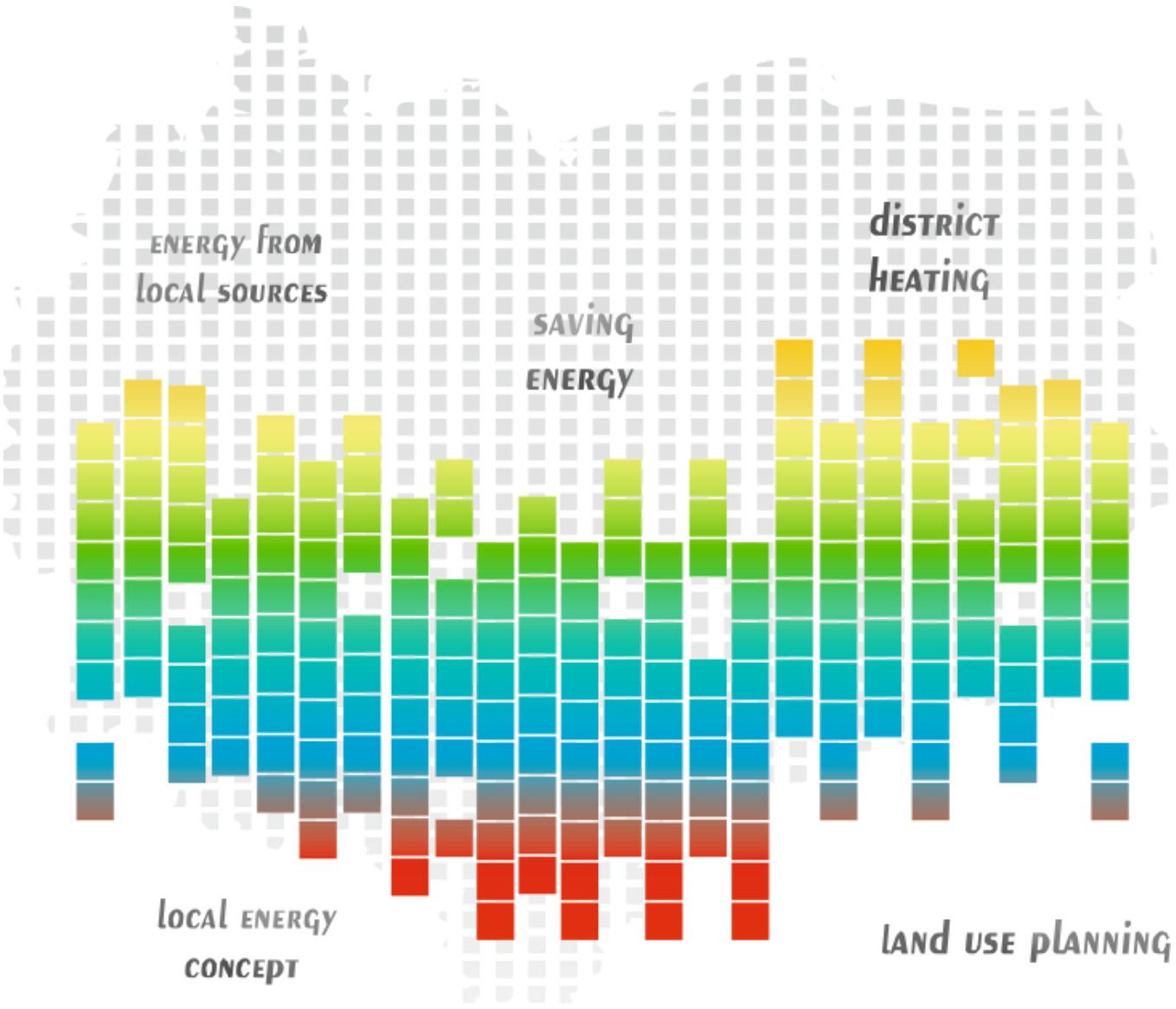
FROM ENERGY MANAGEMENT TO ENERGY SECURITY

A good practice handbook for municipalities / local authorities of how to secure energy supplies by a proper management



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AUTHORS:

Marta Resak
Thomas Duwe
Oldřich Sklenář
Saša Erlih
Regine Hassenpflug
Arno Scheer
Johannes Möller

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Authors: Marta Resak, Thomas Duwe, Oldřich Sklenář, Saša Erlih,
Regine Hassenpflug, Arno Scheer, Johannes Möller

Editing and proofreading: Marta Resak

Cover and book interior design: Anna Nowacka

Poltegor-Institute
Parkowa 25
51-616 Wrocław, Poland
http://www.igo.wroc.pl
e-mail: poltegor@igo.wroc.pl

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Foreword

This handbook provides a comprehensive overview of good practice in engagement of local governments in energy management. It gives advice for communities, local administration units and policy-makers wishing to broaden their local development plans with energy security aspects. It guides you through the major considerations involved in the process of bringing energy security to the local level.

Drawing upon experiences and lessons learned in Central Europe's regions, this handbook will help you start the process, allow you to identify the opportunities inherent in the energy management and later take a full advantage of your visions, strategies and plans.

Acknowledgements

This handbook is a joint initiative of the partnership working in the frame of the ENERGEREGION project. The overall goal of the project is to support development of renewable energy use in combination with conventional energy in regions of Central Europe through strategic energy planning, public outreach, defining resources and providing support to municipalities and local energy committees.

The ENERGYREGION project is implemented through the Central Europe Programme co-financed by the European Regional Development Fund.

For more information on ENERGYREGION, please visit www.energy-region.eu

or contact Barbara Rogosz
barbara.rogosz@igo.wroc.pl

New Perspective On Energy Security

In the past decades energy security has been receiving much attention in the global or national debates rather than it has been a concern of local level administrators. Moreover, considerations on energy security have mostly resolved around oil and natural gas, also coal- and gas-fired power generation and the infrastructure of energy supply such as gas pipelines, oil tankers, refineries, storage and generating facilities, transmission and distribution lines. As climate change, rising costs of fossil fuels and renewable energy becoming increasingly important, energy markets are experiencing a considerable change. Renewable energy resources are available locally or under certain local conditions, therefore, thinking of energy systems must change from global or national to local. At the same time the issue of securing the availability of reliable and affordable energy, with use of an environmentally acceptable system of energy supply, still remains an important challenge.

Since local governments oversee all activities taking place in areas of their administration and draw up development plans helping to achieve certain economic and social goals, they are also in position to determine strategies for sustainable and secure energy. They also have a close access to their inhabitants and knowledge of their needs and local energy resources such as renewables. Transition towards local power supply and local energy infrastructure, i.e. decentralization, can significantly enhance energy security of an area but one must be aware that there are no easy ways to accomplish it.

How to bring energy security to your area?

Usually external energy suppliers are responsible for securing energy supplies and maintaining energy grid safety. Generating and distributing energy on the local level can, however, reduce dependency from external actors. Decentralization of energy market and stable energy supply are only possible when access to local energy resources is secured. Making use of resources such as renewable energy should be accompanied by energy efficiency measures. These two must be complementary and both included in the energy management. In an ideal situation a well-thought-out energy efficiency strategy allows to achieve much lower energy consumption and the energy consumed is provided from local, usually renewable energy sources.

Securing the availability of reliable and affordable energy through developing local energy market requires proper planning and management. An energy strategy for a particular area must be built on the relationship between the energy demand and supply, availability of local energy resources, needs of inhabitants and local economy. Planning and policy-making should be rational since only then it can bring long lasting benefits for local communities. Moreover, the needs of all community members such as public bodies, private investors and local businesses, non-governmental organizations and most of all, inhabitants should be treated with careful consideration when planning.

All these groups have a place in the energy picture and have their roles to play in the energy transition. Demand and supply of energy interact with changes in the society.

Since local governments plan and manage the development and growth of their villages or towns, they have the biggest role to play while stepping onto a path of energy transition. To start with, they can make significant energy savings in their own operations, leading to serious money saving and even testing new renewable technologies with the money saved. Setting a good example should not be underestimated. As local energy management is becoming more common among municipalities, they can also benefit by sharing their experiences and developing best practices. These can also help to strengthen the acceptance of energy transition among the local inhabitants.

If you would like to contribute to energy security of your municipality, there are some options, independent from external energy suppliers:

I. Local energy concept
II. Saving energy
III. Producing energy from local sources
IV. Installing district heating
V. Land use planning to ensure energy security
VI. Providing education

What is there to gain for my community?

In general, a municipality's economic performance is increased by existence of local energy market. Due to a broad spread of investments, the decentralized supply structure is especially advantageous for structurally weak, rural areas. The reinvestments of profits as well as the creation of jobs should be a continuous aim of all parties concerned. Next to direct and indirect investments also induced effects are important. The direct regional added value is for instance defined as the income of the employees, profits of the local companies, remaining regional interests, trade taxes and shares in income taxes. The indirect regional added value includes amongst other things the demand for goods (e.g. spare parts) and the demand for services (e.g. maintenance and repairs, accounting and tax advice). The induced regional added value is understood as the spending of the resulting incomes, profits and revenues of the regional companies and communities. Although the induced effects are difficult to quantify, they make it clear how complex but at the same time how important the circle of the local money flow is.

Furthermore, the local energy market makes an essential contribution to the independence from fossil fuel and/or nuclear power, increase reliability of energy distribution and enhance energy security. This corresponds in most cases to national, European and global aims. The local energy market, which is usually based on renewable sources, also gives strong environmental effects such as reducing local air pollution – these effects combined with economic opportunities essentially contribute to local sustainable development.

Local Energy Concept

The most important step of enhancing energy security on municipal level is to elaborate an energy concept. In simple words, an energy concept determines an energy demand, usable resources and a potential for savings and identifies a set of actions to be taken to fulfill certain goals in the field of energy management. It also defines a time horizon within these goals could be achieved and identifies ways of monitoring. Moreover, energy concepts should explore different energy generation and consumption scenarios, compare actions to be taken in terms of possible outcomes, potential for success and costs. They should allow local governments to take well thought and well planned decisions, especially on investments, and gain public support and acceptance beforehand.

Implications of energy planning for the economy, the environment and the society are meant to be long term. Once designed the energy system will last for years and financial resources dedicated to it should be well spent. Local energy planning by its nature supports self-sufficiency and sustainability in the energy sector. It has a lot of potential, if done on a continual basis by dedicated local administrators and community members. Moreover, it needs to gain a continuous public support.

Decisions taken today may radically influence the future, therefore various options should be taken into account in relation to their long term implications. Energy planning usually assumes evaluation of each decision at regular intervals.

Steps of municipal energy planning

1. **Making inventory of your community's energy consumption.** This is always the starting point of every energy planning. Determining the local situation in terms of energy production and consumption by collecting historical data enables establishment of a baseline against which the energy transition will be presented. The baseline is in fact necessary to quantify potential energy savings and share of renewables in total energy production. Once a baseline has been established, the consumption should be monitored on regular basis to track effects of your energy planning and management.

2. **Developing a community's energy consumption profile.** Such a profile breaks down the energy consumption data into different energy sources (natural gas, oil, coal, gasoline, district heat, electricity) and major energy end-use sectors (residential, commercial, industrial, and transportation). An energy use in a sector may be further divided, for instance the energy use in residential sector can be divided into water heating, space heating, lighting and appliances, air conditioning etc. to demonstrate how the energy is actually used. Defining energy use profiles helps identify possible energy savings and opportunities for using renewable energies.

3. **Defining potentials for renewable energy development.** It provides a description of renewable energy resources available in a given area and the amount of energy that renewable energy technologies can generate – usually on an annual basis. The renewable resources cannot be

calculated as total embodied energy what makes their assessment different than for fossil fuels. The potential of renewable power, heat and fuel generation has to be estimated for various renewable technologies.

4. Setting targets and goals. Knowing the present state and potentials, you can set goals, milestones and pathways for the development. Your energy management concept should define specific targets for energy consumption reduction and energy generation from different sources. The targets must be measurable and based on the findings of the energy consumption inventory and profiling, established baseline and characteristics of the municipality. It is important to set both short- and long-term goals that are consistent not only with local circumstances and legal requirements but also European, national and regional policies and development trends. The targets can for instance follow the "3x20" EU strategy saying that by 2020, the European Union should: reduce its greenhouse gas emissions by 20%, reduce its energy use by 20% and achieve 20% of renewable energy in its energy supply. When setting the targets it is necessary to take into consideration different stakeholders' interests and concerns, including citizens, decision makers and businesses, and their level of awareness with respect to energy sector operations and energy security.

5. Developing a roadmap. After setting measurable targets the next step is to elaborate a comprehensive list of measures, actions, or programmes, in order to help your municipality reach those targets and have control over efforts taken and work being done in the municipality. Such roadmap describes and explains how the municipality's vision will be attained step by step. Potential barriers preventing the implementation of chosen actions should be considered when planning. It is also important to identify ways of monitoring the roadmap's implementation and reporting on all successes or failures.

The package of measures includes behavioral changes, so-called sensitizing measures (energetic behavior, readiness for renovations) and concrete technical measures (e.g. the sealing and insulating of building envelops, replacement of heat producers, installation of PV systems etc.). Measures are usually divided into different areas and/or fields of action, for instance:

- Information, Accompaniment, Nature conservation
- Municipal level of action
- Buildings and Living
- Companies
- Mobility
- Renewable energies, energy efficiency
- Sensitization
- Public relations work.

The development of measures is a particularly important point for involving the citizens and other actors. Moreover, the roadmap's implementation and the execution of listed measures, actions or programmes require relevant financial support. In order to promote the implementation of a specific measure, different possibilities are given for covering the

costs involved. In case of a municipal level of action the support is granted due to political decision which is extremely important to make in order to create a solid link between municipal energy targets and proposed actions.

6. Adopting an energy management concept. All the aforementioned steps of municipal energy planning are usually integrated in a written document that includes all aspects of energy management. In order to achieve identified targets and goals, an energy concept needs to be approved by a municipality council.

7. Implementing an energy management concept. At this step, you need to make things happen - execute listed measures and realize designed programmes - what will result in meeting your energy targets. Providing training and guidance to the community on how to implement specific measures is required. Keep the community informed of your efforts and progress to increase your citizens' acceptance. Ideally a caretaker/energy manager is installed whose only purpose is to address topics of the approved concept and foster its implementation. This person also controls the budget foreseen for events, information material etc.

Key aspects of the planning process

- You must see the whole picture. There is always both heat and electricity to be considered, many various sources and different stakeholders – among others, two opposing groups, the ones who would like to sell energy at the highest possible price and the others who wish to buy it cheap.
- Make use of and focus on your local potentials! Municipalities are characterized by very different potentials in terms of renewable energy generation and possible energy savings. Preconditions for the energy transition vary from one area to other. Comparisons to other municipalities should therefore be made with caution.
- Design energy programmes knowing exactly who you want to reach with a programme and what you would like to accomplish, and then carefully consider all of the means you have available to do that.
- Assure continuous support of your stakeholders! They all need to be on the same side, your side.
- Local money for investments is a crucial factor for the regional value added. Involve local banks!
- A key to success is cooperation. Bring together actors of all energy related groups - companies, farmers, foresters, small and large energy consumers, banks, grid operators, energy providers, etc.

Frankenberg - Citizens working together on the energy concept

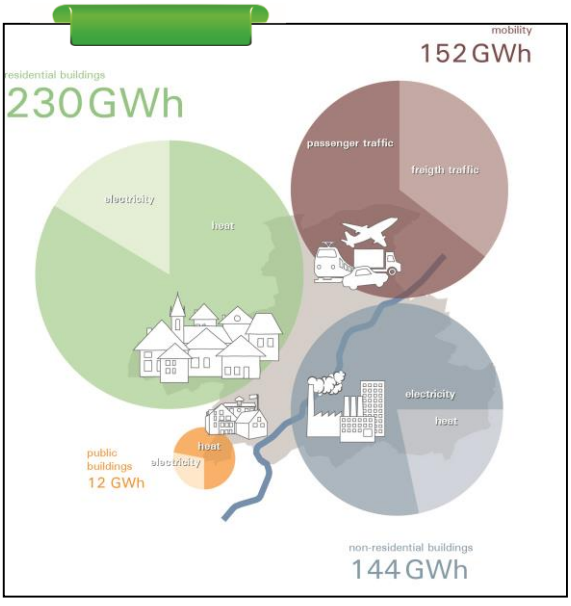
In Germany local energy concepts are developed in the form of climate protection concepts which put energy conservation and renewables at the centre of climate change mitigation. There are certain steps accompanying the process of creation of such a concept and the one presented here serves well as a good practice example.

In the city of Frankenberg (Eder)/Germany, an integrated climate protection concept was designed within one year from December 2012 until November 2012. One focal point of the concept´s development was to inform and raise awareness of the climate protection among the population. For this purpose, different events took place aiming at involving the citizens in the development of the concept. First of all, during a **kick-off event**, the citizens were familiarized with the process of concept planning and asked to participate by sharing their ideas.

Furthermore, an **advisory board** was established, which accompanied the development of the climate protection concept. Different actors from Frankenberg took part in the advisory board. Participants of the board were for instance the energy providers, educational institutions, political representatives, local enterprises as well as representatives of initiatives and associations. All in all, the advisory board hold four meetings during the time of the concept`s development. Today, the advisory board continues to meet in order to accompany the climate protection of Frankenberg in the future. Further public events were a **„climate-day“ with workshops** and a stand which was presented at the local fair and primarily served as a presentation platform for regional companies.

A local fair where the climate protection concept was presented to the public

With regard to the development of the concept as such, first of all an energy and CO_2 balance was prepared on the basis of data provided by the local energy supplier, which included the areas of electricity, heat and mobility for the entire city.



The example of an energy balance

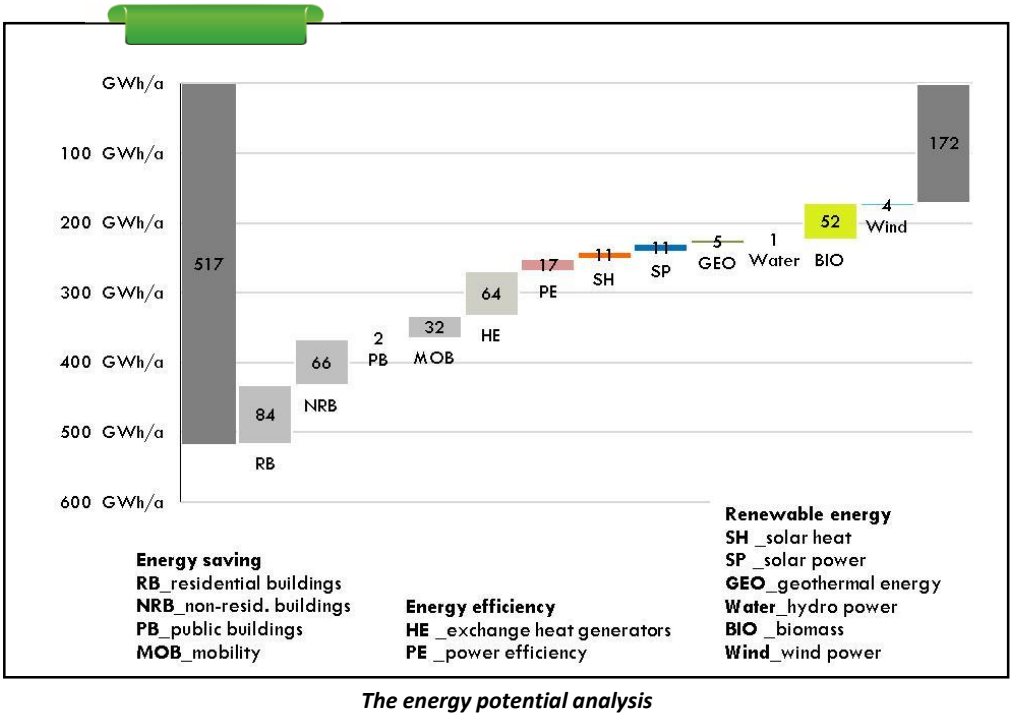
Frankenberg - Citizens working together on the energy concept

Through the preparation of a potential analysis it became clear that the biggest potentials to reduce emitted CO_2 are in the field of energy saving and energy efficiency. Due to a low availability of appropriate areas, the development of renewable energies is, in contrast to other municipalities, only partly possible.

The establishment of relations with different actors in Frankenberg, e.g. through **expert discussions** and the events as well as through the calculations of the potentials, enabled the development of a **catalogue of measures**, which contains 28 measures in total. These measures include the following fields of action: “administration”, “public relations”, “renewable energies and efficiency”, “companies” and “mobility”.

The creation of the climate protection concept was accompanied by a continuous **press and publicity work.** Several press conferences were held during which topics of climate protection were presented from the citizens´ perspective. Furthermore, different actions took place which made citizens aware of saving energy and thus costs by carrying out for instance an energetic building renovation. For this purpose, a “thermographic walk” was performed. By means of a thermographic camera it is possible to detect heat flows at a building´s facade. During the walk, “thermal pictures” were taken together with the owners and interested people and typical measures were discussed concerning the avoidance of unwished heat losses.

Together with the local energy supplier press conferences took place, which informed about



The energy potential analysis

Frankenberg - Citizens working together on the energy concept

current possibilities to save energy. One conference hosted a local building material trader, which informed about different ways to renovate a building (e.g. insolation of the outer wall and the roof as well as replacement of the windows). Another conference discussed the possibilities to save electricity through both the change of behavior and the replacement of inefficient products like e.g. old heat pumps.

Geld sparen mit einer Dachdämmung

Auftaktveranstaltung für integratives Klimaschutzkonzept soll Bürgern Anreize für Sanierungen bieten

In kleinen Schritten oder mit einem großen Sprung: Wenn Hausbesitzer Geld in die Hand nehmen, können sie mit wenig Aufwendungen Geld sparen. Bürgermeister Rüdiger Heß wirbt so für den Klimaschutz.

VON PATRICIA KUTSCH

Frankenberg. Draußen ist es kalt und windig, Schnee hüllt die Landschaft ein. Umso wärmer und gemütlicher ist es bei diesem Winterwetter in den eigenen vier Wänden. In vielen Häusern zieht allerdings ein großer Teil der Wärme nach draußen. Bürgermeister Rüdiger Heß, Projektmanager Matthias Pöhler von der Klima- und Energieeffizienz Agentur „Kea" und Volker Zarges vom Baustoffhandel Balzer geben daher Tipps, wie Hausbesitzer schon mit kleinen Sanierungsarbeiten eine große Wirkung erzielen können – nicht nur für den Klimaschutz, sondern auch für den eigenen Geldbeutel.

„Es gibt viele Möglichkeiten, was Hausbesitzer machen können, um ihr Haus zu dämmen", erklärte Heß. Daher sollte sich jeder Gedanken machen, auch wenn eine Dämmung nicht ganz billig sei – aber sie spare Energie, steigere den Wert der Immobilie und vor allen Dingen die Wohnqualität. Laut Pöhler ist es erwiesen, dass in einem gedämmten Haus die Wände mehr Wärme abstrahlen und keine Luft mehr nach draußen

Bettina Werner, Ansprechpartnerin für Energiefragen in der Stadtverwaltung, Projektmanager Matthias Pöhler, Balzer-Niederlassungsleiter Volker Zarges und Bürgermeister Rüdiger Heß (von links) zeigen verschiedene Dämmmaterialien und Fensterverglasungen. Foto: Patricia Kutsch

zieht. Dadurch wirkt das Haus wärmer als ein ungedämmtes Haus bei gleicher Zimmertemperatur.

Wenig Geld, große Wirkung

Zarges erklärte, dass bei Dämmungen am eigenen Haus neben Handwerkern vor allem ein Energieberater ins Boot geholt werden sollte. Der kennt nicht nur Fördermöglichkeiten und das seit 1. März aufgelegte neue Kreditprogramm der KfW, sondern findet individuelle Lösungen für das jeweilige Haus. „Jedes Gebäude hat eine andere Struktur und jeder Hausbesitzer ein anderes Portemonnaie", sagte Zarges. Ein Energieberater helfe bei der Auswahl, welche energetische Sanierung bei den eigenen Möglichkeiten am effektivsten sei. Pöhler erklärt, dass beispielsweise eine Styroporschicht unter der Kellerdecke schon eine große Wirkung habe und nicht viel Geld koste. Energieeinsparungen im zweistelligen Prozentbereich stellt Zarges in Aussicht, wenn allein die oberste Geschossdecke isoliert werde. „Das ganze Haus einpacken bringt natürlich mehr, aber Dach und Keller dämmen lässt sich schnell umsetzen und ist nicht so teuer." Viele Menschen könnten oder wollen laut Pöhler ihr Haus schließlich nicht einpacken, weil dann die Fassade verschwindet. Handwerker sollten laut Zarges engagiert werden, weil gerade im Altbau spezielle Detaillösungen notwendig seien.

Tipps von Fachleuten

Um Wärmedämmung am eigenen Haus geht es auch am Montag, 18. März, bei der Auftaktveranstaltung zum integrierten Klimaschutzkonzept in Frankenberg. Fachleute geben den Besuchern in der Ederbergland-halle ab 19 Uhr Tipps, wie sie ihr Haus dämmen oder Strom sparen können. Die Handwerker Udo Schmidt und Thomas Ernst halten Vorträge, der Schreiner Werner Böhle erzählt, wie er sein Haus umfangreich von der Heizung bis zur Außenwand hat sanieren lassen.

„Hoffentlich ist das ein Anreiz für andere Bürger", sagte Pöhler. Die Organisatoren der Veranstaltung wollen laut Pöhler die Menschen motivieren und Lösungen zeigen, um damit vielleicht viele kleine Projekte in Frankenberg anzustoßen. „Denn in der Stadt liegt die Hälfte des Energieverbrauchs im Bereich des Wohnens."

Press article „Saving money with a roof insulation"

After the climate protection concept was completed, the city of Frankenberg applied for funding a staff member for the implementation of the concept. The future **climate protection management** in form of a climate protection manager will have the task of implementing the measures of the climate protection concept and establishing the topic of climate protection in Frankenberg on a permanent basis. For this purpose, it is planned to continue to perform public actions in order to sensitize citizens for the topic of climate protection in the future.

The climate protection concept of the city of Frankenberg (Eder) serves as an overall example for the development of a local climate protection concept or energy concept. Frankenberg has shown in particular the importance of a great involvement of both actors and citizens. This realization should be reflected generally in local energy concepts, especially when the energy concept examines only smaller parts of the municipality like for instance one quarter. The following steps are all indispensable work tools: defining energy balance and evaluating energetic potentials, setting targets and goals, developing a roadmap, adopting and implementing an energy management plan. However, the active participation of the people on-site is the most important element to develop a successful local energy concept.

Wollen Stromfresser aus den Haushalten Frankenbergs verbannen: (von links) Matthias Pöhler (KEEA), Bürgermeister Rüdiger Heß, Armin Raatz (KEEA), Bettina Werner (Stadtverwaltung) und Karl-Heinz Schleiter (EGF). Foto: Sonnabend

Sparen mit voller Energie

Zum Auftakt des Klimaschutzkonzeptes können Bürger Heizungspumpen gewinnen

VON NORA SONNABEND

FRANKENBERG. Sie sind heimliche Stromfresser, die sich meistens im Keller verstecken: Alte Heizungspumpen verbrauchen stündlich bis zu 90 Watt, weiß Bürgermeister Rüdiger Heß und wirbt für die Installation von Energieeffizienz-Pumpen zum Energiesparen im eigenen Haushalt.

„Diese Pumpen verbrauchen nur sechs bis elf Watt", sagte er beim Pressetermin. Vier solche sparsame Pumpen werden bei der Auftaktveranstaltung zum Integrierten Klimaschutzkonzept in Frankenberg am Montag, 18. März, um 19 Uhr in der Ederbergland-halle verlost. Auch die Installation der Pumpen ist im Gewinn inbegriffen.

Investition zahlt sich aus

Für ein Einfamilienhaus kostet die Anschaffung und Einrichtung normalerweise etwa 350 Euro. „Das ist eine geringe Investition, mit der man riesige Kosten im Haushalt spart", sagte Armin Raatz, Geschäftsführer der Klima- und Energieeffizienz-Agentur KEEA, die die Stadt beim Projekt unterstützt. „Man spart damit 141 Euro im Jahr ein", ergänzte Karl-Heinz Schleiter, der Geschäftsführer der Energiegesellschaft Frankenberg (EGF).

Wichtig sei aber, zuvor für eine gleichmäßige Wärmeverteilung an die Heizkörper im Haus einen hydraulischen Abgleich vornehmen. Und Schleiter machte deutlich, wieviel Energie durch alte Pumpen verschwendet wird: „Das entspricht in Deutschland dem Verbrauch von zwei Großkraftwerken."

Wo im Haushalt noch Energie eingespart werden kann, zum Beispiel bei Fernsehern, die auf Stand-by stehen, Waschmaschinen oder Wäschetrocknern ist unter anderem Thema der Auftaktveranstaltung: „Wir möchten zeigen, wie mit Ressourcen besser umgegangen werden kann und mit den Menschen ins Gespräch kommen", sagte Armin Raatz. Auch Förderungsmöglichkeiten und Zuschüsse werden dann vorgestellt.

Press article „Saving with full energy"

Praha Libuš – Model energy concept for the city district

In 2008 Prague-Libuš (a district of almost ten thousand inhabitants of the city of Prague, Czech Republic) commenced its activities in the energy planning and management (in the frame of the European project entitled MODEL -Management of Domains Related to Energy in Local Authorities).

At the beginning, an eight-member energy team, comprised of district office staff and led by its secretary, was established in Prague-Libuš. The team subsequently underwent a training in the area of energy management and was involved in the development of the Energy Plan for Prague-Libuš until 2020 together with a partner organization. This plan analyzed the current level of energy management of the city district and then defined a target situation for 2020 based on the vision of the work team. The vision is characterized by the following objectives:

- increasing energy self-sufficiency and independence;
- enhancement of environmental quality;
- building a well informed and engaged community.

These objectives then corresponded to the priority areas set out in the plan, namely:

- energy savings;
- renewable energy sources;
- education and awareness.

Within the Energy Plan, the priority areas were processed to describe specific steps that the district needed to take in order to meet the set objectives. The output was the list of activities containing characteristics of every particular activity, definition of its extent, expected costs of implementation, anticipated external sources of possible co-funding and a period of realisation.

In the first priority area (energy savings) it is mostly planned to reconstruct buildings of the city administration, while the particular activities are split into stages, which are individually solving the issue of heat insulation or exchange of heat resources etc. Also low-cost measures such as replacement of appliances for more efficient ones or installation of thermostatic valves are included.

Energy management training

The second priority area involves the support of renewables solved mainly by installation of rooftop photovoltaic and solar thermal systems - from the stage of identifying suitable buildings (appropriately oriented roofs) to the concrete realization of such a systems.

The last priority area, focused on public awareness raising, brings up the topics such as organisation of particular public events, a form of web presentation or thematic courses for city hall employees.

Praha Libuš – Model energy concept for the city district

A local fair promoting energy management

In December 2009 the Energy Plan was approved by the city district council.

In addition to organizing informative events, one of the first activities implemented was an energy management system for buildings owned by the city district. As a basis of the system, a sophisticated software application, E-manager, was created. The data on energy consumption can be collected in one week periods (manually inserted by the buildings' mangers or maintenance staff with an access to the system) and analyzed with respect to energy audits of certain buildings, current weather conditions (temperature) and long-term statistics for particular places. Deviations from usual "behaviour" of the building can be easily detected and appropriate measures applied. Such energy management system is usually a good start for a long-term energy planning.

Rotenburg - Developing the energy concept for 2000 sq. km area

The integrated climate protection concept (energy concept relating energy policy to climate change mitigation) for the administrative district of Rotenburg (Wümme) was developed in a one-year long process from September 2012 to August 2013. The objective was to develop an energy and climate protection strategy and propose projects as concrete as possible. The focus was on the use of energetic potentials in order to maximize regional value creation. The development of the climate protection concept shall strengthen the administrative district of Rotenburg (Wümme) for the future by using for instance the region`s energy resources which are processed in highly efficient renewable energy plants. Additionally, the region´s energy demand will be reduced by promoting e.g. the energetic building renovation, the improvement of the efficiency level of renewable energy plants as well as the increase of the efficiency of business enterprises.

The most concrete possible catalogue of measures has been developed in close cooperation with the local players and is thus likely to be implemented quickly. The following events took place during the development process:

- Public kickoff event;
- Establishment of an advisory board which accompanies the process and serves as an instrument for coordination and cooperation on the concept-related issues. The advisory board consists of representatives of the local energy suppliers, the companies, the Chamber of Handicrafts, the Commercial and Industrial Chamber, the chimney sweeps and local banks, who can all contribute with their ideas;
- Workshops on the themes of „energy efficiency in companies“ and climate protection in the district`s administration. These workshops intend to address important players, integrate them in the development process of the concept and help consider their suggestions and proposals of measures;
- A survey of enterprises in order to record possible energy potentials and to prove different opportunities for action;
- Private conversations with experts from the district of Rotenburg (Wümme) (e.g. with energy suppliers, entrepreneurial transfer institutions, banking institutions, forest administration, employees of the district administration (areas: nature conservation, building management, the Office for Education), tourism association, manufacturer of biogas plants/small wind turbines and some others).

A workshop for companies

Rotenburg - Developing the energy concept for 2000 sq. km area

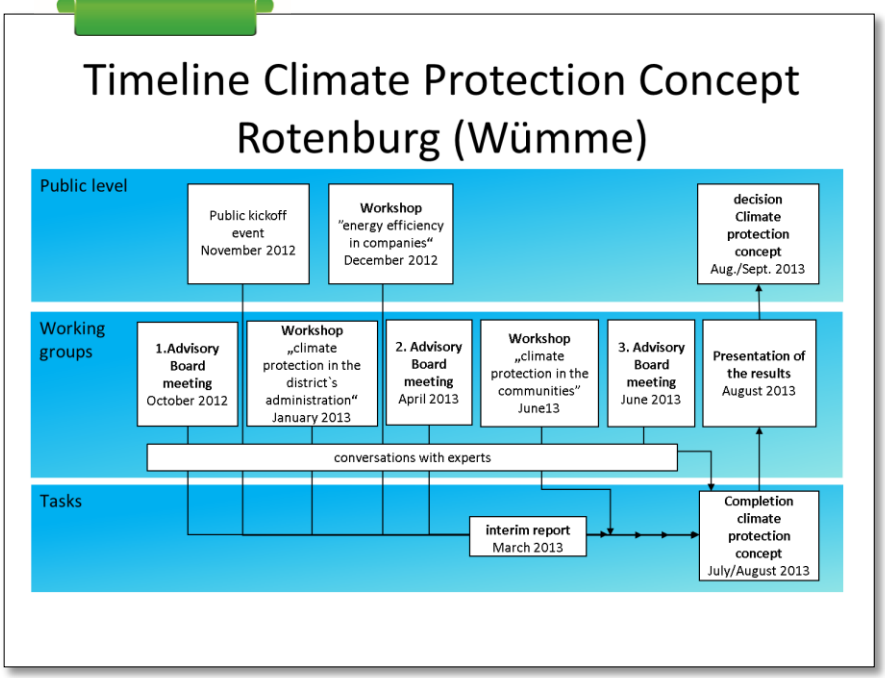
The result is an action strategy for the administrative district of Rotenburg (Wümme) including an implementation-oriented catalogue of measures. The catalogue comprises 22 measures related to the following fields of action:

- Energy saving;
- Energy efficiency;
- Renewable energies;
- Information and nature conservation.

The following measures are included: to develop village and district energy concepts, to launch new programs dedicated to financially support the energetic renovation of buildings, to promote bicycle traffic, to establish low-threshold advisory services, to examine the possibilities for the implementation of PV or small wind plants, to promote citizen involvement in renewable energy plants and the development of an information system.

The concept gives evidence for the positive economical effect which climate protection has on site. The regional economic dimensions of climate protection are, in particular in Rotenburg (Wümme), significantly higher than in most other regions of Germany:

- Good basis conditions make the region perfect for generating renewable energy and thus offer an additional source of income to farmers, commercial enterprises and citizens.;
- A high number of companies specialized in the fields of production and maintenance of renewable energy plants create new jobs and incomes;
- A statistically seen above-average living space per citizen as well as a relatively low renovation level offer big economic potential for companies in the field of building renovation, this means especially in the local handicraft.



Contents and development stages of the integrated climate protection concept

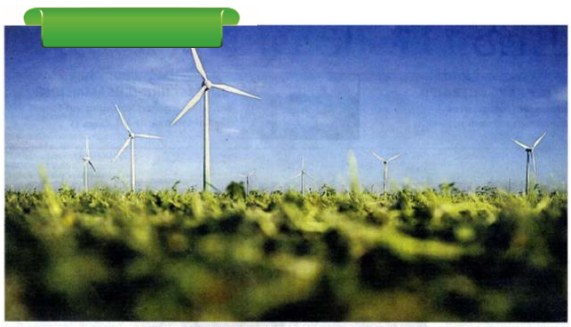
Rotenburg - Developing the energy concept for 2000 sq. km area

The measures proposed in the integrated climate protection concept therefore concentrate on fields which have both a high energetic and economical potential. The following objectives should thus be achieved in the district:

- 10% energy saving until 2030;
- 30% share of renewable energy in total energy consumption by 2030;
- Expansion of the priority areas for wind energy from currently 0,5% to 1% of the district´s area;
- Increase of the building renovation rate to 1% (on average, 1 out of 100 buildings will be energetically renovated per year).

The achievement of these objectives is pursued with the appropriate amount of prudent judgment and in ways that respect the people and the environment: no further construction of biogas plants is anticipated but an increase in efficiency and energy recovery instead; priority areas for wind energy will be concentrated on areas with little land use conflicts; conservation of moors is considered in the efforts made for climate protection.

The climate protection concept can contribute to the worldwide climate protection, to local service development and last, but not least to the regional added value. However, this will only be possible if the concept is implemented in form of concrete measures. In order to do so, the employment of a climate protection manager is recommended for at least three years, to initiate, accompany and implement regional projects.



Der Landkreis will den Bedarf an weiteren **Windenergieanlagen** ermitteln, die für eine umweltfreundliche Energieerzeugung stehen. Foto: dpa

„Landkreis auf gutem Weg“

Integriertes Klimaschutzkonzept wird erarbeitet – Reduzierung des Gebäudeenergiebedarfes notwendig

ZEVEN. Welche Möglichkeiten gibt es, auf nachhaltigem Wege Energie zu erzeugen? Wie können Privathaushalte, Betriebe, Schulen oder Vereine zu einem sparsamen Verbrauch der Energie beitragen? Und vor allem: Was kann der Landkreis Rotenburg tun, um das Klima zu schützen und gleichzeitig daraus einen Nutzen für die Menschen und die regionale Wirtschaft zu ziehen?

Mit dem Integrierten Klimakonzept für den Kreis soll diese Thematik jetzt weiterentwickelt und realisiert werden. Gemeinsam mit der beauftragten Klima- und Energieeffizienz Agentur KEEA stellte der Landkreis das Projekt bei der Auftaktveranstaltung im „Landhaus Roose“ in Zeven vor.

» **Klimaschutz ist eine Gemeinschaftsaufgabe.** «
ARMIN RAATZ

Der Landkreis Rotenburg sei bereits auf einem guten Weg, den Bedarf an Energie und Wärme lokal zu decken, versicherte Landrat Hermann Luttmann in seinen einleitenden Worten.

In zwei bis drei Jahren solle dieser Bedarf ausschließlich innerhalb des Kreises produziert werden. Die Chance für die Zukunft: Der Landkreis über große Energieressourcen verfügt, hat auch die beteiligte Agentur in ersten Erhebungen bereits festgestellt. „Was hier jedoch dringend nötig ist, ist die Reduzierung des Gebäudeenergiebedarfs“, betonte Geschäftsführer Armin Raatz. Das Projekt ist auf ein Jahr angelegt und die Gesamtkosten betragen rund 133 000 Euro, wobei die Entwicklung des Konzeptes aus den Mitteln des Bundesumweltministeriums mit 86 500 Euro bezuschusst wird.

In den vergangenen 50 Jahren hat sich der Weltenergiebedarf vervierfacht, so Raatz, und genutzt werden in erster Linie fossile Brennstoffe. „Im Laufe der erdgeschichtlichen Entwicklungen haben sie das CO_2 gebunden, das jetzt innerhalb weniger Jahrzehnte wieder freigesetzt wurde“. Mit dem steigenden Verbrauch ist der Preis für Energie ebenfalls enorm teuer geworden.

Dieses Geld bleibt nur zu einem geringen Teil in der hiesigen Region und wird somit dem Wirtschaftskreislauf dauerhaft entzogen. Investitionen in Klimaschutzmaßnahmen im Bereich Energieeffizienz und Energieerzeugung steigernd hingegen die regionale Wertschöpfung. Ein Punkt des Klimaschutzkonzeptes sieht daher zunächst eine CO_2-Bilanz vor. Darüber hinaus soll das Potenzial an Wind-, Sonne- und Biomasse ermittelt werde, das künftig im Landkreis Rotenburg noch genutzt werden kann. Der wesentliche Teil des einjährigen Projektes ist jedoch der zu entwickelnde Maßnahmenkatalog. Hier setzt die KEEA auf koordinierte Aktionen, anstatt ungeordneten Aktivismus. „Klimaschutz ist eine Gemeinschaftsaufgabe“, betonte Armin Raatz.

Der **Ingenieur und Energieberater Armin Raatz leitet die Klima- und Energieeffizienz Agentur KEEA.** Fotos: he

Andreas Siebert hat in Niestetal bereits ein Klimaschutzkonzept realisiert. Fotos: he

Umsetzung des Konzeptes

Wie die Umsetzung des Konzeptes aussehen kann, darüber berichtete Andreas Siebert, Bürgermeister aus Niestetal bei Kassel. Dort sind es zum Beispiel gemeinschaftliche Energieanlagen, ein Energieforum für Unternehmen und Bürger oder Bürgerenergiegenossenschaften. „Um unsere Bürger umfassend über Fördermöglichkeiten informieren zu können, haben wir auch einen Klimaschutzmanager mit einer halben Stelle eingestellt, der als kompetenter Ansprechpartner oft konsultiert wird“. Im ersten Schritt werden jetzt Fragebögen verschickt, die Anfang des nächsten Jahres [illegible] ausgearbeitete CO_2-Bilanz eine Einblicke gewähren. hei

Seite 2 von 2

A press article on the integrated climate protection concept

SAVING ENERGY

Energy conservation reduce dependence from fossil fuels, improve energy security and decrease environmental impact of conventional energy uses. One can say that energy efficiency is the most effective and the least expensive energy resource. The energy conservation measures also give the most-immediate results. Simply speaking, at this very moment everyone can start to use less energy and everyone can benefit from doing it.

Possible measures that can make a direct contribution to energy saving are for instance:

- Energy use behavioral changes (turning off lights, appliances, heating when not in use, washing clothes in cold water, installing efficient light bulbs and thermostats etc.);
- Energetic renovation of municipal properties and houses;
- Renewing of street lightning (energy-saving lamps, LED, systems which depend on the needs);
- Increase of power efficiency in municipal buildings and companies (illumination control systems, green IT, introduction of switchable power strips etc.);
- Introduction of energy management systems (smart meter);
- Replacement of inefficient heating systems;
- Reduction of heat demand of companies;
- Energy controlling and saving programmes for schools and public buildings;
- Optimization of municipal vehicle fleet towards less fuel consumption;
- Enhancing the attractiveness of public transport (improvement of timetable/options for changing, unification of the traffic structure, construction of stops etc.);
- Initiation of car-sharing system;
- Encouragement of pedestrian and cycle traffic;
- Improvement of parking facilities for bicycles at public stops, promotion of Park&Ride.

Reducing energy demand and optimizing energy use have a broad set of environmental, economic and social benefits to all members in a community:

- **Lower household energy bills** – Energy efficiency can help families save money on household expenses. Better insulated homes, more efficient lights and electrical appliances, efficient heating systems and making good use of the heating controls will have an important impact on reducing energy consumption. Particularly it is a good opportunity for low income households and older houses whose inhabitants usually pay more for energy due to bad thermal insulation, inefficient heating systems and appliances;
- **Better economic performance** – The same as households, companies can control their use of heating, electricity and transportation, lower energy bills and deliver more cost-effective products. And if energy efficiency

in a community increases and as money stays in the local economy, spending in retail, entertainment and other services will increase;

- **More assets in a municipal budget** – Local governments provide basic services such as water and waste management, street lighting, public transport and other services and they use big amounts of energy in their buildings and vehicles. Energy conservation in a municipality operation will save money that can be then spent for improving public services such as education, health and safety services. But this may happen in a long term. In a shorter term first savings should repay some or most of expenditures needed for financing of energy conservation investments;
- **Increasing energy security** – The less energy you need, the less dependent you are from energy resources and their distribution patterns and the more secure you are. You also need less fuel storage capacity;
- **Lower local air pollution** – Energy efficiency can reduce the amount of local air pollutants that can come from fossil fuels such as oil or coal used for heating houses, and from gasoline consumed in large amounts by cars;
- **Better life quality** – Implementing energy conservation measures can improve the quality of life - renovation of houses and buildings to enhance their energy efficiency will increase property values and can also improve their aesthetics at the same time; proper traffic organization, abundant bike lanes and good public transport will contribute to reducing fuel consumption, lowering air pollution and creating more people-friendly (instead of car-friendly) environment.

Taking first steps to be more energy efficient is never easy, but it pays back. Moreover, energy conservation measures should be addressed at the beginning if you would like to contribute to energy security of your municipality. Although simply using renewable energy resources that are locally based instead of being dependent from external sources of fossil fuels may seem a more convincing way of increasing energy security, it is advisable to start saving energy beforehand. In such a way renewable energy technologies will serve to energy security to a greater extent and will be considered as better investment.

Nový Lískovec – Renovation of residential buildings

City district of Nový Lískovec is located on the western outskirts of Brno, the second largest city in the Czech Republic. The first settlement in this area dates back to the Neolithic period, however, the current history is closely linked to the beginning of the last century. A significant increase in population dates back to 1978, when a new prefabricated housing estate with 1,000 units was built there and 2,500 units more were added in 1990. Nowadays, this is one of the most densely built-up urban areas with around 12,000 inhabitants; most of them living in prefabricated blocks of flats.

Approximately one-third of the available housing, i.e. approximately 1,100 flats in 17 blocks of flats are administered by the municipal council. These originally stateowned flats were first transferred to the city of Brno, and since 1994 they have been gradually conferred to the administration by individual city districts. At the end of the '90s, in Nový Lískovec thus a question arose what to do with these gradually dilapidated buildings. After some ups and downs, in 1999, a working group in charge of a comprehensive regeneration of prefabricated houses was appointed here. Experts from local technical university and non-profit organizations were invited to this group. A support in the first phase was also provided by a team of Austrian architects.

The aim was to create a replicable model of affordable renovation of prefabricated houses and reach much higher energetic performance than normal standards in the country. Emphasis was placed not only on the technical details, but also on organizational measures. The concept of construction work itself was verified in the first two buildings renovated in 2001. After that, the modernization included 10 oldest blocks containing a total of 384 rental flats. The average age of these structures was 28 years. The key elements of modernization included exterior insulation by 16 cm thick polystyrene boards, as well as weatherproofing of the basement facade down to the ground level and below, ceiling weatherproofing in basements and weatherproofing of the roof. In order to minimize heat losses, new balconies were implemented, in particular they are anchored in a different way.

A renovated apartment house in Nový Lískovec

Nový Lískovec - Renovation of residential buildings

Central heat supply stations were also modernized and the heating system was complemented with thermoregulation added to individual radiators. Inside the flats, wiring was replaced completely and prefabricated bathroom units made of plastic panels called UMAKART were replaced by brick structures. Windows were replaced by new wooden double glazed windows. Ventilation system was also modified. For the first two buildings, a system with a central heat-recovery unit located on the roof of the building was used. Tenants, however, were not satisfied with this method of ventilation, especially due to unpleasant feeling of draught. Another drawback was the relatively high consumption of the heat recovery unit due to long lines. Thus, for other blocks a much easier system was selected. Exhaust was provided by small fans located in each of the flats and intake was solved by microventilation through windows. This system moreover allows individual ventilation as needed.

The first phase of renovation was completed in 2006, with a decrease of energy consumption for heating of the renovated buildings down to 40 kWh/m^2 per year. This represents the conditions of low-energy standard (<50 kWh/m^2 per year), and in some of the renovated buildings that also means a decline to less than one-third of the original consumption. Calculated reduction of CO_2 emissions is then 1,100 tons per year.

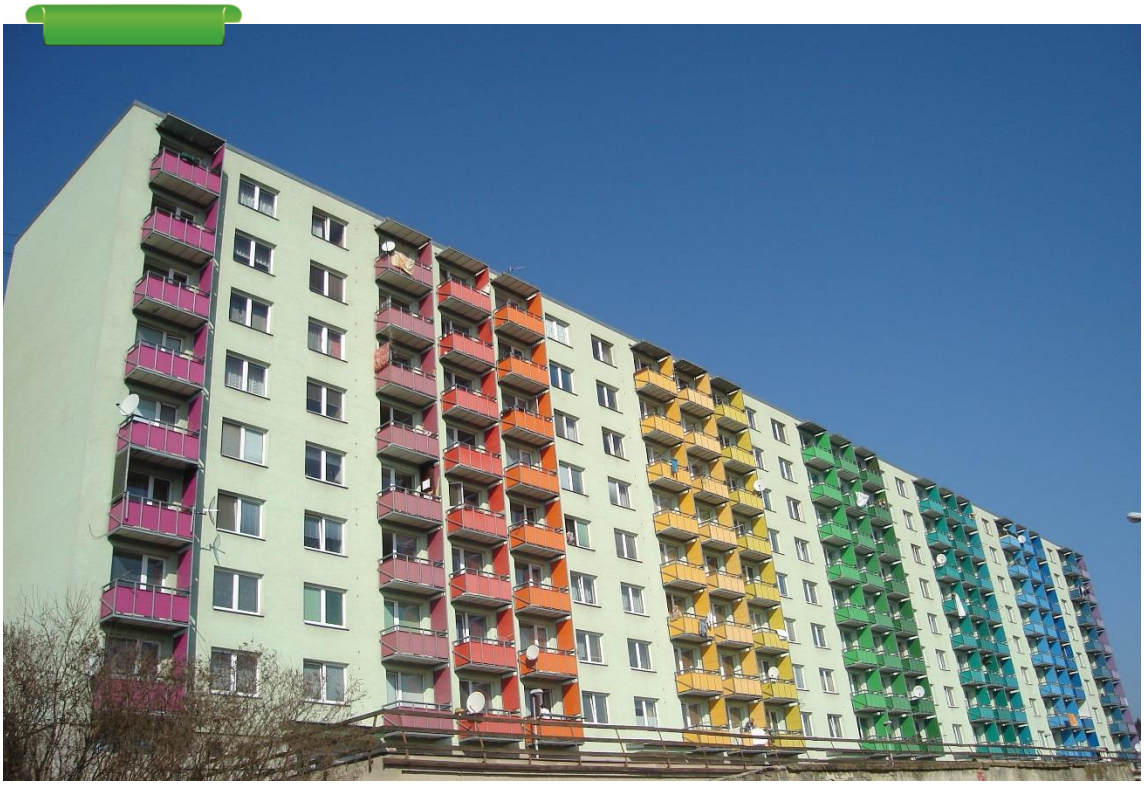
These results encouraged the City Hall to start the second phase of renovation which included the buildings finished after 1990. In these blocks, with average age of around 18 years at the onset of modernization, there are a total of 672 flats. Implementation of modifications was similar to the previous case, only the facade was insulated by 20 cm thick layer of polystyrene this time, and windows with triple glazing were used in some blocks. The second phase completed in 2010 resulted in a decrease in energy consumption for heating in the modernized blocks down to the level of 30 kWh/m^2 per year.

Total Costs	EUR 9.5 million
Renovation Duration	2001 - 2011
Number of Renovated Flats	1056
Resulting Annual Specific Consumption	40 kWh/m^2 (Phase I)
	30 kWh/m^2 (Phase II)
Annual CO_2 Emission Reduction (Phase I)	1,100 t

An integral part of the construction measures in both cases was the introduction of energy management. It includes in regular readings of energy consumption in individual buildings while watching the outside temperature. Readings are conducted weekly, what represents a significant difference compared with a conventional approach where energy flows are measured once or twice a year. The measured values are then evaluated graphically, by plotting a so called E-T curve. This allows early detection of fluctuations out of the common consumption mode and thus also prompt reaction to the caused deviation. All measured data are then made available online on the website of the city district.

Other organizational measures consist of creating a manual for operation and maintenance and its implementation in practice, technical-building-equipment staff training, checking the temperature and humidity in the flats and

Nový Lískovec - Renovation of residential buildings



Nový Lískovec district

training their inhabitants. These measures, in total, allow a further reduction in the consumption of renovated buildings. After the implementation, in fact, it occurred that the resulting consumption is still about 10 per cent higher than it was assumed by the energy audit. This increase was due to the behaviour of tenants who heated their flats too much (it was found that only about 20 per cent of the tenants maintained the recommended temperature of 20 °C) and ventilate their flats in the wrong way. Nevertheless, with the introduction of energy management, this situation has been improving constantly.

Unit investments in this renovation ranged from EUR 13 to 19.5 thousand for one flat, depending on its layout and size. For flats in which the prefabricated bathroom units were not exchanged, unit costs ranged from EUR 5 to 8 thousand. In total, the overall cost exceeded EUR 9.5 million which were invested between 2001 and 2011. The project was financed from three sources: the Nový Lískovec district budget, the budget of the city of Brno and a bank loan (about EUR 4.6 million = 48 per cent). Interests on bank loans are partially covered by the state programme to support renovation of prefabricated housing estates. The estimated return of the investment was calculated in 2007 to 13 years. Due to the expected lifetime of 30 years, it is a profitable investment.

Częstochowa - Management leading to energy saving in public buildings

Prior to the implementation of the energy management, municipal units of the town of Częstochowa, Poland independently managed electricity and heat supply and bear the costs in accordance with the terms of delivery proposed by installation designers and/or energy providers. The lack of experience in this field among the administrators of the objects often resulted in excessive energy consumption and high costs. In addition, complex tariffs and complicated invoices significantly hindered the optimization of costs.

In 2003 the local government took a decision to create the position of Municipal Engineer and specialized organizational unit - the Office of the Municipal Engineer - to cover monitoring and management activities in the area of energy, water and wastewater in about 230 buildings and premises used by educational institutions and municipal companies . Detailed monitoring and annual reporting included 118 educational facilities.

The general objectives of the energy and environmental management programme in public buildings of Częstochowa are:

- Reducing the consumption of energy and water and related costs in public buildings of the city;
- Development of energy and environmental management in the public facilities;
- Preparing the town to play a leading role in meeting the obligation to reduce energy consumption in the public sector and committing to sustainable energy use and climate protection.

Implementation of the management programme required first to prepare a detailed database for approximately 230 buildings and premises used by public institutions and municipal companies (with the exception of municipal residential buildings), start monitoring, conduct analysis and verification of the data on the use and costs of district heating, electricity, natural gas, other fuels, water consumption and sewage. The first set of data was collected in 2003, which was subsequently adopted for comparisons as the base year (i.e. when there were still no effects of management actions). The developed database served as the basis for implementing the following activities:

- Reduction of costs through the optimization of terms and conditions in contracts with suppliers (the first effects of the activities occurred in 2004), the analysis of invoices for compliance with the terms of the contracts and adjustments in case of inconsistencies;
- Improving efficiency by shaping the appropriate behavior of the public buildings' administrators, ongoing control and elimination of excessive consumption of energy and water, optimizing automated heat controllers, solving technical problems with suppliers, initiating the use of modern, efficient and environmentally friendly solutions for the energy supply;
- Preparing detailed annual reports on the use of energy and water for 118 educational facilities.

Częstochowa - Management leading to energy saving in public buildings

Until 2007 data from the invoices were obtained directly from the suppliers. Starting from January 2007, data on consumption, costs and conditions of use have been delivered by the administrators of the buildings. Engaging the administrators in the process of data gathering has an educational value and helps them realize the importance of consumption analysis. Since 2010 they have been entering the required information directly into the Internet Monitoring System. The system has been extended with analytic tools, surveys and a possibility to generate annual technical reports for each monitored object. The collected data served as a good basis while preparing public procurement for the collective purchase of electricity. The procedure took place in 2012 and the total volume of 33.55 GWh was tendered (jointly for four departments of the City of Częstochowa and more than 130 subordinate units).

Apart from establishing greater control over energy consumption in the municipally-owned buildings, The Office of the Municipal Engineer also requested and supervised the following activities:

- Replacement of bulbs, lamps and electrical appliances with energy saving ones;
- Plumbing repairs, installation of thermostatic valves, installation of automated heat controllers and their proper regulation;
- Performing energy audits;
- Between 2004 and 2013 15 educational facilities were thermomodernized (along with the modernization of their heat sources);
- In 2004, using the ESCO formula, there were heat transfer stations modernized in 22 buildings and boilers replaced in 2 buildings;
- In 2007 a reconstruction of heat transfer stations in 19 buildings and installation of automated boilers at 4 sites took place;
- In 2013 there took place a reconstruction of a heat transfer station in one kindergarten.

Economic and environmental benefits, resulting from actions taken towards reducing the energy consumption, have mainly had a positive influence on the budget of public buildings and utilities. This is particularly well manifested in the case of educational institutions, whose financial resources saved on electricity or heat can be used for other purposes, e.g. strictly related to teaching. The Office of the Municipal Engineer aimed for a change of behaviour and habits of educational institutions' administrators in the first place, who then included students in the energy conservation. The knowledge disseminated among the students is likely to be further passed into their homes.

Częstochowa - Management leading to energy saving in public buildings

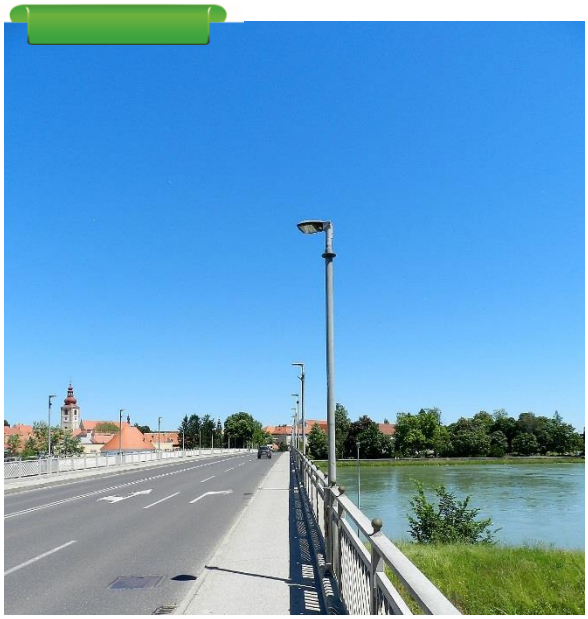
The effects of management actions and technical modernization of buildings, closely monitored and reported for a group of 118 educational institutions, enabled the reduction of energy consumption by total 169, 171 MWh and CO_2 emissions by total 71, 877 t (between 2004 and 2013). In 2013 the energy consumption and CO_2 emissions were lower by 27% and 26%, respectively, compared to the base year 2003.

The Office of the Municipal Engineer employs four specialists and acts under the direct supervision the President of the Town of Częstochowa. In addition to the implementation of programmes to improve energy efficiency, the Office collaborates with energy providers and other organizations to ensure the energy security of the city.

Ptuj - Energy saving in street lighting

Public lighting is used to illuminate public roads, public areas, important buildings and monuments. The public lighting infrastructure in Slovenia was up to 2008 either outdated or planned only according to local needs and not based on the experience of planners. In 2007 Slovenia adopted a regulation on limit values for light pollution (Off. Gazette of RS, No. 81/2007) providing that local communities must approach solving technological inadequacy and lowering energy consumption. A threshold for an average consumption of electricity for public lighting in a minicipality was set to 44.5 kWh per inhabitant per year. In case of public lighting, energy savings attributed to reconstruction (energy efficient lamps, central controllers) have a potential to cover renovation costs in a relatively short time.

As average electricity consumption in most of municipalites (app. 80 kWh/a per capita) significantly exceeds the target value, some of the muncipalities have decided to use the ESCO model to finance the investment, but the level of satisfaction varies from municipality to municipality. Slovenia with its average annual consumption per capita takes the second place in Europe, just behind Belgium with yearly consumption of 107 kWh per capita. Due to substantial potential savings attributed to renovation of public street lighting, Slovenia decided to cofinance the investments from structural funds. In 2011 a call was published by the Republic of Slovenia in which EUR 14 million were reserved for investments. The eligible costs range from replacement and installation of energy-saving and environment-friendly lamps and installation of energy saving lamps to regulators and installation of lighting control systems.

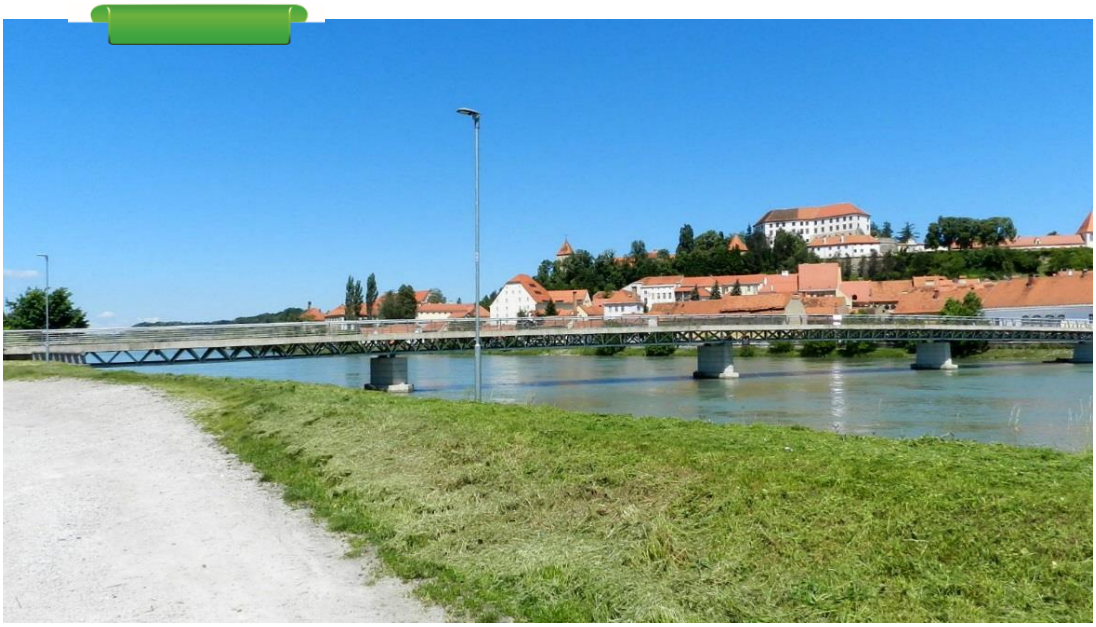


Renovated public lighting in the municipality of Ptuj

Reconstruction of street lighting in the municipality of Ptuj was implemented by replacing lamps and lighting bases (where necessary), reconstruction of electrical cabinets, replacement of cables and installation of complete control system, enabling efficient operation.

In the municipality of Ptuj more than 72 km out of 220 km of roads are iluminated. The investmement started in 2012 and ended next year. During that time all street lights (3142 units) were replaced and their bases were renovated. Additionally the illumination control system was installed enabling monitoring and switching off the lights, thus contributing to a more efficient lighting system. The energy savings

Ptuj - Energy saving in street lighting



New street lamps in Ptuj

attributed to the investment of EUR 1.5 million were in range of 108 MWh/a or approximately 55 % of former consumption. The comprehensive renovation will enable better traffic safety and higher quality of life, while reducing light pollution in the whole area and contributing to local sustainability.

Besides the municipality of Ptuj, an increasing number of Slovenian municipalities have made a good use of the subsidy and modernized their public lighting, for sake of energy savings, but also in order to be in compliance with normative requirements. By 2017 all of the public lighting in the Republic of Slovenia will have to comply with the requirements of the national regulation.

A renovated lamppost

Producing Energy From Local Sources

Most of electricity in Central Europe comes from large, fossil fuel power plants covering energy demand of vast areas. As far as heat is considered, privileged are urban areas where usually exists district heating providing heat from combined heat and power plants. In less densely populated areas buildings and houses are equipped with individual heating systems. Both cases mean conversion of fossil fuels, such as coal or gas, which come from external sources. Nevertheless there are options of generating energy from local renewable sources.

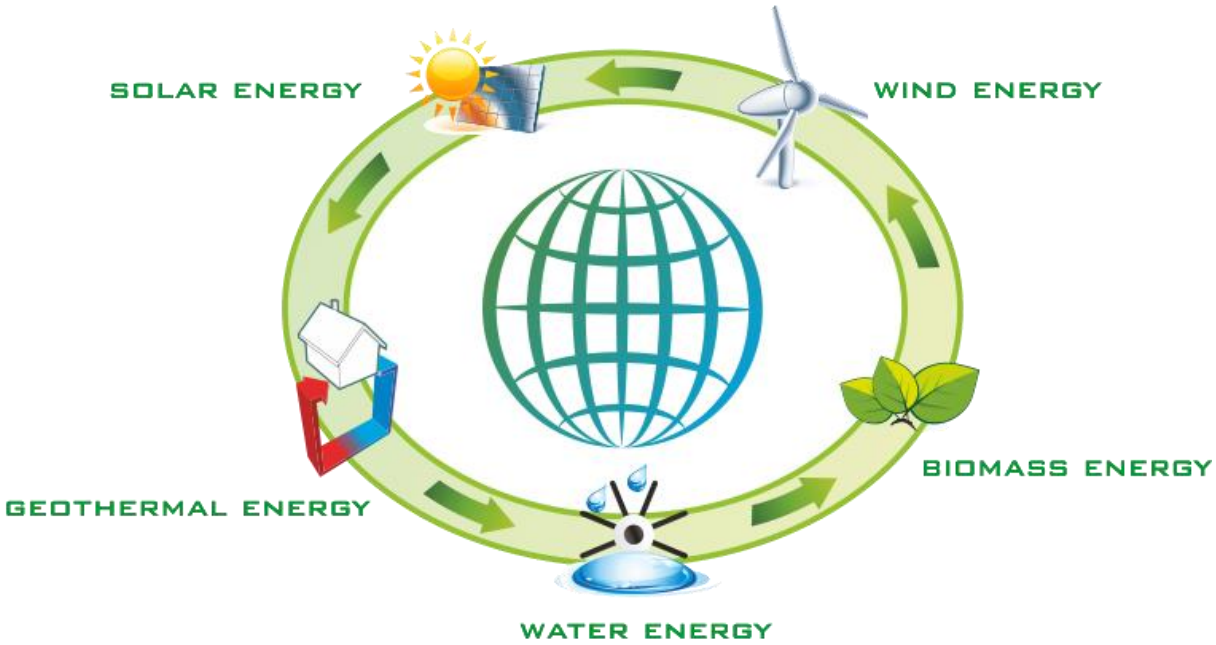
In the long run, regardless whether it takes 50 or 500 years, renewables will have to serve our energy needs to 100%. Today there already exist the needed techniques and know-how to make use of renewables for all applications we need. Moreover, renewables are abundant. The sun shines everywhere, wind resources are of relatively high potential, also trees and other plants grow everywhere possible. Renewable systems offer a long term energy supply, reduce dependency from external sources and increase energy security at the same time.

In case of electricity the influence of local renewable power plants on energy security is rather indirect. Such locally based power generators are connected to existing distribution lines and therefore are part of large electricity systems based on fossil fuels (and nuclear energy). Regardless lack of actual independence those power plants provide additional value to the electricity systems - usually they do not require extra investment in transmission or distribution but still improve their overall efficiency. Renewable energy power stations are dispersed among human dwellings and commercial facilities – their electricity consumers. Such close localization and dispersion brings reduction or even elimination of energy losses during distribution. What is more, if such plants are abundant they significantly improve reliability of the whole electricity system. Since most system failures are caused by damage to power lines, locally based generators can still provide power to consumers located within their vicinity even if a breakdown occurs somewhere in the distribution system. When using storage systems and well designed power generation (photovoltaic and small wind turbine) systems, autarkic complexes can be created (i.e. smart homes).

In case of heating by installing renewable systems one can immediately stop or significantly reduce using imported fossil fuels, thus eliminate dependency from external supply in a direct way. Many renewable energy technologies providing heat are tailored for individual use meaning that households can also contribute to the improvement of energy security of an area.

Enhancing usage of renewable resources brings other advantages – they especially occur in rural areas. Particularly, biomass conversion, photovoltaic and wind power can provide a new source of revenue for agricultural industry, farmers or land owners. There can be created new economic opportunities and jobs in renewable energy plant construction and maintenance. It is particularly important for the areas where agriculture is no longer a successful economic sector.

Producing Energy From Local Sources



Energy transition towards locally based and controlled renewable energy systems must take time and there is no single technology that will improve existing energy system at once. Nevertheless, there can be found a new potential in renewable energy technologies, which combined together, in line with local resources, and accompanied by a significant reduction of energy consumption, will substantially improve energy security of any community.

Dzierżoniów - Solar thermal energy use to improve local energy balance

Solar thermal collectors are ideal for domestic use and can be easily combined with a primary heat source causing a direct reduction of the primary fuel consumption at homes. Therefore, the Department of Environment , Agriculture and Forestry of District Office in Dzierżoniów, Poland developed and launched a programme called "Sunny Collector" directed to the residents of the district.

The programme's objective was to encourage inhabitants to use solar energy in order to complement local energy balance, reduce emissions to air, save fossil fuels and reduce heating costs. The use of solar water heating is very efficient in Polish conditions. In addition, solar thermal systems have very low operating costs.

The rules of "Sunny Collector" were very simple. The programme offered grants to finance both purchase and installation of solar thermal collectors in residential dwellings. The subsidy was 50% of the documented cost of equipment purchase and mounting, but not more than PLN 5 thousand (ca. EUR 1.2 thousand) per investment. The programme was initiated in 2004 when 15 investments were subsidized, which gave approximately a total area of 75 m^2 of solar collectors installed in residential buildings.

During the next four years the interest was rather similar as in the first programme's edition in 2004 – a total of 54 solar thermal installations were constructed in the framework of the programme. The sixth and the last edition of the "Sunny Collector" happened to be a great success, attracting a large number of interested residents and resulting in a sudden increase in the number of grant applications.

At first the programme's creators had assumed co-financing of 25 solar thermal heating systems in 2009. Due to the great interest of the inhabitants of the Dzierżoniów district, after investigating submitted applications the District Board decided to increase financial resources to subsidize all 51 properly completed requests. As a result solar collectors of a total area of 255 m^2 were installed in 2009.

In total, the programme "Sunny Collector" subsidized 120 individual investments with an active area of solar collectors of 600 m^2. The total subsidy was about EUR 100 thousand; the equal amount was invested by individual households.

"Sunny collectors"

Salaš - Clean air and local wood instead of imported coal

The village of Salaš is located in the submountainous area in the vicinity of Uherské Hradiště, Czech Republic. As in other municipalities in the region, here gasification has not taken place, causing problems with air quality in the past. The village of 380 inhabitants is situated in jagged terrain. This fact, together with scattered houses, does not even allow building a system of district heating.

Representatives of the village therefore decided to perform an unusual solution - replacement of outdated boilers burning brown coal with boilers burning wood gas directly in chosen households. The objects were selected in accordance with a survey of individual properties based on expert assessment. Thus, 32 modern gasification boilers equipped with an exhaust fans, and of a total output of 800 kW, were installed. This represents an exchange of heat source for about one-third of all households. Replacing the boilers was further complemented by installing four solar systems which are used to preheat domestic hot water, with a total area of 26 m^2. On the basis of individual assessments of the affected buildings, further measures leading to energy and fuel savings were also recommended.

The project was implemented within the framework of a cross-border cooperation program entitled Interreg IIIA supported by funds from the European Union. Project preparation and submission of the application took place in 2005 and the project was actually implemented in 2006. The total costs amounted to EUR 70 thousand, with an EU grant of EUR 52 thousand (75 per cent of costs). The remaining amount of EUR 18 thousand was paid by the municipality itself. Residents of the affected households only paid for connecting work related to the installation of boilers and solar panels.

To ensure stable fuel supplies, an agreement was signed with the owner of the surrounding forests, which is the organization of Lesy ČR. Based on that, the village by means of their municipal workers ensures thinning in forests up to forty years of age. Firewood is supplied as one- or two-meter long logs right to the properties. Thus, the project also resulted in creating one job associated with the organization of wood extraction, handling, registration and billing individual project participants. The annual production volume is around 800 m^3 of wood. This quantity (approx. 500 t) per year is able to replace the original 170 t of fuel, which was usually brown coal. This means an annual reduction of 60 t of emitted CO_2 and possibly 0.6 tons of SO_2. The ash generated by burning wood can then be used as a high quality fertilizer.

Actual Costs	EUR 70,000
EU Grants	EUR 52,000
Salaš Municipality Subsidy	EUR 18,000
Number of Supported Residents	160
Installed Capacity	800 kW (32 installations)
Area of Solar Panels	26m^2 (4 installations)
Annual CO_2 Emission Reduction	60 t
Annual SO_2 Emission Reduction	0.6 t

In order to share experience, there is a regular annual meeting of boiler users also attended by a representative of the installation company in the

Salaš - Clean air and local wood instead of imported coal

The village of Salaš

village. Post-season inspections of both, the installed boilers (mainly focused on cleaning the combustion chamber and tarring) and chimneys, continue to take place. In case of solar collectors, after the first positive experience new installations start to emerge, carried out by individual citizens in the village. With the implementation of this project, not only the environment in the village has improved, but also residents' perception of it has shifted.

Outdoor recreation near Salaš

Cölbe - The community profiting from the sun

Cölbe is a community with about 6.5 thousand inhabitants consisting of 6 villages in the middle of Hessen, Germany. In 1993 a gravel pit was established in Bernsdorf, Cölbe.

After gravel mining the pit was refilled and waiting for a complete restoration by covering with fertile soil. In the land-use plan a part of the area was dedicated to agriculture, but in 2012 it was more like a wasteland.

The land before erecting a solar farm in Cölbe

In Germany a solar power station mounted on the ground (and not on a building) is allowed - and the generated power can be sold according to the EEG (Renewable Energy Act) – but only on a "conversion area" used in certain ways such as military area or potentially harmful industrial ground, on a sealed area or alongside motorways and railtracks up to the distance of 110 m.

When the idea came up to build a solar power station in Cölbe, it was first necessary to change the dedication of the area in the land-use plan from agricultural (as it was set in the treaties with the mining company in 1993) to solar power. This proved to be complicated and expensive, because certain public interest parties for nature conservation generally do not want agricultural land taken out of use for solar power. As a result, the authorization procedure took several weeks longer than expected.

During this time the guaranteed price for the sale of electrical power according to the EEG decreased considerably. When the negotiations where complete, it was still profitable to build the plant, but less so, and only if the plant would start to deliver power before October, the 1st , 2012, after which the price would decrease again and therefore make the profit doubtful.

The project was designed to have the citizens of Cölbe profit from the facility, either directly by investing in the project, or indirectly by being part of the community which profits financially.

The project costs were EUR 4.9 million, a part of which was brought up by the community of Cölbe and partners with EUR 33,333 each (20) and an estimated return of 5 %. Private persons could sign "solar savings certificates" with a return of 3.8 % for 10 years. The remaining sum was a bank loan which Cölbe guaranteed. After 17 years, the loan with interests will be paid. The guaranteed selling price for the generated power runs according to the EEG for 20 years, so the biggest part of the profit will happen in the last 3 years.

Cölbe - The community profiting from the sun

The solar power plant in Cölbe

It took only 7 weeks to install the 3.3 MW solar power station covering the area of 4000 m². In the first year of operation, the yield was 3.1 MW as expected. The top soil was removed to the edges of the area to be distributed after the 20-year long use. This makes the site environmentally more valuable.

Together with all the privately owned solar panels on the roofs and the power generated in the power station of the sawmill by woodchips and bark, in the category of electrical power Cölbe has 28% production from renewable sources, which is the 3rd biggest share in the district of Marburg-Biedenkopf.

Wierzchosławice - The first photovoltaic farm in Poland

In 2011 the first ground-mounted photovoltaic power plant in Poland was built in the 2-hectare area in Wierzchosławice. The plant of 1 MW consists of 4445 PV modules and was constructed in the period of two and a half months. The preparation of the investment took 8 months in total. The farm is owned by a company called "Energia Wierzchosławice" Ltd. which has been set up by the Municipality of Wierzchosławice and sells the entire volume of electricity to the grid.

Wierzchosławice is a municipality of more than 10 thousand inhabitants, consisting of 11 villages, which is engaged in different actions towards sustainable energy supply. To express their interest in renewable energy in 2008 the local government launched a programme for installation of solar thermal collectors in residential buildings in the municipality, one of the first of this kind of programmes in Poland. They are also strongly interested in using the available resources of geothermal energy.

In 2009 the Mayor of Wierzchosławice came up with an idea to construct a photovoltaic farm in the area of the municipality and started to look for funding possibilities. The farm was eventually built two years later and co-financed from the European funds in the framework of The Operational Programme Infrastructure and Environment (co-financing of ca. EUR 1 million). The remaining half of the construction costs (ca. EUR 1 million) was covered from the loan granted by the Regional Fund for Environmental Protection and Water Management. The municipality provided land for the investment and paid the cost of connecting the power plant to the grid. The total cost was EUR 2.5 million.

The constructed 1 MW power plant represents only the first stage of the entire investment. It is planned that the farm will be expanded to 1.8 MW in the nearest future. The Municipality of Wierzchosławice has been also considering construction of another ground-mounted solar power plant and a geothermal installation.

Photovoltaic panels

Installing District Heating

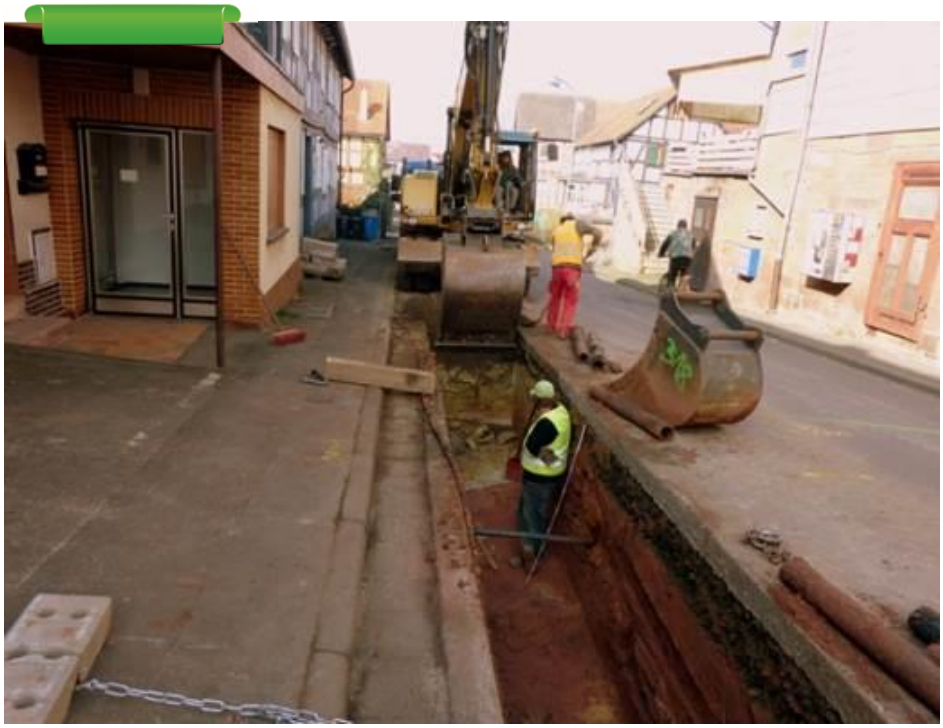
If you want to secure energy supply and be independent from outside providers, one option is to operate your own grid. This is common for electricity as backup systems for single buildings or complexes like hospitals. It is also known for remote operations as island systems, especially in countries where there is no dense power grid. Technically it is possible to run own grids for small communities, however it requires high investments. In the long term the possibility to "do-it-yourself" could attract more and more people, since it enables adapting prices and steering to local circumstances.

A way easier is the installation of a grid for heating. District heating is mostly available in big cities and towns. Inhabitants of rural and other less densely populated areas have to supply themselves with heating on individual basis. District heating has various advantages compared to individual heating systems. It is usually more energy efficient and cheaper as it is produced in combined heat and power generation plants. It is more comfortable for the customer as they do not need to take care about anything but paying the bills. And if based on fossil fuels, it is usually more environmentally friendly since combustion techniques and emission reduction are more technologically advanced in industrial plants than in small individual heating systems. Moreover, renewable energy technologies can be also applied to district heating. If using local energy sources, such as biomass, such type of heating system may even become attractive, e.g. for rural areas where biomass is abundant, small town districts or peripheral areas of cities. There are possibilities of using other renewable energy resources (i.e. solar or geothermal energy), waste heat from industry or heat from waste incineration.

District heating system is a long-term investment requiring relevant policy, good decisions making and a proper amount of funding from public or private investors (or public private partnership). If a district heating already exists it is relatively easy to apply new sources of clean energy having in mind that the cost of energy needs to be optimized. Construction of a new system, however, requires greater financial backing and a strong support of future end users. The systems are feasible if located in areas with higher population densities, where distances between single dwellings enable construction of pipe network at reasonable capital costs and then allow efficient transfer of heat through pipes (without significant heat losses).

In case of biomass, which is the most common renewable source applied in district heating, there is a strong need to ensure that the biomass supply (e.g. wood chips and pellets, forest residues, waste wood from mills or furniture manufacturers, energy crops, agricultural residues for biogas plants) is secured in a long term. One also needs to consider fuel pick-up, delivery and storage logistics. Solar thermal technology can be combined with all other sources of energy for district heating and deliver substantial input to the total heat production but economical and environmental feasibility of such combination need to be checked. Moreover, solar thermal systems applied in district heating require access to a large area for the solar collectors (either ground or roofs).

Installing District Heating



Construction of a local district heating network

Geothermal energy comes from warm underground water which is pumped up to the surface and can be also used for district heating. Geothermal energy, however, is available due to the very unique geological conditions and therefore its use is limited to places where such conditions occur. Moreover, in most cases it requires high-cost deep holes drilling. Both solar heat and geothermal heat have high upfront investment costs and low operational costs.

For quarters consisting of new or renewed and well insulated buildings a so called “cold district heat” can be also used. For heat efficient buildings the temperature of the heating system can be lowered and the overall consumption is lower, too. Here, solar thermal plants or soil heat pumps can supply enough heat. Instead of insulated pipes from metal common plastic pipes can be used, which is much cheaper.

Roštín - Producing fuel for district heating within 4 km surroundings

The village of Roštín with its 700 inhabitants is located on the edge of the protected landscape area called Chřiby in the Czech Republic. The fact that it is situated in a valley, together with the fact that there is no established gas grid resulted in problems with local air quality during heating season. Most of the households fired brown coal in their boilers.

The idea of how to solve this situation came some years ago from the mayor who proposed construction of a central heating system. The fuel to be used was straw from local sources, which at the time represented a unique solution in the Czech Republic. By that time, most of the biomass heating plants had burned woodchips. Nevertheless, the new proposal was initially accepted without any objections. The mayor therefore organized a field trip for local people by two buses to Austria. There, they were able to see the straw combustion technology in operation. Better acceptance among the inhabitants of the village was also gained due to the fact that the connection to the central heating system was subsidized. It was reflected in the cost of connection that was only EUR 500 during the construction of the system.

Energy centre in the village of Roštín

Financing of the entire project was divided among the State Environmental Fund of the Czech Republic, Kommunalkredit Bank Austria, a Dutch company of BTG engaged in the sale of emission limits, and the Danish Distance Heating Plant Association called DFF. These entities covered 85 per cent of the entire budget. The municipality's resources covered the remaining share of 15 per cent. Total costs amounted to EUR 3.4 million. The budget is displayed in the following table.

Construction of Boiler House	**EUR 680,000**
Technology	EUR 1,135,000
Heat Distribution System	EUR 1,300,000
Miscellaneous (Press, Straw Loader, Collection Mechanization, etc.)	EUR 260,000

From a technical perspective, the system consists of a primary source with capacity of 4 MW. The supplier in this case is the Danish company of Danstorker which has rich experience in this field. The boiler burns cereal straw with humidity of around 18-23 per cent. The boiler house works completely automatically. Physical presence of the operator is not necessary, because the control system is able to notify about any failure by means of a text message to one's mobile phone. Biomass comes from a circle of 3-4 km around the village, while it is collected and compacted by municipal workers. The conveyor feeding the boiler can take up fuel for 16 hours of operation. Annual consumption is then around 1,200 t. This quantity is produced on about 650 hectares of surrounding fields. To store the straw, a warehouse built just for this purpose is used

Roštín - Producing fuel for district heating within 4 km surroundings

with a capacity of 900 t, which represents three-quarters of the annual consumption. The primary source is accompanied by a backup source that burns light fuel oil stored in five tanks of 1000 litres each. Possible fluctuations in operation are solved using the thermal storage tank with a volume of 150 m^3.

Heat produced from the boiler is distributed through a system of pre-insulated steel pipes. The highest water temperature in distribution phase is 95 °C, return water temperature is then 70 °C. The system is connected to the municipal office, primary school and kindergarten, community centre, church, rectory, swimming pool and a total of 156 households, representing 81 per cent. The price of heat was initially set on the basis of tariffs, the State Energy Inspectorate, however, rejected such an approach. Today's heat price consists therefore of two components: a flat fee for the exchanger (EUR 15 per 1 kW per month) and the price for heat consumed (EUR 0.03 per kWh). In general, the price of 1 GJ of heat from this system amounts to EUR 15 which is still considerably less in relation to when other heating fuels are used.

The whole system was put into pilot operation at the end of 2002, since 2003 it has been in full operation. Since then, only two households disconnected from the system. In contrast, 16 new households joined it, even though the cost of connection to the system is now ranging from EUR 2.8 to 4.0 thousand.

The municipal heating plant is not only affordable and user-friendly way of heating, but mainly local air quality has significantly improved for the period of its operation. As measured by a reputable company, the average daily air pollution concentrations of sulphur dioxide decreased from a peak of 91 g/m^3 before the system was introduced to the current maximum of 22 g/m^3. This happens due to the exhaust gas cleaning systems which capture heavy particles using MultiCyclone followed by a fabric filter. The difference between emissions produced before the introduction of the district heating and after it is shown in the following table.

Annual Emissions of Pollutants in Tonnes	Total Emissions prior to Implemen-tation	Heating Plant Emissions	Emissions of Uncon-nected House-holds	Annual Savings
Solid Pollutants	681	0.5	3.5	**677**
SO_2	409	1.06	3.3	**404.64**
NO_x	47	1.62	0.5	**44.88**
CO	76	2.01	0.8	**73.19**
Hydro-carbons	23	1.08	1.6	**20.32**
CO_2	22,045	0	3,600	**18,445**

The operation of the municipal heating plant also has an appreciable positive effect on local economy by not only creating new jobs related to the operation of the equipment and preparation of the fuel, but also by stabilizing production of local agricultural organizations that nowadays have entered into contracts for the supply of fuel straw.

The central heating system in Roštín, thanks to its contribution, was rightfully awarded the first prize in Biomass-League of the Czech Republic in 2010. This competition of towns and cities assesses biomass heating plants throughout the Czech Republic. The installation is also on appointment open for tours that come not only from the Czech Republic, but also from abroad.

Schönstadt - Cooperative-owned heat-grid

When the sawmill "Holz-Schmidt" in Cölbe-Schönstadt (Marbug-Biedenkopf, Hessen, Germany) built a power station to provide heat for chamber-drying of its products, a local action group (which was originally founded to establish a citizen-run water-supply) organized excursions to the new power-station to make people think positive about the new big industrial structure standing on a hill in the rural area around the village of Schönstadt.

The power station uses waste wood from the sawmill and woodchips from a radius of about 60 km and produces heat and power, which is sold under the EEG (Renewable Energy Act). It is a local producer of CO_2-neutral power.

One of the participants of the excursion noticed that due to the implemented technology (ORC, Oil Rankine Cycle) a lot more heat was produced than needed for the chamber-drying of wood (1.1 MW of electricity and 4.9 MW of heat).

The heat and power station in Schönstadt

So in a first step the heat-supply of Fleckenbuehl, a community with about 200 inhabitants living directly below the sawmill, was built in 2009 as a district heating with heat from the power station. This used up only a small fraction of the dispensable heat. The plan developed to supply the whole village of Schönstadt with district heating from the sawmill.

A questionnaire was developed to estimate the heat demand. The engagement of the action group led to a return of the questionnaires of 98% in 5 weeks. With this data, in a second step, two more feasibility studies where prepared. One was to check if there would be still enough heat to supply Schönstadt with its 1500 inhabitants living in 380 households and to determine the potential of the power station along with technical aspects of changes that would need to be made at the existing facility.

The other study estimated the heat demand of the village, the required length of the pipes and the resulting amount of households whose participation was needed to make the project cost-effective. The studies where financed by the community of Cölbe and the county Marburg-Biedenkopf.

The feasibility study was presented to general public in March 2011 with a conclusion that it would be possible to build a heating network with the surplus heat of the existing power plant if at least 205 households got connected to the grid. The houses in Schönstadt are quite dispersed, so 12 kilometers of pipes were required to connect all the participating buildings.

A cooperative was founded. To get connected to the district heating grid it was necessary to become a member of the cooperative by buying one share of the cooperative of EUR 500.

Schönstadt - Cooperative-owned heat-grid

Another 9 shares where needed to get connected (EUR 4.5 thousand). This included the pipes into the house and the heat exchanger. The participant had to provide only the trench to the house on his private ground, the core hole and the installation of the heating. 285 of the 380 households (75%) took part in the cooperative and got connected to the heating grid.

Costs of planning and construction
(290 households, 13 km pipes)

Members contribute:	EUR 1.4 million
Credit (soft loan):	EUR 2.7 million (at 2.4%)
Gov. subsidy :	EUR 1.7 million
TOTAL:	**EUR 5.8 million**

The construction work started in March 2012. In October, only 8 months later, the district heating started to deliver warm water to the households. There were four building teams working at the same time from four sides of the village. At the heat transfer station, which uses an old unused chicken stable, a 2 MW boiler was installed for backup during maintenance and peak load. The construction time and budget were not exceeded due to the engagement of the project group.

Energy costs

One time:	Membership contribution of EUR 5,000
Ongoing:	Monthly fee of EUR 11.90
Energy price:	EUR 0.0976 per kWh; this equals (using a full cost accounting) to an oil price equivalent of EUR 0.70 per liter

The village of Schönstadt

Kočevje - Precursor district heating system in Slovenia

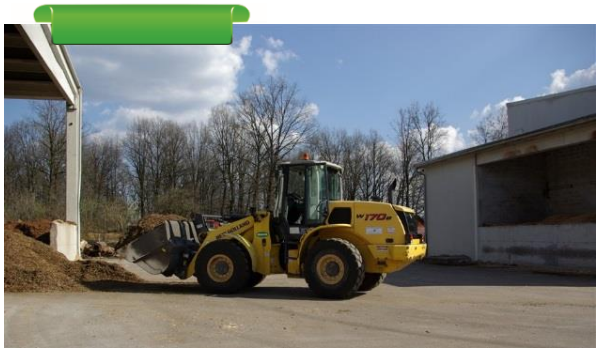
A district heating system (DHS) in Kočevje, Slovenia is managed by a public utility company 'JKP KOMUNALA Kočevje d.o.o.' in ownership of the Kočevje Municipality. They performed studies which showed that the most economical solution would be to upgrade the existing district heating system. Therefore, the project aimed at making a switch from fossil fuel (fuel oil) to renewable (local) wood biomass district heating; therefore improving local heat supply, air quality and reducing prices of energy for heating.

The district heating plant in Kočevje

When a new heating plant started operating, 8 older and smaller heating plants, containing 15 warm-water boilers with a combined power of 10.5 MW, stopped operating. Also a larger heating station with a 6.4 MW power was shut down. Few of the old facilities still serve as a backup to help cover peak demand in the heating season.

The region surrounding Kočevje is rich with forests. The area of forest in the community Kočevje amounts to 465 km^2, which represents 84 % of the entire region. Within the radius of 20 km, it is possible to collect enough wood biomass for the needs of the district heating system. The most important source of biomass are remainings of wood processing and treatment. Biomass supply companies from the nearby area have signed long-term contracts with the system operator.

The main goal of the investment was to implement the first stage reconstruction of the heating plant and enlargment of the existing distribution system – pipelines. First of all, a new wood biomass boiler of 4.5 MW power (efficiency in surplus of 88%) was installed. It was followed by an installation of a new IT solution for system management (regulating dosage of biomass from the reservoir, combustion management, ash removal and cleaning of flue gases) and expansion of a heating network with reconstruction of the main pipelines of 150 mm diameter and the connection to the heating hubs. The reconstruction of the pipelines was initiated at the length of 3.9 km. The size of an indoor storage serving the boiler room is 3,500 m^3, with an additional outdoor storage of 5,000 m^3.



Biomass handling and storage

Kočevje - Precursor district heating system in Slovenia

In the first year of operation, buildings and facilities with total energy demand of 11.6 MW were connected to the heating system. The amount of the produced heat was 11,700 MWh, with app. 5,430 tonnes of wood biomass used, which reduced the fuel oil consumption by app. 1,370,000 litres. The resulting reduction of CO_2 emissions amounted to 3,562 tonnes. In the following years, the connection power of the buildings and facilities has risen up to app. 14.1 MW. The amount of the produced heat increased to 15,900 MWh, with app. 6,800 tonnes of wood biomass used, which reduced the consumption of fuel oil by total 1,883,000 litres and CO_2 emissions by 4,900 tonnes. 70% of the produced heat is used in residential buildings and the rest in business sector and other facilities.

The total investment amounted to EUR 2.75 million. The (re)construction took place between August 2004 and May 2005. The Ministry of the Environment and Spatial Planning of the Republic of Slovenia also took part in the project due to environmental and economical efficiency of the project.

The financial construction of the investment was:

- The Municipality of Kočevje: EUR 1.085 million;
- United Nations Programme for Development (UNDP), Global Environment Fund (GEF): capital investment of EUR 520 thousand ;
- Ministry of the Environment and Spatial Planning : subsidy of EUR 520 thousand;
- JKP KOMUNALA Kočevje, d.o.o.: environmental loan from Eco fund of EUR 625 thousand.

Finally, over the years the Municipality of Kočevje and utility company bought over the GEF's share and thereby the final financial construction was covered in 78% by the investor and the rest from the grants. The project is particulary interesting as it was the first of its kind in Slovenia. It was also the best practice example utilizing all mechanisms available at the time. After a successful decade of operation, a major contribution of the DHS to wellbeing of the Kočevje Municipality inhabitants has been demonstrated, especially if one considers that it was a precursor investment into biomass district heating in Slovenia.

The covered outdoor storage of biomass

Land Use Planning To Ensure Energy Security

Everywhere there exist certain potentials to use renewable energies. However, realization of these potentials might take years, especially when large investments have to made upfront (in case of e.g. modern wind farms). Therefore securing these potentials is necessary. Local governments are able to integrate energy and other development strategies into land use planning in a way that helps secure local energy resources, protect the natural environment and make communities more economically attractive. Furthermore, they have knowledge and understanding of the spatial needs of the community as well as social circumstances. Land use planning is particularly important when taking efforts to create local energy system and at the same time secure the desired development of land, protect real estate values and esthetic conditions within the municipality.

Governments wishing to integrate energy strategies into their land use planning activities have several options, for instance:

- **Securing areas for local energy production** (forest and agricultural biomass, energy crops, solar and wind farms) through updating local zoning regulations and establishing guidelines for both commercial and residential renewable energy generation; also securing areas for constructing district heating network. Local zoning and other land use regulations can effectively encourage renewable energy development and mitigate the potential negative effects resulting from certain forms of energy generation;
- **Including energy efficiency requirements in local building laws** what ensures sustainable renovation and construction of buildings and facilities; including issues related to energy consumption in the local building permit and site plan approval process. New buildings are rarely improved in the first years after construction and their energy efficiency will then set trends in energy consumption for a long time. What is more, the existing buildings are often renovated up to standards of the new ones. Therefore, the energy efficiency requirements in building regulations can directly influence construction of buildings and indirectly the renovations. Major renovations or enlargements can be as well covered by the building laws;
- **Promoting more compact residential development** with possibilities of walking, biking and using public transport – such planning not only protects open space and energy resources such as wind and sun but also reduces energy inefficient individual car traffic.

Spatial planning is a powerful tool facilitating local energy production. However, changing use of too much farmland from food production into energy production and deforestation resulting from too high biomass demand might have serious negative consequences. Therefore, land use planning requires strategies to protect land destined for food and animal production, forests and other valuable areas.

Baunatal - The new energy efficient residential area

Baunatal is a city of about 28 thousand inhabitants, consisting of 7 districts, in north Hesse, Germany. There is a huge demand for building plots destined for single-family housing in Baunatal, so the local government has decided to develop a residential area. In the first step, a feasibility study was done for a woodchip-fired district heating system. The outcome of the study showed that the woodchip district heating was not profitable. The reason is that new buildings do not need so much heat and the area is quite extensive. Thus, the idea was born to minimize the energy demand in the area by construction of highly energy-efficient buildings.

In collaboration with a partner organization (deENet – Kompetenznetzwerk Dezentrale Energietechnologien e.V.) Baunatal designed an 8-hectare residential area "Am obersten Heimbach" in an innovative way. The main idea is to involve energy consultants at the very beginning of the house planning and to expect a higher level of energy efficiency than is demanded by the Energy Saving Ordinance (EnEV), the German law regulating energy-related standards for buildings.

The vision for the residential area "Am obersten Heimbach" includes three main components:

- The minimum energy performance requirements of a residential building are determined. The improved building standard results from the primary energy demand. The latter is shown in the thermal protection certificate / energy performance certificate and derives from the Energy Saving Ordinance (EnEV). In case of the area "Am obersten Heimbach", the minimum energy performance needs to be 15 % lower than the values set by the Energy Saving Ordinance (EnEV);
- The use of any sort of renewable energies is mandatory. The house owner decides which type of renewable energy they want to use. The City of Baunatal merely requires that at least one type has to be used. In the construction plan, the building plots are arranged in such a way as to enable a high performance ratio for solar installations. Moreover, for instance the use of CHP-plants, heat pumps and ventilation systems with integrated heat recovery is possible. In the case of biomass facilities, a certificate e.g. with the Blue Angel label must be submitted;
- The house owners rely on an energy consultant. In an initial consultation all available options concerning efficient building and financial support are clarified according to the individual building design. During construction, the energy consultant ascertains whether all works are done in compliance with the energetic aims. After completion of the construction phase, the energy consultant confirms the proper execution of the implemented energetic measurements by his/her signature. In addition to that, a hydraulic balancing of the heating system is to be proven by a specialized company declaration in order to achieve optimal operation of the heating system.

Baunatal - The new energy efficient residential area

The residential area "Am obersten Heimbach" in Baunatal

Simultaneously to the concept of the residential area, a funding programme based on bonus points was developed to support families building energy efficient houses. The more environmentally friendly the house is constructed, the more bonus points can be collected by the house owners. The equivalent of the total amount – one bonus point corresponds to one euro – is provided as an interest-free loan by the City of Baunatal. For instance, a maximum standard for energy efficiency in buildings (e.g. passive house) equals to 5 thousand points and EUR 5 thousand. Energy consultancy is included as a compulsory part of the bonus point programme.

So far, all building plots have been sold and a variety of different technologies has been applied in the new houses. By implementing the integral concept of the residential area, the City of Baunatal has taken up the challenge to play the pioneer role in the entire region of Hesse.

Niestetal - Planning the commercial area supplied with renewables

In anticipation of an intercommunal industrial area planned with several surrounding communities in the region of about 130 hectares, the municipality of Niestetal, Germany has planned and developed an area of 39 hectares itself. According to these plans a commercial area "Sandershäuser Berg" of approximately 25 ha on the east of the motorway A7 is developed. The area is designed in a way that an expansion in the northern direction is possible.

With the "Sandershäuser Berg" land use plan the community of Niestetal has broken a new ground for the energy supply of the area. The purpose of the community through the development of the commercial park is to take a step on the way to a "CO_2 neutral municipality" which implies that it is possible to cover the entire energy supply (heat, electricity) of the territory from renewable energies. For this cause there are various stipulations made in the land use plan in order to use renewable and clean energy. Fossil fuels such as coal and oil are excluded from use because of disproportionately high pollutant emissions at low energy efficiency. Eco-friendly, however, is the combustion of natural gas or the use of district heating. Wood is for environmental reasons recommended by the federal government as a renewable energy carrier and supported financially. Due to the amendment of the first BlmSchV (Federal Emission Regulation) limits are introduced for dust values. Therefore, wood stoves can be used with integrated fine dust filters (80 % efficiency). The combustion of wood / wood pellets is therefore admissible because it is assumed that technical innovations to the fuels or combustion devices (pellet with mechanical loading in conjunction with a combustion air control) are increasingly reducing pollution levels. The use of geothermal energy is excluded due to the hydrogeological assessment to protect the groundwater. Since this is also a relatively environmentally friendly form of energy, the use of some (near-surface) forms of geothermal energy is allowed exceptionally, if the corresponding proof is provided to competent water authority that no deterioration of groundwater is to be expected.

What happened until today in the area of "Sandershäuser Berg"?

- First decisions: May 2009;
- Articles of incorporation : May 2010;
- Marketing of commercial land : from mid-2010;
- 22 ha of business park sold, so far to only two companies, one of which will be built in 2014;
- About 3 hectares of the industrial area are still for sale;
- PV area on the west of the road built, leased to the east, will be implemented in mid-2014;
- Green area with solar garden is not yet implemented.

Niestetal - Planning the commercial area supplied with renewables

Map legend

Type of builing use (§ 9, para 1, No. 1 BauGB)

GE commercial area

SO Photovoltaik special area PV

Construction, building lines, construction line (§ 9 para 1 No. 2 BauGB)

construction limit (§ 23 BauNVO)

Traffic areas (§ 9 para 1 No. 11 BauGB)

Road surfaces, road boundary line, traffic areas special purpose

Areas for the retention and infiltration of rainwater (§ 9 para 1 No. 14 BauGB)

areas for retention of rainwater

Green spaces (§ 9 para 1 No. 15 BauGB)

public green spaces (purpose: Solar garden, anti-glare, outskirts greening)

private green spaces (purpose: glare protection)

Areas for action for the protection, care and development of nature and landscape(§ 9 para 1 No. 20 BauGB)

M1 M2 measure surfaces

areas for planting and want to plant trees

Surfaces with connections for planting and for the preservation of trees, shrubs and other plantings (§ 9 para 1 No. 25b BauGB)

Limit of the geographic scope

The "Sandershäuser Berg" land use plan

According to the intention of the land use plan in the field of renewable energy, the following structures have been set up so far to supply power:

- 2011: connecting a roof-mounted PV system on the SMA inverter plant: 900 kWp - about 776 MWh of annual generation – equal to about 20% of the demand; client: Städtische Werke AG Kassel
- September 2012: connecting a ground-mounted PV farms to the power grid: 786 kWp - 600 MWh of annual generation
- Summer 2014: construction of a 3.2 MWp plant for research purposes and own consumption in the SMA inverter plant - about 1,400 MWh of annual yield (equal to 36% of the demand)

The photovoltaic power plant in Niestetal

The road to Niestetal (the SMA inverter plant in the background)

Niestetal - Planning the commercial area supplied with renewables

The new wind turbines in Niestetal

- Due to the new planning of the Regional Council two new wind turbines (3 MW each with approximately 14 GWh of total electricity production per year) were built in about 1 km distance and connected in January 2014 to the network.

The last of these was not foreseen at the time of the preparation of the land use plan. Nevertheless, these windmills may supplement the further energy supply to the commercial area and can serve as an encouragement to support this type of interaction right from the start of planning. The installer of the system, the Städtische Werke AG Kassel, will offer approximately ¾ of the shares as investments to the regional municipalities business and citizens' energy cooperatives in spring 2014. With respect to this, there is a good chance that there will be a further direct marketing of renewable energies and thus the 100% of power supply in the industrial area will become reality.

Concerning the heat supply to the industrial area, so far it has been only supplied with natural gas. Therefore it is necessary, perhaps by creating a solar thermal surface, to bring about a change in the coming years to fulfill the land use plan intention.

Providing Education

Energy management in a community shall be supported by awareness campaigns and other communication activities. Since for an effective energy security improvement you need support of your stakeholder groups in the community, they all need to be aware of what you try to achieve. Education and promotion of your goals should start from explaining the reasons for any changes in the existing energy management and clearly stating what the goals are exactly and how your action plans and initiatives will help achieve these goals. Your stakeholders need to know why they should engage and be educated on how to engage in your energy programmes in practice. Education which is only generally focused on energy issues will never be so effective as concrete information on what the gains are if one decides to implement a specific action. This does not mean that educational programs and campaigns that increase general awareness of renewable energies and energy conservation (e.g. in schools) should be avoided. They should, however, present a broader picture relating energy management in individual households and in a community to economic and social effects.

Apart from communicating goals and measures, the more specifically focused training and education should of course provide suitable information on incentives and/or subsidies available for households and businesses. In the stage of further implementation of your energy concept the stakeholders also need to be regularly informed on how the plan progresses and which goals have been achieved and which still have not. Reporting progress to the community will gain more support for your current programmes and future initiatives. Efforts of your target groups and actions actually taken must be widely recognized and appreciated to create a snow ball effect.

Some of the examples of educational and promotional measures are listed here:

- Development of an internet information platform to link and present activities, measures and projects on realizing local energy potentials including presentations of best practice examples, also, if possible, in the form of an open forum with a possibility of citizens' participation;
- Leaflets about energy security and local energy sources, energy page in local newspapers;
- Central contact point for a local energy concept (all the relevant information on this topic);
- Energy conservation days;
- Energy conservation award for citizens and companies;
- Sustainable energy map / atlas (spatial representation of good examples);
- Establishment of expert groups, (advanced) trainings to become a renewable energy and/or energy efficiency expert;
- Energy workshops and consulting services regarding efficient energy user behaviour;
- Guideline for actions concerning „energetic renovation" (step by step to an efficient building);
- Promotion of the qualification of craftsmen (training courses on the topics of energetic renovation, renewable energies, etc.);

PROVIDING EDUCATION

Energy workshops for students

- Promotion of the use of public transport;
- Overall strategy of lifelong learning (energy education for children and teenagers, training material for energy and climate protection), education initiative (education for sustainability), education catalogue (overview of educational opportunities), actions at schools, concrete demonstration objects for pupils, extracurricular learning centers, holiday offers and plays for kids.

Energy awards for pupils

Plzeň - Energy management training... not only for energy managers

Demands for public servants, i.a. concerning an issue of energy management, have been recently increasing. One of the options to provide them with sufficient information and knowledge in this field are educational projects. An example is the "Energy and energy savings training programme" implemented from March 2013 to August 2014 in the Pilsen Region (co-financed by the European Social Fund and the state budget of the Czech Republic).

As a part of this program, its participants are provided with specialized education in the form of professional courses. These courses are organized in four-week cycles of 2.5 h per week (i.e. each participant attends a total of 10 hours of lectures). The courses are supplemented by e-learning support containing all the necessary documents and materials which are easily usable even in a daily practice. The provided study materials also include case studies, practical examples and tutorials.

Among the course topics there are:

- Strategic and energy planning;
- Energy management;
- Reducing energy consumption – effective "how to" tutorials;
- Use of alternative energy sources, in particular within the context of potential savings.

The target group of these courses consists mainly of the following:

- energy managers and staff responsible for different areas of energy management;
- representatives of NGOs of towns and municipalities;
- representatives/employees/officials of towns and municipalities engaged in property management;
- members of the local action groups;
- staff of energy agencies.

The courses, however, are also open to the representatives of the private sector or the general public interested in the issue of energy savings.

Preliminary costs of organizing the nine four-week cycles of lectures are calculated at about EUR 5 thousand. Then, the cost of preparing the educational materials, including print, along with the cost of creating specialized e-learning portal and its subsequent operation amount to EUR 45 thousand.

Training courses for energy managers

Cloppenburg - Educating the youngest citizens

Raising awareness of the need of environmental protection and energy saving seems to be the only way to ensure future commitment of general public to these issues. Engagement of municipalities, which own various properties and supervise different institutions, and teaching open up diverse opportunities for establishing topics of energy and climate protection on a permanent basis. It is yet necessary to distinguish between adult and children education and to create educational offers for both groups.

An energy event for children

An interesting project for both adults and children/adolescents is the introduction of a bonus system. This system aims at prompting people of one building to save energy together. Those people can be employees, pupils and, in private households, family members. The project`s objective is to make every single user save energy. The saved money is then passed on to everybody as a bonus, ideally 50/50 share, so that everybody receives the same amount. Consequently, if the energy costs are reduced, half of the saved money is forwarded to the users of the building.

In 2011 in the rural district of Cloppenburg, Germany a bonus project was launched for schools in the region with a duration of three years. Apart from the introduction of the bonuses and later calculations, the main purpose of the project was to organize an accompanying pedagogical concept. With help of different actions the concept intended to raise motivation and knowledge about climate protection in general and to show different possibilities of energy saving to pupils, teachers and caretakers. In order to do so, the so-called energy teams were established, consisting of the different groups of people. Those teams pursued various approaches concerning saving of energy, according to the individual schools' needs. Their work was supported by energy experts helping them collect various data as well. The overall aim of this pedagogical project was to save heat and electricity only by changes in behaviour. In general, this aim was achieved throughout all schools within the project's duration.

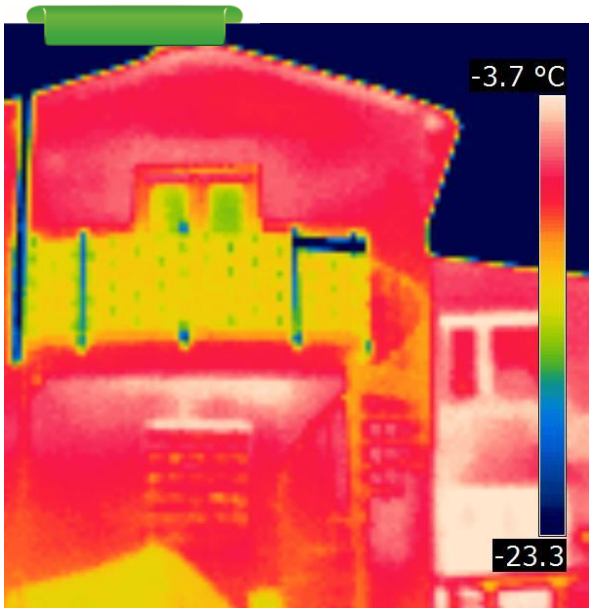
A special attention is usually paid to primary school children. The youngsters are motivated in a playful manner to learn more about energy and climate protection. The primary school Mittelsten-Thüle organized for instance an energy and climate day when the pupils visited a water mill together with the information centre „Renewable Energies". At this location the pupils were informed about renewable energy generation from biomass, wind, sun and water. It was thus possible to repeat the pre-gained knowledge.

Kassel - Showing where energy is lost

Actions that aim at motivating people to get involved in energy management, either in their own houses or in a municipality, are more successful if having a demonstrative character. An example of such demonstration are so called thermographic walks detecting energy waste in buildings.

Thermal imaging is a process by which heat radiation, which is invisible to the human eye, is made visible. With use of a thermographic camera, heat flows on a buidling´s facade are detected and made visible. A thermographic walk addresses all those, who are interested in experiencing visually typical heat flows in buildings of different years of construction. On the basis of a previously selected route, different buildings owned by interested proprietors are examined from outside and thermal images are taken. Thus, participants come together in a conversation and can have a discussion with an energy consultant, who guides the walk. After the walk, the images are evaluated together with the participants in a subsequent session. This meeting gives the opportunity to exchange opinions on the results.

Thermographic walks can be for instance organized in the course of the planning of an energy concept. They are not very complicated to organize and can become a valued tool in identifying problems related to energy waste.



A thermal image of a building

Wo Wärme verloren geht

Thermografie-Rundgang in Dörnholzhausen als erster Schritt zum Energiekonzept

Von Nora Sonnabend

DÖRNHOLZHAUSEN. „Energieverlust sieht man nicht – höchstens am Ende des Jahres auf der Energiekostenabrechnung", sagte Markus Mannsbarth von der Klima- und Energieeffizienz-Agentur in Kassel (KEEA). „Mit Thermografie können wir aber zeigen, wo die Wärme verloren geht." Bei einem Thermografie-Rundgang in Dörnholzhausen hatten Bürger jetzt die Möglichkeit, sich das bei ihrem eigenen Haus anzuschauen.

15 Objekte begutachtet

Mit einer Wärmebildkamera wurden 15 Häuser abfotografiert. „Im Februar soll es dann eine Nachbesprechung geben", erklärte Willi Naumann, Erster Stadtrat in Frankenberg. Er ist auch Mitglied der Lenkungsgruppe in Frankenberg, die ein Klimaschutzkonzept entwickeln soll. Sie wurde 2010 aus Parlamentsmitgliedern, Vertretern von Naturschutzgruppen, Schornsteinfegern und Vertretern der Wirtschaft gegründet.

„Es geht darum, wo welche Energie eingespart werden kann und darum, wie wir Energie gewinnen können", erklärte Willi Naumann. Dazu solle zunächst der Zustand der Stadt und der Ortsteile begutachtet werden.

„Ich freue mich, dass Dörnholzhausen als Beispiel dient", sagte Ortsvorsteher Karl Hecker-Michel. Auf den Bildern der Wärmebildkameras zeigte sich die Temperatur an der Fassade der Häuser. Diese muss im Verhältnis zur Außentemperatur bewertet werden. Wird beispielsweise an einer Stelle des Hauses im Vergleich zur Außentemperatur eine eher hohe Temperatur angezeigt, bedeutet dies, dass hier Wärme entweicht – das ist oft an Fenstern der Fall.

Mit einer Wärmekamera kann man sehen, an welchen Stellen des Hauses Wärme entweicht: So wie hier (von links) Thorsten Röder (Technischer Leiter EGF), Stefan Klinge (EGF) und Matthias Pöhler (KEEA). Dabei entsteht ein ähnliches Bild wie rechts zu sehen. Nino Sonnabend/pbu

Stefan Klinge von der Energiegesellschaft Frankenberg (EGF) fotografierte die Gebäude mit der Wärmebildkamera: „Bei einem Einfamilienhaus kostet das 275 Euro plus Steuern. Kunden der EGF werden mit 150 Euro gefördert." Bürgermeister Rüdiger Heß ergänzte: „Auch manche Bauunternehmen und unsere Bezirksschornsteinfeger bieten dies als Dienstleistung an."

Erster Stadtrat Willi Naumann erklärte auch, dass die Gründung einer Energiegenossenschaft Teil des Konzeptes sein könnte. „Wir suchen aber noch nach konkreten Objekten." Dann könnte sich jede Privatperson mit Anteilen am klimafreundlichen Umbau von Gebäuden beteiligen.

HINTERGRUND

Frankenberger sollen sich beteiligen

An dem Klimaschutzkonzept für Frankenberg sollen Bürger mitwirken. Das heißt, sie werden am Maßnahmenkatalog zum Klimaschutzkonzept beteiligt sein. Dazu findet am 18. März am Abend eine Auftaktveranstaltung in der Eder-berglandhalle in Frankenberg statt, die genaue Uhrzeit wird noch bekanntgegeben. Alle Interessierten sind dazu eingeladen. Es soll Workshops zu verschiedenen Handlungsfeldern geben, in denen konkrete Maßnahmen und Themen von Bürgern angestoßen werden. Danach wird es noch einen weiteren Termin geben, bei dem alle, die noch Interesse haben, sich weiter zu beteiligen, kommen können, erklärte Matthias Pöhler vom KEEA. (nos)

Press article „Where heat is lost"

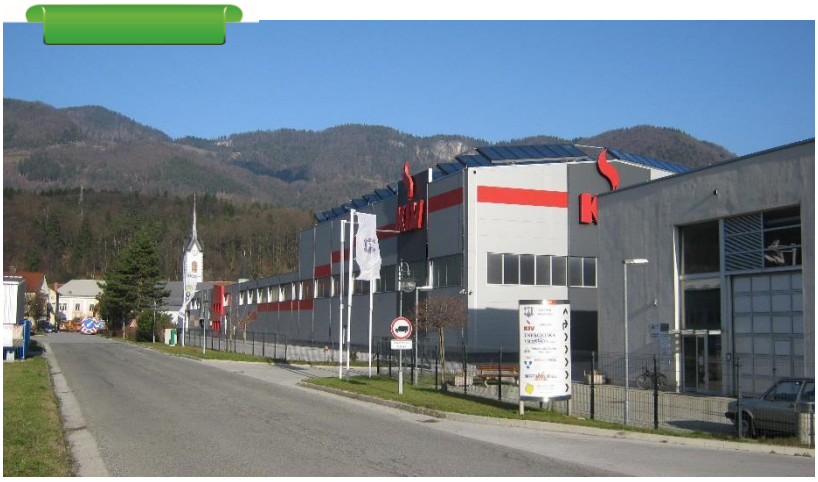
Vransko - Innovation Centre fostering new technologies

A long-term strategy of the municipality of Vransko, Slovenia is, besides municipality's general development, focused on ecological improvement and related energy conservation and transition to local renewables for energy production. Achieving this objective requires a change in thinking and behavior which puts learning at the heart of community's development. Learning enables people to gain skills and confidence so they can influence changes in their community and households.

The Municipality of Vransko was one of the pioneer communities plotting the way to energy sustainability in Slovenia and therefore prepared its own energy concept well in advance of others. Right after preparation of the energy concept in 2003, the municipality in cooperation with local entrepreneurs established a company Energetika Projekt Ltd. , working in the public interest, aiming at promoting energy efficiency and use of alternative energy sources. Its first mission was to implement a biomass district heating system for the whole community, which was successfully accomplished in 2005, and is now supplying 189 households and all public buildings with heat. But not wanting to stop there, they wished not only to pile up new knowledge, but also to progress and conduct new research in the area of renewable energy sources.

Therefore, a decision was made to facilitate the realization of Innovation Centre for development of alternative energy sources. In the first stage a facility was erected beside the biomass district heating boiler room. The Centre, covering 300 m2 area, started with a pilot incinerator facility, lab equipment, and exhibition space for education and demonstration. Now, the Centre provides opportunity for citizens and workers to get essential understanding, knowledge and skills to build capacity for local renewable energy production. It acts as a trigger to discussion, education and outreach opportunities for the general public. On the other hand it stimulates interest of the community in beneficial renewable energy uses with engaged staff presentations and examples. The Innovation Centre also hosts conferences, tours, exhibitions, and facilitates partnership programmes.

In order to demonstrate renewable sources utilization a variety of systems have been implemented. The pilot incinerator plant is an important asset to the field of research on different materials and utilization of waste heat,



The Innovation Centre of Vransko

Vransko - Innovation Centre fostering new technologies

which is becoming an extremely important area of alternative energy sources in the world. The next phase was devoted to PV research power plants - in one location three PV units were installed (35.3 kW of cumulative power). One of them is an on-roof application (80 polycristal modules), the second one is a pilot façade PV system (66 polycristal modules, 90 deg.) and the third one is a PV tracking system (18 monocrystal modules of 3.8 kW).

The pilot façade PV system in the Innovation Centre of Vransko

Besides the research actions, solar street lighting, being entirely a result of local knowledge, protected by patent rights, was implemented as an initiative of the Centre and erected in the location. This lighting is an interesting possibility for remote areas and routes where the cost of installing mains lighting is high and requires an extensive preparatory work. Moreover, a charging station for electric vehicles (EV), again being entirely the result of local knowledge, was developed. The purpose was to create a user-friendly charging station, allowing fast recharging of EV (charging time not exceeding 30 minutes).

The pilot solar street lighting

Due to the upgrade and extension of the programme for renewable energy development in the municipality of Vransko, they also participate in new projects in the field of solar, hydro and wind power as well as energy renovation of public buildings. They organize education and awareness raising seminars for potential investors who can see the operation of new technologies on concrete cases and monitor processes from the development to operation. The Municipality of Vransko has a close relationship with its local population and its successful efforts brought up the title of the Greenest Municipality in Slovenia.

Conclusions

Enhancement of energy security is achievable for every municipality. You just need to look for local potentials either they are new energy sources or people wanting things to change. There are many opportunities and finding solutions which are right for you is crucial. The outcomes might differ among municipalities but the pathway should generally follow the same pattern:

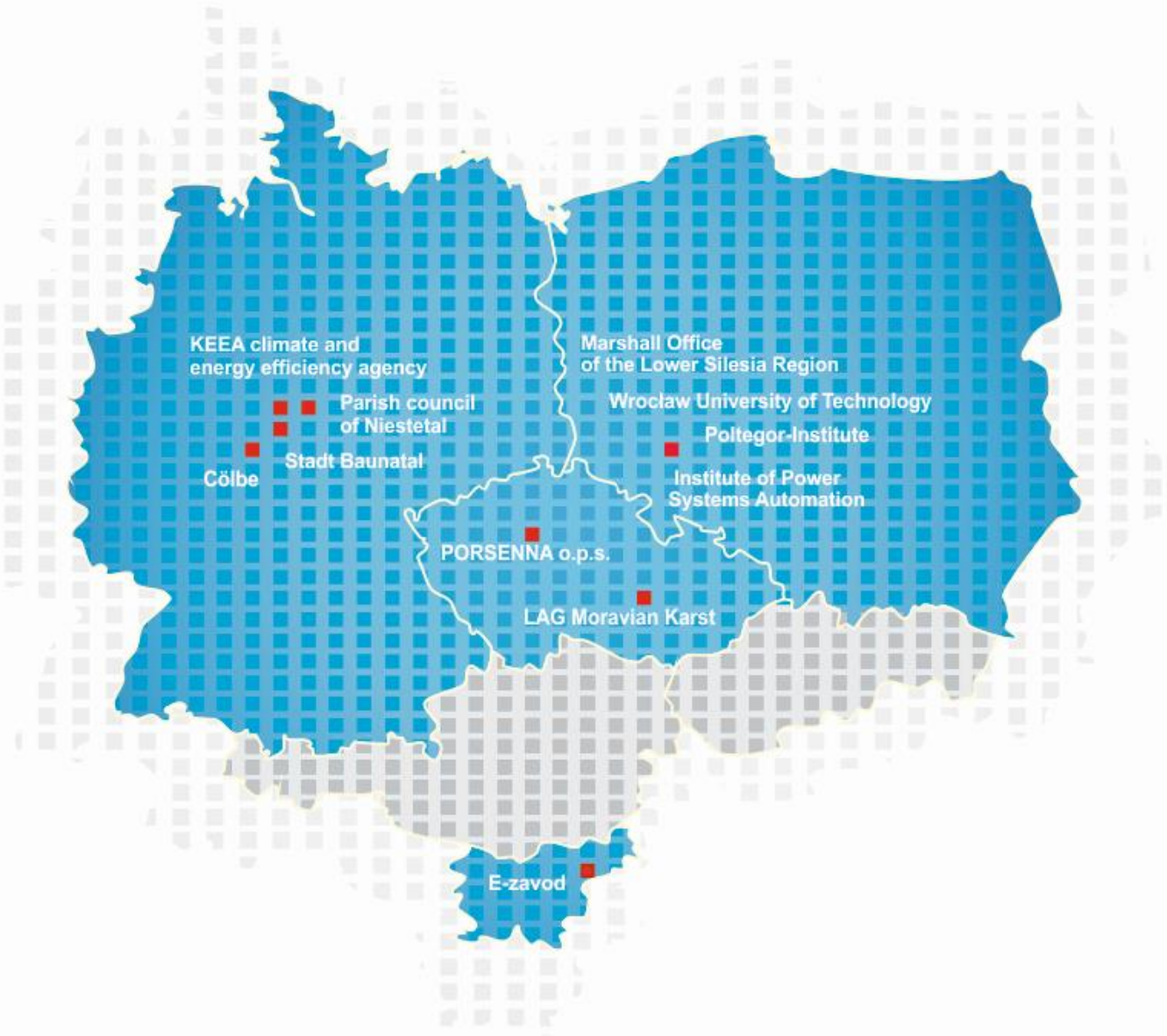
1. Survey before taking action. Get to know your local resources
2. Define where you want to go (set your goals)
3. Define how you want to get there (choose tools and measures)
4. Write that down, pick someone to take care of it
   (appoint or hire an energy manager to take the lead)
5. Start implementation
6. Monitor effects and make adjustments if necessary

Remember that it takes time to influence the overall direction of the energy system change. Therefore, you need a constant involvement of your local key actors and citizenship. Bring people together to share, understand and cooperate. There is a need for everyone in the municipality to be involved in some way, or at least to be aware of how they can personally contribute to their municipality's energetic performance. But any changes need to start at the top, with your municipality's government and administration responsible for implementing local energy concept and supporting individual actions. To be successful, local energy concepts need to be related to the municipality's development and spatial plans.

The creators of this handbook hope that the examples of good practice presented therein will serve you as an inspiration to build a successful and sustainable energy strategy of your own. Continuous improvement of energy efficiency combined with increasing local energy production and new distribution networks can bring your municipality closer to the energy security.

ENERGY REGION

To learn more on good practice examples please visit www.energy-region.eu and find ENERGYREGION's Catalogue of Measures and Catalogue of Best Practice!



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