

Market uptake of small modular renewable district heating and cooling grids for communities

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***Framework conditions on small district
heating and cooling grids in
Slovenia and Ljutomer***

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1 Introduction – facilitating DHC

The framework conditions are important for the establishment and operation of collective district heating and cooling systems (DHC systems). A characteristic of collective systems compared to individual systems is that a collective system requires organisation – and this requires framework conditions e.g. to facilitate that the investments in hardware can be financed. The costs of financing should be minimized, reflecting the low risk characterizing district heating and district cooling supply.

Subsidies and taxes is an instrument which can influence the behaviour of the consumers. E.g. in Denmark the tax levels are relatively high, providing further incentive for energy efficiency.

This report (one of five reports constituting deliverable 2.5 in the CoolHeating project) provides an analysis of the framework conditions for small heating systems in the target country Slovenia. The analysis comprise the different levels; EU-level (increasing capacity to enact EU-legislation), national level as well as regional and local level.

A key aspect of collective systems is trust. Trust is crucial for realizing the synergies of a collective system. This implies obligation of the consumers to pay for part of the fixed costs, i.e. to provide security that the investments will be reimbursed.

This report is supplemented by a Best Practice report (deliverable 2.1), which contains descriptions of a number of examples of renewable district heating plants in operation. Another supplementing report is on information material for the public (deliverable 3.3), which addresses the aspect of local acceptance.

The template for the report is provided by PlanEnergi, and the content is provided by the partner in Slovenia.

2 Framework conditions for DHC in Slovenia

In Slovenia there is one of the highest feed-in tariffs for biomass CHPs on the positive side but have slow administration and slow and inefficient procedures for acquiring of the needed permits which have a very negative impact. The framework conditions are derived from several online available documents from Slovene national ministry and national agencies responsible for energy – Ministry of infrastructure¹, Energy directorate, Energy agency², Slovenian power market operator³.

Key positive aspects:

- High national subsidies for renewable and high efficiency DH systems
- High feed-in tariff for small CHP project using RES
- Good availability of RES; abundant forests, untapped potential of geothermal energy, high solar energy potential

Key negative aspects:

- Slow administration and problematic obtaining of needed permits
- Few national examples of small RES driven DH projects and
- Low public awareness on the benefits of small RES driven DH projects
- Highly political

2.1 Energy policy

Slovenian national energy policy is dictated by the **Energy act of Slovenia** which defines the **National energy concept** document as the key development document for Slovenia until 2035 and respectively 2055. The national energy act has been renewed in 2014 and the national energy concept is in development ever since. In general national energy policies reflect ambitious aims of EU energy policy, they also reflect favourable conditions of Slovenia in terms of RES abundance. Implementation of the policy however has not really pushed national potentials in RES. Especially large national projects usually focus on nuclear or fossil options.

The energy sector has been moved between ministries in the past 10 years in Slovenia, reflecting a highly bureaucratic handling of the energy sector. Within a short time span the focus moved from planned expansion of nuclear power plant Krško to a highly non-transparent, political and expensive investment into a new coal plant TEŠ 6 (€1.4 billion investment in a new 600 MW coal plant). The lack of focus and determination is also reflected in this investment which in a short time after its erection already does not handle the costs of purchasing the national lignite coal, which was the key political motivation for TEŠ 6.

The new energy act of Slovenia transposes a number of EU directives concerning electricity and gas markets, energy efficiency and renewable energy sources. It lays down the principles of energy policy, principles and measures in order to ensure security of supply, as well as it regulates the area of energy infrastructure and heat distribution. This new Energy Act brings greater independence to the Energy Agency, which is a national energy regulatory authority. The Energy Agency was given the responsibility to supervise the implementation of the provisions of the law and regulations of the European Union concerning electricity and natural gas markets. Agency's monitoring tasks are expanding from the regulated activities to the overall monitoring of electricity and natural gas markets activities. An important role has

¹ <http://www.mzi.gov.si>

² <http://www.agen-rs.si>

³ <https://www.borzen.si>

been given to the agency also in ensuring the competitiveness of the energy markets while in exercising its powers in the market the Energy Agency will cooperate with the Slovenian Competition Protection Agency.

Slovene energy policy aims at improvement of the national energy efficiency for 35%, lowering the transport emissions for 35% and achieving 30% RES in the end energy use until 2035. The aims until 2055 are even more ambitious with achieving 100% of national RES that can be sustainably used, heat generated in 100% by low carbon energy sources, lowering of emission in transport for 70% and achieving 100% of electro mobility in public and personal transportations.

2.2 DHC related legislation

Heat energy represents 40% of end energy use in Slovenia. DHC related policies focus on energy efficiency and efficient energy production from RES. One of the focuses of the new energy act is the energy efficiency with the aim to refurbish at least 3% of public objects annually. This puts new pressure on the public sector where current situation in energy efficiency and energy production is relatively poor.

The new Energy act of Slovenia defines that heat production for DH systems is obliged to use RES at least as a part of the used fuel. Also, new projects of power production from RES will not receive the feed-in tariff automatically, but will have to apply to the tender of the Energy agency. The tender will reflect the national budget allocation for feed-in tariffs and will select most promising project (evaluation criteria will focus on lowest costs of energy production). This brings a large uncertainty in the very lucrative CHP project segment in Slovenia. Time will tell if the high feed-in tariff will justify project development costs, where investors will face potential project rejection in the Energy agency tender, or as in 2015 the risk of no tender at all, due to unavailable funds.

In general the DHC distribution in Slovenia can be operated as a public utility company or as commercial activity. For supply of up to 100 households any of the mentioned options can be implemented. For larger systems local authorities have means to decide on the form of distribution. They have to deliver a decree on heat supply where the extent of the DHC project, allowed fuels and technology is defined. Also the form of the supply is exactly specified – if it will be a publically owned project or whether the municipality will select a concessionaire.

For quality assurance of the DHC systems the distributor, who carries out the heat distribution as a service of public utility, must determine the quality and reliability of supply in its system operation instruction. A distributor carrying out commercial distribution must the matters relating to secure and quality supply draw up in general terms and conditions (energy supply contract).

End customer energy price is regulated for DHC systems larger than 500 kW or supplying more than 100 households. Price regulation method is carried out on the basis of:

- Price Control Act⁴;
- 12th indent of Article 2 of Decree supplementing the Decree laying down the list of goods and services subject to price control measures⁵;
- The methodology for determining the price of heat for district heating as defined in the Decree setting prices for the generation and distribution of steam and hot water in

⁴ [http://www.uradni-list.si/1/content?id=73395#!/Zakon-o-kontroli-cen-\(uradno-precisceno-besedilo\)-\(ZKC-UPB1\)](http://www.uradni-list.si/1/content?id=73395#!/Zakon-o-kontroli-cen-(uradno-precisceno-besedilo)-(ZKC-UPB1))

⁵ <http://www.uradni-list.si/1/content?id=47325#!/Uredba-o-dopolnitvi-uredbe-o-listi-blaga-in-storitev-zakaterese-uporablja-ukrepi-kontrole-cen>

district heating for tariff customers, which entered into force on 23 April 2014 and is valid for 12 months⁶.

District heating and cooling systems must be efficient. Heat distributors must ensure an annual level of heat by using at least one of the following sources:

- at least 50% of heat produced from RES;
- at least 50% of waste heat;
- at least 75% of cogenerated heat; or
- at least 75% of a combination of the heat referred to in the above three indents.

Heat distributors, whose units exceed a nominal power capacity of 10 MW, must ensure:

- a control system for the operation of the district heating and cooling system, which allows for optimum thermal and hydraulic operation of the system;
- the implementation of measures for optimising the operation of the DHC system.

2.3 Incentives – taxes and subsidies

For realisation of ambitious goals Slovenia is offering considerable subsidies and tax reliefs for DHC projects with high efficiency and use of RES. These incentives are managed by different government agencies and ministries. Key programmes for subsidies for new investments into DHC projects are managed by the **Ministry of infrastructure** which is responsible for the energy sector. Due to implementation of the new energy act and national energy concept also the new programmes are in preparation. New subsidies will be available at the **national energy portal**⁷.

It is expected that the subsidy **programme DOLB** will be available also in the new perspective. The DOLB subsidy programme was offering grants of 30 - 50% of investment costs into biomass, geothermal and solar driven small district heating projects with overall power of up to 20 MW, which could include CHP technology. The scheme was available for the private investors. Eligible costs included building costs, infrastructure and technology costs and erection supervision. In first half of 2016 it was unclear when the DOLB subsidies will be available.

Grants for erection of new DHC projects are available also on **Eco Fund**⁸, Slovenian Environmental Public Fund. Eco Fund is an independent legal entity, with the Ministry of the Environment and Spatial Planning, being represented as majority in the Supervisory Board. The Eco Fund is offering grants in form of subsidies and loans for private sector and the public sector.

Slovenia power market operator **BORZEN**⁹ - company's principal activity is the implementation of public service obligation relating to the organisation of the electricity market that includes organisation of the electricity market in the strict sense and the activities of the Centre for RES/CHP Support. The Centre administers the electricity feed-in support scheme for RES (renewable energy source) and CHP (high-efficiency cogeneration) power plants. This support scheme is particularly important as the feed in tariffs for up to 1 MW_{el} wood biomass CHP projects are among the highest in EU. The feed-in tariffs are available at

⁶ <http://www.uradni-list.si/1/content?id=117171#!/Uredba-o-oblikovanju-cen-proizvodnje-in-distribucije-pare-in-tople-vode-za-namene-daljijskega-ogrevanja-za-tarifne-odjemalce>

⁷ <http://www.energetika-portal.si/>

⁸ <https://www.ekosklad.si>

⁹ <https://www.borzen.si/en>

BORZEN web site where also the informative feed-in calculator tool is available. The feed-in tariffs are being annually corrected in regard to fuel price change.

Other national instruments offer additional tax relief and grand incentives for new DHC investment projects. Ministry of economic development and economy, Directorate for regional development is implementing the Act on support of regional development with subsidies for new infrastructure projects in DHC for the public and private investors. Government office for development and European cohesion is also offering subsidies for such projects, with more focus on the public sector.

In summary it is important to underline that Slovene national energy policy is being updated with the new energy act in force and with the new national energy concept in development. Therefore the grants for investments in DHC for the period of 2015-2020 are in preparation. The new grant schemes will support small RES driven DHC projects but it is unclear what changes will be regarding the grants available in the previous perspective and when the grants will be available.

Also as the grants for DHC investments for the public and private investors in Slovenia are available from a broad variety of sources, it is advisable to use specialised consultants for identification and application to suitable grant schemes.

2.4 Permitting procedures

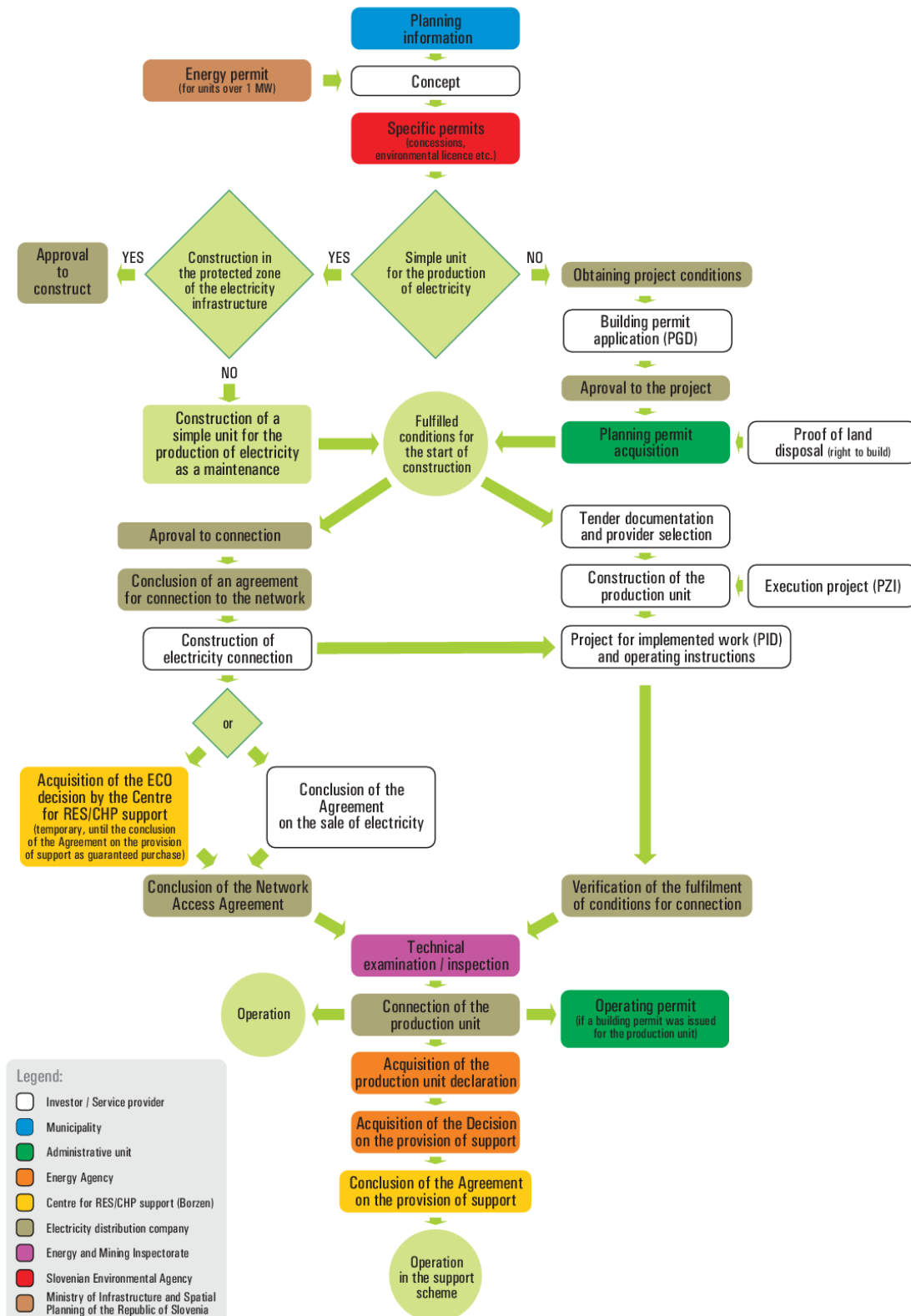
Required permits and documentation for individual DHC projects are specific and due to Slovene national regulation the process of acquiring needed permits and documentation is long and elaborate. The permits are handled by a variety of administrative offices, the Municipality where the project is located and the correspondent Administrative unit, Energy Agency of Slovenia, Centre for RES/CHP BORZEN, Electricity Distribution Company, Energy and mining inspectorate, Slovenian Environment agency and Ministry responsible for the energy sector. In order to help potential investors the Ministry responsible for the energy sector published two support documents¹⁰:

- Useful Tips for Small Power Plant Construction for the production of electricity from renewable energy sources and the cogeneration of heat and power; Borzen & SODO, August 2013
- A diagram of the acquisition of the required permits and approvals for the construction of production unit and connection to the network

The diagram of acquisition of the required permits and approvals for the construction of production unit and connection to the network is including also needed permits for CHP projects, therefore a DHC project without power generation require less permits. The diagram is included in the following page.

It is important to add that the diagram outlines standardised permitting procedures without specifics of projects. E.g. in case the DH network includes specific impacts on environment additional specialised elaborates are needed and have to be cleared from the authorities. And that some procedures can also represent a dead end for a project. Especially in terms of the definition of a DHC project by the local authorities. In case local authorities (municipality council) refuse to implement the required procedures (red box on the diagram) the project cannot be implemented.

¹⁰ <http://www.energetika-portal.si/podrocja/energetika/podporna-shema-ove-in-spte/>



2.5 Time for authorization and transaction costs

As shown above the permitting procedure is elaborate and takes a lot of time. In some cases it has been noted that the response times of national agencies responsible for individual permits can have very long response times. Timeframes of more than one year must be considered. The general cost forecast for acquiring of needed basic permits (building permits and permits connected to the building permit) is 3% to 5% of the overall investment costs for a specific project.

3 DHC in Ljutomer

The previous section has focused on the national level and the regulatory framework. This section provides the local perspective, describing the potential for DHC from an implementation point of view.

Municipality Ljutomer extends over two geographically and economically completely different areas of hills in the north east or the “Slovenske gorice” and the western area of the Pannonian circumference. Northeast is extremely flat with fields, meadows, forests, small areas and larger settlements. The southwest extends over hilly area with vineyards, forests and scattered settlements. The municipality counts 11,773 inhabitants and stretches over 107 km². It encompasses 44 settlements, but the city of Ljutomer is by far the largest settlement with about 3.500 inhabitants. The most important economic activities of the Municipality of Ljutomer are: Agriculture, viticulture, agro-processing, textile and wood-processing industry, trade and services sector.

3.1 Supply of heating and cooling in Ljutomer

The Local energy concept of the municipality Ljutomer shows almost 56.5 GWh of annual energy demand for heating and industrial heat energy demand. Of that 26.4 GWh of heat is used for domestic heating. This demand is covered in a large share with biomass (47%) and heating oil (45%). The rest is covered by natural gas and in a small proportion electricity.

Public buildings require 4.9 GWh of heat energy per annum. Covered mainly by fossile fuels: natural gas (56%), heating oil (42%), LPG (1%) and in a smaller proportion by electricity.

The industrial heat needs correspond to 25.2 GWh and are not surprisingly mainly covered by the cheapest emergent at the time being – natural gas with 70% of the demant. It is important to add that there are some very large energy consumers in the industrial zone of Ljutomer city which can negotiate very low prices for natural gas based on their overall annual consumption also outside of Ljutomer (companies as dairy product company Pomurske mlekarne and pharmaceutical industrial giant Krka). A smaller share is covered by heating oil (8%) and biomass (21%). There are also significant amounts of waste heat available in the industrial zone, especially from wood drying but the exact amount of available.

3.2 Energy resources available in Ljutomer

Slovenia is a country with high potential in renewable resources and municipality of Ljutomer is very representative in this context. With 2.744 ha of forests 25% of its area is covered by this renewable source. The overall annual harvest in Ljutomer area amounts to 8.968 m³ and in the broader area of Pomurje to more than 130.000 m³. It is important to add that the amount of wood appointed for annual harvest is growing due to poor realisation of the planned harvesting and import of cheap energy wood from the south countries (Croatia and Bosnia).

With a strong agricultural segment in the municipality there is also a lot of potential for biogas. There are more than 2.500 head of cattle and more than 25.000 head of pigs on more than 800 farms. The overall agricultural area amounts to almost 5.500 ha of which majority is in agricultural use. But there is also a significant amount of overgrown areas which are not being cultivated and are turning into forest. Farmland produces mainly corn and grain therefore straw as agricultural residue is widely available.

Slovenia has a high potential in sun energy. The annual solar irradiation in Slovenia amounts to between 1000 and 1500 kWh/m² (estimation for the Ljutomer municipality area is 1236 kWh/m²) with 1.400 to 1.900 hours of sunshine annually. Solar energy in Slovenia is mainly used for photovoltaics as high subsidies fuelled exponential growth of investments in this sector up to a point where national plans are covered and subsidies have been lowered.

Ljutomer area has also a high potential in geothermal energy. The temperature gradient in the north eastern area of Slovenia is higher than average in Slovenia. In 1.000 m depth we can find aquifers with more than 60 °C and in 4.000 m depth with more than 150 °C. The utilisation of this source is lucrative but the investment costs are significant due to obligatory use of reinjection boreholes and risk.

In other areas potentials are not significant (wind energy and hydro energy). The level of utilisation of RES is relatively low if taken in consideration that a biomass use in individual household heating is historically high. A high proportion of energy resources are imported in terms of fossil fuels but partially also biomass is imported due to low prices in Croatia and Bosnia.

3.3 Initiation, planning, implementation and operation of DHC in Ljutomer

At present there are no district heating or cooling systems in the Ljutomer municipality. The closest thing are localised boiler rooms of individual apartment buildings, predominantly using heating oil. One of them has been lately refurbished into a natural gas CHP driven unit. There are no relevant plans for implementation of new DH projects, but there was an initiative for a DH system in Ljutomer City in 2013. The project failed due to lack of political consensus and support. National legislation obliges municipalities to define DH projects in an obligatory document Decree on heat supply. This document defines a base for a tender for selecting and awarding a concession for heat supply and defines key aspects of the DH system to be erected (location, area to be covered, fuel that can be used). The local authorities failed to deliver enough consensus within its bodies to define and adopt the decree. The key lesson learned from that project is that the key element in planning the new DH systems in Slovenia is consensus in local authorities (Mayor and Municipality council) as only if they share a common vision DH projects can be implemented.

3.4 Potential and barriers for DHC in Ljutomer

There are significant potentials for new DHC projects in Ljutomer municipality. At the level of smaller settlements modern and efficient modular DHC systems of around 1 MW_{th} could replace existing use of heating oil and biomass in old and inefficient individual boilers. And at the other side the Ljutomer city could be connected to a large DHC network covering also the energy demand of the industrial zone.

The local government is in favour of such projects but there are significant barriers for such projects. First of all there are no real best practice examples in Slovenia and households are reluctant to connecting themselves to district heating networks. Also energy prices of fossil fuels are low at the moment so it is hard to motivate households with the energy price. Also a high use of biomass from own forests is making this difficult. The existing vacuum due to a new energy law and consequently absence of national subsidies doesn't help either.

Not least a strong and unifying political force at the local level is needed to implement such projects. Local authority has to communicate, motivate and unite individuals, but also ensure political consensus to be able to provide obligatory procedures and documentation for DHC project implementation.