpes region but also in other regions in France.

In a first video-conference on 25 January 2022, the representatives of ACV specified their main points of interest:

- Microgrids for district heating using various renewable sources of energy
- Microgrids for electricity making use of other renewable sources than solar power
- Organisational structures for the operation of microgrids, notably cooperatives
- Focus on small communities with up to 1,000 inhabitants

Given that the originally planned Alpgrids pilot project in Germany, an electric neighbourhood microgrid in Schönborn, a new city quarter under development in the City of Grafing, could not be implemented due to the unfortunate German legislative framework, and the Alpgrids pilot project developed in its place, a tenant electricity model for a new residence for retired people with a photovoltaic roof-top plant and public electric car charging places in the basement, was not yet implemented, microgrid projects outside the Alpgrids project were selected and visited and visited on 5 and 6 April 2022.

On 22 June 2022, Michael Stöhr, B.A.U.M. Consult GmbH, visited in return two members of ACV close to Grenoble, France, the citizens collectives Centrales Villageoises du Gresivaudan and Centrales Villageoises Portes du Vercors.

ELEKTRIZITÄTWERK HINDELANG EG

The first microgrid visited was in Hindelang, owned and operated by the Elektrizitätswerk Hindelang eG (EWH, Power Plant Hindelang registered cooperative) a cooperative established in 1923 for the supply of the community of Hindelang in the mountainous Allgäu region in the south-east of Bavaria. EWH supplies 3,908 connection point, thus supplying the majority of the 5,294 inhabitants of Hindelang with electricity. Further, some inhabitants are supplied with natural gas. Though EWH operates own hydropower stations and photovoltaic power plants, and is co-owner of several hydropower and windpower plants, all the generated electricity is sold at the German electricity market, because this allows receiving a premium under the German Renewables Energy Act. The electricity sold to the clients is purchased on the German electricity market. This scheme veils the local origin and the renewable nature of the electricity.

EWH is targeting at involving its members and clients more actively and to set up supply schemes ensuring local exchange of energy in a visible manner. At this aim, EWH participates in the EU Horizon 2020 project DECIDE which was presented by Ludwig Karg from B.A.U.M. Consult GmbH to the visitors from ACV.

Apart from electricity, supply with heat from local combined heat and power stations and heating plants is envisaged – competing with the supply with natural gas. Thus, EWH is an example of an old organisation facing the challenge of the transition towards a modern energy community involving members actively and highlighting better the local and renewable nature of the energy sold as well as the challenge to provide renewable heat in addition to electricity. Island operation capability of the electric grid is not envisaged by EWH due to related high costs.

<https://www.ewhindelang.de/index.html>
<https://decide4energy.eu/>

ENERGY VILLAGE WILDPOLDSRIED

The second microgrid visited was in the Energy Village / Community of Wildpoldsried, not much far from Hindelang, a bit further in the north of the same region. In Wildpoldsried renewable electricity generation covers more than eight times demand, and renewable heat generation from wood fuel (mainly wood chips and pellets), biogas, solar irradiation and ambient heat covers the major part of the demand. Installations are owned by citizens organised in companies set up in the specific German form of a Kommanditgesellschaft (KG, limited partnership) with the same Gesellschaft mit beschränkter Haftung (GmbH, limited company) as general partner. Economic viability of power plants is ensured by the German Renewable Energy Act. Though a Bavarian Act interdicts installations of wind turbines closer to houses than ten times the total height of the wind turbine (10H rule) since 2012, Wildpoldsried profits from the possibility to be exempted from the 10H rule upon decision of the municipal council. Thanks to the wide acceptance of wind power in Wildpoldsried obtained by involving citizens from the outset and letting them profit financially, the municipal council was safe taking this decision.

The local grid has been a testing field for microgrid operation including controlled disconnection and reconnection from the grid, black-out simulation and black start with batteries. The most recent project covered testing a local market for electricity and flexibility.

The visit included a reception by the mayor of Wildpoldsried, Ms. Renate Deniffel, with presentations on the history of renewable energy and microgrid development in the community, including recent projects and results. The session was completed by a walk around the energy campus with storages and installations for microgrid control.

<https://www.wildpoldsried.de/>

DISTRICT HEATING GRID OF MOOSACH

Moosach is a small village with 1,500 inhabitants east of Munich in the District of Ebersberg. Its district heating supply includes a heating plant consisting of a field of ground-based solar collectors and 3 woodchip heating boilers, and a heating network connecting the heating plant with presently 76 private households. Connection of up to 120 private households is possible. Woodchips are local and come from a maximum distance of 40 km.

The project was initiated and developed by citizens and the heating plant started operation in 2018. The original plan was to set up a cooperative, but the total investment of 1.5 M€ was too much for a significant portion to be raised from the citizens. For this reason, a different solution was searched and implemented: The heating network and the ground on which the heating plant is installed are owned by the Community of Moosach. The heating plant is owned by an ecological energy supplier, Naturstrom AG, which pays a lease to the community and delegates the operation of the plant to a local company specialised in renewable energy projects. The private households are clients of Naturstrom AG.

The heating plant was visited, and technical as well as organisational details were presented and discussed on site. The visit has been mediated by the member of the Alpgriids Sounding Board, Prof. Simon Schramm from Munich University of Applied Sciences.

<https://moosach.info/nahw%C3%A4rme.htm>



Figure 3 – Representatives of ACV and BAUM with the initiator of the district heating Moosach and a representative of Rothmoser.
Foto: S. Schramm

HEAT AND POWER GENERATION IN GRAFING

Grafring is a small town in the District of Ebersberg east of Munich very close to the Community of Moosach. Supply with electricity and heat via a district heating network is ensured by Rothmoser GmbH & Co. KG, a family-owned local energy supplier founded in 1899. The company is a partner in the Alpgrids project and responsible for the German Alpgrids pilot. In Grafring, many municipal buildings, households and enterprises are connected to the district heating network fed by combined heat and power plants run with natural gas and biogas. Rothmoser operates also a number of public charging stations for electric vehicles.

A further company linked to Rothmoser, Bioenergie Grafring AG, operates a biogas plant fed with manure, maize, grass silage and whole plant silage. The biogas is piped to two motors in different quarters of the town run in combined heat and power generation mode. The heat is distributed via networks.

The visit included one of the four sites for combined heat and power generation and the biogas plant. In terms of the Alpine Microgrid Model, the visited installations jointly form a multi-vector microgrid with three different energy vectors: biogas, heat, and electricity.

<https://www.rothmoser.de/>



Figure 4 – Representatives of ACV, BAUM and Rothmoser at the Rothmoser biogas plant.

Foto: E. Jouin

CENTRALES VILLAGEOISES DU GRESIVAUDAN

The citizen collective Centrales Villageoises du Gresivaudan (Gresi21) was founded in 2016 and has chosen the corporate form of a société par actions simplifiée (SAS), supplemented by an association since 2020. The SAS has 500 members (citizens, communities and companies), currently operates 45 PV systems on rented roofs, mostly on municipal facilities, and generates 1 GWh of electricity per year, which is equivalent to the consumption of about 400 households. The public grid is used to exchange the electricity generated. Its operation is not impaired, nor are grid services provided. In the current situation of rapidly rising energy prices, Gresi21 ensures stable electricity prices for its members. Gresi21's goal is to contribute to regional development. The return on equity is limited to 4 % and the company's profits are reinvested in the region. In addition to generating electricity from PV systems, Gresi21, with the help of 100 volunteers, advises citizens on how to save energy and exchange fossil fuels for pellet heating systems, carries out campaigns at schools, and encourages "TupperWatt meetings" to exchange experiences.

<https://gresi21centralesvillageoises.com/>

CENTRALES VILLAGEOISES PORTES DU VERCORS

Like Gresi21, Centrales Villageoises du Vercors (CVPV) was founded in 2016 as a SAS with variable capital and a cooperative governance. Co-decision is a crucial element. The principle of 1 person = 1 vote applies. One share is € 100, no one may hold more than 10 % of the shares. The dividend of the shareholders is limited to 2-3 %. 19 PV systems ranging in size from 9 kWp to 100 kWp and with a total output of 313 kWp generate about 350 GWh per year. Furthermore, households, communities and companies are supported in energy saving measures. The joint production and use of heat and cold is planned.

<https://www.portesduvercors.centralesvillageoises.fr/>

The wide range of different technical and organisational microgrid solutions shows that microgrids don't fit into a narrow perspective – a finding that is also reflected in the Alpine Microgrid Model. Instead, there are many possible ways to implement microgrids both technically and organisationally, a bunch of flowers which might inspire interested replicants to find the own solution which best fits the own local situation. The only thing all successful microgrid solutions have in common is involvement of citizens in one or the other way, at least as clients which receive a local product which is more than just energy.

ROTHMOSER GMBH & CO. KG (DE) - BUSINESS ORGANISATION WEIZ- ST. RUPRECHT (AT)

Business organisation Weiz - St. Ruprecht is a company that was founded of the two municipalities of St. Ruprecht/Raab and Weiz to enhance living conditions and create business opportunities for the region.

The region is located approximately 25 km east of Graz, which is the capital of the Bundesland Steiermark.

The local business can be characterized as follows:

- 64% service industries
- 35% industrial sector and construction
- 1% agriculture and forestry

There are 11.755 citizens living in the area.

The economic area sees itself as a region of the future, a course setter for future projects and actively supports future-oriented project developers. The topic of future design plays a central role. Together with partners from the areas of research, education and business, a permanent and constructive exchange of views on relevant future issues takes place. In line with this future-oriented attitude, the economic area is working on sustainable solutions in the areas of energy efficiency and e-mobility through existing cooperations in order to also assume an ecological pioneering role. When it comes to fiber optics and digitization, the company relies on future-proof infrastructure and is involved with the G31 fiber optics district of Weiz initiative and Weiz.OnLine for a nationwide fiber optic expansion in the region. With these key areas of work, the Weiz – St. Ruprecht/Raab economic area offers an ideal environment for innovative companies to successfully relocate to the area and is therefore also actively involved in the Smart City theme.

Rothmoser and Business organisation Weiz- St. Ruprecht had an online-meeting at 30.11.2021.

Participants of the meeting were Florian Rothmoser (Rothmoser GmbH & Co. KG), Stephan Pessl (project manager at Wirtschaftsraum.net), Roman Neubauer (executive director at WEIZ Immobilien GmbH) and Franz Kern (energy consulting at energy agency W.E.I.Z.).

Local energy production and energy sharing is an important topic both for Rothmoser and for business organisation Weiz – St. Ruprecht.

Also community heating with renewables is an important topic for the future. While in the area of Weiz and St. Ruprecht biomass in the form of wood chips are used, Rothmoser uses a mix of biogas and natural gas in combined heat and power units.

Especially interesting was the comparison of legal settings for photovoltaic feed-in tariffs and the direct-line connection between buildings. Direct line electric connections that use public room between buildings to increase self consumption are not allowed in Germany, but are allowed in Austria. This means that different business cases are possible. The different regulations limit the possibility of business model transfers between the countries.

Both parties plan to stay in contact to exchange ideas for decarbonisation and energy sharing.

COMPAGNIE NATIONALE DU RHÔNE (FR) - CENTRALES VILLAGEOISES GERVANNE-RAYE (FR)

The replication candidate supported by CNR is the “Centrales villageoises Gervanne-Raye” (CV-GR), which is a local citizen-owned organisation dedicated to local energy transition. The shareholders of CV-GR are compounded by 86 individuals and 2 public municipalities. It covers a geographic perimeter of 6 local municipalities in the Drôme area of France, near to Saint-Julien-En-Quint pilot site, for a total of around 1500 inhabitants.

Acting as a citizen energy community, CV-GR has equipped, between 2015 and 2019, ten roofs of its territory, with solar panel. The total energy production is sold to the grid at feed-in tariff. The regular revenues from sales of electricity allow now the CV-GR to invest in new energy transition projects that are harder to get financed by banks, like collective self-consumption (CSC).

The CV-GR aims thus at developing its first PV production project dedicated to CSC. The project consists in installing PV panel on the roof of a local artisanal brewery (located in the “Gigors et Lozeron” village), own by a brewer-farmer who uses his own production of barley and hops. The energy produced by these PV panels will be shared with local consumer in a collective self-consumption framework, the brewery being one of the self-consumers.

Thanks to its pub and the organization of events, like concerts in summer, the brewery has become an important local gathering place. Thus, this project could be a local showcase for citizen energy transition and microgrid promotion.

The CV-GR wants to develop this collective self-consumption project for various reasons:

- The need to have access to energy prices kept under control (emphases with the recent increased of energy prices)
- CSC enables self-consumers to take ownership of the energy issues and to turn them into active consumers, managing better their energy consumption and its flexibility
- The energy sharing creates a local dynamic and social bounding between participants.
- The ambition to add social concerns with specific energy prices to those in fuel poverty.

Five meetings, organised as working sessions, were held with CV-GR to support them on their project. Three were held on site, on the 1st October 2021, the 11th February 2022 and the 11th March 2022, and two were held on-line, on the 8th November 2021 and the 14th January. These meetings gather CV-GR management committee membersn, the owner of the brewery, ACOPREV members and technical staff as well as members of the CNR ALPGRIDS project team.

Thanks to the experience sharing brought by ACOPREV and CNR on the pilot site, the first meetings help the CV-GR to better understand how a collective self-consumption project may be undertaken. Various topics were discussed during these meetings. The first one was to express the motivation of the stakeholders, in order to validate that collective self-consumption is the good answer to their needs, given the feedback of ACOPREV. Then, the design of the project was a key point: the brewery being a large consumer, is there any interest to merge individual self-consumption and CSC? Legislative aspects were to be carefully considered on this subject. Another key topic was of course about the economic concerns: is there investment subsidies? What about the selling of the energy in excess? What is the right selling price of the energy to self-consumers to keep an economically balanced project? The last major point of attention was the organisation of the collective self-consumption, and especially, how to communicate with the potential self-consumers.

The first meetings help the CV-GR to define more precisely its project and to answer the questions raised. The CSC project was then designed, with an associated action plan, defining the action to be carried out, including the administrative ones: derogation request to extend the self-consumption perimeter, connection request to the DSO, contractual organization with the DSO and with the self-consumers, monitoring aspects... During the last meetings, the action plan was followed up, the experience sharing helping to tackle the problems and questions that were arising.

It must be highlighted that during the process of the design of the CSC project, in addition to the regulatory aspects and the economical concerns, the sake of simplicity and sustainability was an important selection criterion. Questions concerning the lifetime of the project, like “what happened if the brewery ceases its activities?” were taken into consideration. To consider the project in its entire lifetime, taking into account all what can happen, even external inputs, is obviously a good practice to ensure the sustainability of a CSC project.

The replication process was very useful on the way to make the CSC project of CV-GR become reality. The Val de Quint pilot site brought field experiences, contacts and practical tools to design the CV-GR project. A practical support by people who carried out the same type of project is truly very useful for CSC kind of project, with a very specific and not well-known regulation. A dynamic of “companionship” is emerging in France, several other local energy communities being now in touch with ACOPREV to benefit from the support of their experience.

COMUNE DI UDINE (IT) - FEDERCONSUMATORI UDINE APS (IT)

As part of its ALPGRIDS activities the Municipality of Udine committed itself in a strict collaboration and fruitful exchange with Federconsumatori Udine. The selected OP is the local section of Federconsumatori APS, a national association set up in 1988 and focused on social promotion whose major objectives are information and advice on each aspect of citizens' daily lives from insurance contracts to electricity bills, from internet providers to energy supply.

Federconsumatori - APS is active throughout the country with a capillary network of offices and info-points aimed to provide assistance and advice to all citizens and consumers without distinction.

Federconsumatori Udine has been working for over twenty-five years in the defense of consumer rights and thanks to a well-established network, specific local events and massive national projects are developed with public and private partners. Specialized experts and trained personnel make available their skills gained in a number of experiences and collaborations in different fields.

In recent years Federconsumatori has promoted information campaigns focused on both good practices in the individual management of energy and tools to implement national energy policies.

In this context, the meetings held in 2021 and 2022 between Federconsumatori local leaders and the Municipality of Udine defined a common interest to inform the stakeholders on the energy communities regarding both the development of the specific national legislation and the possibilities currently allowed by the implementing rules.

The collaboration strategy has had a remarkable impulse after the event held in Udine on 13.05.2022 ("Renewable energy communities: benefits and challenges") and organized by the Municipality in collaboration with the local Energy Agency (APE FVG) and the National Association of Italian Municipalities (ANCI). The ALPGRIDS pilot site in Udine was presented to more than 120 local administrators and it was made the point on the energy communities potential at regional level

On the sidelines of the event the collaboration between the Municipality and Federconsumatori was formalized through the drafting of an agreement that allows the association the use of premises owned by Udine's Administration in the city centre.

In what is going to become the city's "information hub on sustainability and energy", it was agreed that PO experts would provide a basic advice service conveying, mainly to private citizens, the experience gained on energy communities through ALPGRIDS and covering all the information useful to orient lifestyles and consumptions towards the circular economy transition.

The main focus remains on the objective and independent information of the end users and at the same time their training in the adoption of the most suitable solutions towards sustainability.

Currently (June 2022) the agreement draft provides that the hub is going to be active one day a week.

For more information on the evolution of the initiative and the approval process by the City Council:

<https://www.comune.udine.it>

<https://www.federconsumatori-fvg.it>

OBČINA SELNICA OB DRAVI (SI) – PROVINCIA AUTONOMA DI TRENTO (IT)

Autonomous Province of Trento is an autonomous province of Italy, in the country's far north. The province is composed of 177 municipalities. Its capital is the city of Trento. The province covers an area of more than 6,000 km², with a total population of 541,098 in 2019. Trentino is renowned for its mountains, such as the Dolomites, which are part of the Alps.

One of the most important field of work are climate changes and Trento is performing many different projects about mitigation and adaptation. Renewable energy sources are one of the most important topics to assure secure and affordable energy for all. They have already started to work on energy community as well as important part for fostering decentralisation of energy supply. The Autonomous Province of Trento aims to become the protagonist of this energy transition and since 2018 has set up a special working group composed of the Provincial Agency for Water Resources and Energy (APRIE), the University of Trento, Fondazione Bruno Kessler and Fondazione Edmund Mach, that will draw up a new Provincial Environmental Energy Plan. FBK has coordinated the drafting of the new energy scenarios, aligned with the EU decarbonisation objectives, and with a long-time horizon, extended to 2050, necessary to target the investments of the next decade.

<https://magazine.fbk.eu/en/news/towards-an-energy-autonomous-and-zero-emission-trentino/> (April 2022).

At the virtual meeting after the presentation of each organization, SELNICA has presented ALPGRIDS project, its pilots and especially the activities to establish energy community in SELNICA. Trento has presented many of their activities also in the field of energy communities. As they are a province, they do not perform such project by themselves. Its municipalities are implementing many activities on the field together with responsible partners such as energy and environmental agencies and institutions. There was a discussion about microgrids and community projects on both sides. In Trento there are some initiative and pilot about microgrids but not established communities according to the legislation. Both partners have similar strategies in the field of sustainable energy and they are looking for potential common projects in the future. Also, the possibilities for side visit were discussed.

UNIVERSITÀ DEGLI STUDI DI GENOVA (IT) – REGIONE PIEMONTE– SUSTAINABLE ENERGY SECTOR (IT)

Regione Piemonte by its Sustainable energy Sector, promotes Renewable Energy, energy efficiency and GHG reduction through the implementation of a Regional Energy Plan.

Regione Piemonte is involved in several relevant initiatives, such as the management of Regional ERDF, the updating of the legislative energy framework in coherence with EU and National laws, the provision of the technical support to Local Authorities of the region. From administrative point of view, the region is divided in 8 provinces and more than 1.200 municipalities. The multilevel governance is, thus, very important and this is managed with institutional consultation processes dedicated to low carbon initiatives.

The University of Genoa met Regione Piemonte - Sustainable Energy Sector during a workshop about microgrid and energy communities organized by the University of Genoa and IRE Liguria on March 23rd 2022 inside the Savona Campus. Both the promoting organizations of UniGe and IRE were invited to participate to the event in order to better facilitate the exchanges among all the entities involved. The workshop started with the UniGe research experience on the sustainable energy sector by focusing on the research infrastructures present inside the Savona Campus and the related activities and projects carried on during last years. The ALPGRIDS project activities were presented by IRE, while UniGe focused on the details of the pilot project. After this, one hour was dedicated to the discussion about microgrid and energy communities among the different institutions.

During this moment of exchange of best practices, UniGe learned about the experience of Regione Piemonte.

In particular, the Regione Piemonte issued a law for the promotion of Energy Communities in 2018 (Regional Law 3 August 2018, n. 12), 2 years ahead of national legislation.

Moreover, in Regione Piemonte one of the first Italian Energy Communities was born in the Municipality of Magliano Alpi (<https://cermaglianoalpi.it/>).

As the main coordinator and prosumer of the REC, the Municipality of Magliano Alpi has built a 20 kWp photovoltaic system in 2020 on the roof of the Town Hall. The plant can share the energy produced and not self-consumed with the local REC, currently formed by the utilities of the library, gym and schools, in addition to the four residents who first joined the starting configuration. Two EV charging stations will also be connected to the same system, which can be used free of charge by residents.

In the last year Regione Piemonte with the help of leading research institutions and universities has promoted several initiatives to increase experiences and to inform consumers about the possibility of having an active role in the management of their energy expenditure. New projects for the creation of new Energy Communities are active in different areas of the region.

The Energy Agency of Friuli Venezia Giulia has brought its experience in the field of promoting energy communities. In particular, the Agency offers support from a technical and administrative point of view to groups of consumers who wish to form an Energy Community, directing them towards the most efficient forms of aggregation.

During the workshop IRE and University of Genoa offered a synthesis of the main topics covered in Alpgrids and some results related to the Pilot SPEED2030. The cases presented provided ideas for the next round table.

During the round table, the potential advantages and the main critical issues of the Energy Communities compared to the model adopted in Italy were mainly analyzed. In Italy a law was issued in advance also on the transposition of the European Directive thus promoting a first small-scale experimental phase (Low Voltage users, plant size up to 200 kWp) that has highlighted opportunities and criticalities.

In the recent transposition of the European Directive, some critical issues have been already overcome. In the next phase that is expected starting by the end of June 2022, the Energy Communities can be extended to users of Medium Voltage networks with plants up to 1 MW size.

However, Italy has decided to adopt a virtual model for Energy Communities without the possibility of creating direct connections or private networks. The incentive associated to the so-called “Shared Energy” does not fully enhance the energy produced and consumed by REC users but only a part of it.

No incentive or compensation is provided for the energy “exchanged” i.e. fed into the network and withdrawn at different times. During round tables all partners agreed that with a similar incentive scheme it will be rather difficult to implement business models with acceptable ROI, except in special cases.

Although everyone agrees that Energy Communities should not be analyzed only from the point of view of investment profitability, it was recalled that Energy Communities are part of the tools provided by the REDII Directive for the achievement of the 2030 climate targets. For this reason, they should be accompanied by a legislative framework adequate to their full development.

BILATERAL EXCHANGES

OUTCOMES BILATERAL EXCHANGES

Figure 5 – Representatives of APE FVG, Regione Piemonte, Università di Genova, IRE during the workshop about microgrid and energy communities in Savona Campus



3

HINTS AND TIPS

SUPPORTIVE AND EVOLVING LEGISLATIVE FRAMEWORK: Many member states have already taken regulatory action to encourage the development of Energy Communities. Nevertheless, the transposition of EU directives is still ongoing and may lead to further changes for instance about the governance, scope and responsibilities of the community. Obstacles such as regulations complicating, strongly restricting or forbidden energy communities to use the existing public local grid for the exchange of energy need to be modified.

A GAME CHANGER FOR LOCAL AUTHORITIES: Local and regional authorities can support “local community energy” dynamics in various ways: involving an entire district in changing its energy supply mode and consumption patterns, teaming up with individuals and cooperatives in identifying, financing or operating Energy Community projects, engaging citizens in the local planning of energy infrastructure and policies.

ADMINISTRATIVE SIMPLIFICATION: an important support in the launch of RECs is represented by an higher simplification of processes, especially those related to the connection to the grid of the energy production plants. In many countries there is not a different and smarter procedure if the connection is in the framework of an Energy Community

AWARNESS RAISING: Citizens and public Administration should have a greater awareness of the advantages deriving from RECs, especially in view of funding and incentives that will be made available shortly in some countries. Information campaigns and the creation of information points could fulfil the purpose

MAPPING OF RECS, BUSINESS MODEL AND REFERENCE SCHEME: despite the increased awareness of the advantages deriving from RECs, it is still difficult for citizens and public bodies to understand how to sort out. Information campaigns and the creation of information points could fulfil the purpose. Mapping of the existing RECs, business models and reference schemes, especially as regards contractual aspects, would represent an important incentive for the development of local energy communities.

4

CONTACTS

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Design and Management of Electrical Power Assets: <https://www.demepa.eu/>

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Rothmoser GmbH & Co. KG: <https://www.rothmoser.de/>

Compagnie Nationale du Rhône: <https://www.cnr.tm.fr/>

Comune di Udine: <https://www.comune.udine.it/>

Občina Selnica ob Dravi: <https://www.selnica.si/>

Università degli Studi di Genova: <https://unige.it/it/>

Territoire Energie 38: <https://www.te38.fr/>

Agenzia per l'Energia del Friuli Venezia Giulia: <https://www.ape.fvg.it/>

Varicon solutions: <https://www.varicon.at/>

Energy Agency South Tyrol – CasaClima: <https://www.agenziacasaclima.it/en/welcome-1.html>

Municipality of Thannhausen: <https://www.thannhausen.de/startseite-thannhausen>

EOS Powersolutions: <https://www.eospower.com/>

Lombardy Region: <https://www.en.regione.lombardia.it/wps/portal/site/en-regione-lombardia>

Association des Centrales Villageoises: <https://www.centralesvillageoises.fr/>

Business organisation Weiz- St. Ruprecht: <https://wirtschaftsraum.net/>

Centrales Villageoises Gervanne-Raye: <https://www.gervanneraye.centralesvillageoises.fr/>

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Municipality of Magliano Alpi: <https://cermaglianoalpi.it/>

Elektrizitätswerk Hindelang eG: <https://www.ewhindelang.de/index.html>

DECIDE Project: <https://decide4energy.eu/>

Municipality of Wildpoldsried: <https://www.wildpoldsried.de/>

Municipality of Gemeinde Moosach <https://moosach.info/nahw%C3%A4rme.html>

RECOCER project: <https://recocer.eu/>



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