MSc Program
Renewable Energy in Central and Eastern Europe

Tariffs for Renewable Heat Support in Slovenia

A Master's Thesis submitted for the degree of
"Master of Science"

supervised by
Dipl.-Ing. Dr. Lukas Kranzl

Matjaž Grmek

0827592

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"Ognuno sta solo sul cuor della terra
trafitto da un raggio di sole:
ed è subito sera."

Salvatore Quasimodo

Affidavit

I, **Matjaž Grmek,** hereby declare

1. that I am the sole author of the present Master Thesis, "TARRIFFS FOR RENEWABLE HEAT SUPPORT IN SLOVENIA",
   113 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master Thesis as an examination paper in any form in Austria or abroad.

Vienna, _______________ ____________________________

Date Signature

Preface

Being involved in renewable energy sector already for some years now, I had the opportunity to see some successful examples and some less successful ones. I was particularly stricken with the renewable heat (un)development in public sector. Although it seems like the most appropriate one and in spite the fact there seems to be a great deal of awareness among the principals of the public institutions, RES-H projects were simply not given the right support. At the same time we could observe a relatively success story of the so-called green electricity production through adoption of the feed-in tariffs support system in the recent years. The question arose, could we take some wisdom from the latter and give it to the former?

Abstract

Background EU has set high binding goals for the use of renewable energy. Looking at the last years' development it seems that renewable heating does not follow the dynamics of the so-called green electricity production. Tariffs or bonus model, deriving from so far the most successful model of the feed-in tariffs applied in renewable electricity sector, could improve the situation. The first such scheme was introduced in the UK, coming into force in June 2011. I wanted to check if this could be the right way to enhance the renewable heating in public buildings in Slovenia. Results For this purpose an overview of the current renewable heat supporting mechanisms and experienced gathered so far is made and comparison of the bonus with other models is shown. To check the idea in practice a simulation is made using the real case examples of two public buildings in Slovenia. *Results* from the literature and case studies were mainly positive and confirmed the initial idea. Hence a basic design of the scheme was made and further development proposed. Furthermore, estimation on the needed funds for a ten years renewable heating retrofitting programme for public buildings was derived and compared with the actual subsidy spending and the costs planned according to the national REAP. *Conclusions* The results showed good perspectives for the proposed model. However, further options like different scale (households, district heating) and technologies (solar and geothermal, heat pumps) options should be analysed. A much more comprehensive analysis of the suitable height of the tariffs is needed for well designed scheme.

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List of acronyms

ApE	Energy restructuring agency
ARSO	Environment Agency of the Republic of Slovenia
BAP	Biomass action plan
CHP	Combined heat and power
DH	District heating
EC	European Council
EEA	European Environment Agency
EEU	Efficient energy use
ERDF	European Regional Development Fund
EREC	European Renewable Energy Council
EZ	Energy Act
FIS	Financial incentives
FIT	Feed-in tariffs
GHG	Greenhouse gas
IEA	International Energy Agency
kW	Kilowatt
kWh	Kilowatt hour
LEA	Local energy agency
LEC	Local energy concept
MKGP	Ministry of Agriculture, Forestry and Food
MG	Ministry of the Economy
MOP	Ministry of the Environment and Spatial Planning
NEP	National Energy Programme
NREAP	National Renewable Energy Action Plan 2010 - 2020 SI
NREAP	National Renewable Energy Action Plan
RDP	Rural Development Programme
ReNEP	Resolution on the National Energy Programme
RES	Renewable energy sources
RES-E	Renewable electricity
RES-H	Renewable heating
RHI	Renewable Heat Incentive
SORS	Statistical Office of the Republic of Slovenia

1 INTRODUCTION

1.1 Motivation and objective

One of the main messages that got imprinted in my brain from my study of mechanical engineering was about efficiency and boundaries. Namely, no matter how good the innovation (higher efficiency) in its local environment is, it is only worth if the change it brings means an improvement for the whole system it belongs to in the first place.

It seems we tend to forget this simple yet fundamental principle when talking about economy and their holly cows, *progress* and *GDP*. The growth we strive for means yes an improvement for a small element, but unfortunately not for the whole system. In fact, many times it means the very opposite.

1.1.1 Socio-economic background of the renewable energy

Nicholas Georgescu-Roegen, an economist, was long ago aware of the above mentioned fact. He described it in his works “*The Entropy Law and Economic Process*” and *“Energy and Economic Myths”* (Georgescu-Roegen, 1971, 1975), where he cited physicist and an authority on thermodynamics P. W. Bridgman, and his term "*entropy bootlegging*". It means the (erroneous) position that “*Mankind’s entropic dowry is virtually inexhaustible, primarily because of man’s inherent power to defeat the Entropy Law in some way or another*.”

He criticised the mechanistic approach of the (neoclassical) economists, which excludes nature from the equation and, as he put it, natural dowry of the earth and its finiteness. He argued that the erroneous view of the economic process as a whole not to see that there are no material factors other than natural resources is “*to ignore the* *difference between the actual world and the Garden of Eden*." He pointed out that "*as strange as it might seem, the whole stock of natural resources means not more than two days of sunlight!*" Furthermore, he made a connection with the Second law of thermodynamics and argued that it also governs economic processes. He is also considered "one of the key intellectual progenitors of ecological economics", the goal which is the improvement of human well being through planning for the sustainable development of ecosystems and societies.

He was rejecting the scientists' vain pride and their declaration they would be able to produce proteins (i.e. food) from oil till year 2000 and claimed the opposite in his words that "*we can be sure that someday – perhaps sooner than we think – we will use the technology other way around to produce petrol from crops"*. No commentary needed. More over, he pointed out that survival of every species on earth depends, directly or indirectly, on solar radiation. Only man, because of his exosomatic addiction, depends also on mineral resources. For their use man competes with no other species; yet his use of them usually endangers many forms of life, including his own. Finally, he calls for some reason when he says: "*Economist have been preaching to maximise momentary profit too long now. It's high time for mankind to comprehend, that the most rational thing to do is to minimise regrets*."

That the words of Georgecu-Roegen are still very much true and things are maybe not what they appear to be on the surface, or the way the Western world leaders try to picture them, confirms **Noam Chomsky** in his books, e.g. in "*Profit over people*".

In more recent times their thoughts were shared by **Hermann Scheer**, German politician and parliamentarian that paved the way to government support to renewable energy in Germany. In 1986 he published a book "*Die Befreiung von der Bombe*" where he opted for solar energy instead of the "Star Wars" programme of the USA president Reagan (Pater, 1998) In his book "*Sonnenstrategie"* he wrote, quote*: "Die Marktwirtschaft als Leitbild der westlichen politichen Systeme hat unverkennbare Innovations-, Wettbewerbs- und Verbrauchervorteile und damit auch soziale Funktionen für diejenigen, die die Chance zur Marktteilnahme haben. Aber sie ist grundsätzlich blind gegenüber den externen sozialen und ökologischen Folgen ihrer Prozesse. Diese Folgen werfen um so größere Schatten, je erfolgreicher eine*

Marktwirtschaft ist. Sie ist aus sich heraus unfähig, zwischen reproduzierbaren und nicht reproduzierbaren, zwischen sozial nützlichen und sozial schädlichen Werten zu unterscheiden. Solange man diese Werte unterschiedslos kommerzialisiert, ist ab einem bestimmten Zeitpunkt die soziale Explosion vorprogrammiert. Dies ist die Grunderkenntnis aus dem Entropiegesetz, das man – wie wir gesehen haben – auch auf die wirtschaftlichen, sozialen und administrativen Vorgänge übertragen kann. Nicht reproduzierbar sind fossile und atomare Energien, mineralische Rohstoffe, Tropenwälder, Boden, Luft und Wasser." and "*Nur ein solares Energiesystem ist mit der Marktwirtschaft in ihrer positiven Ausprägung vereinbar. Solange man das nicht in seiner vollen Tragweite erkennt und das neue Konzept nicht konsequent realisiert, läuft man den Problemen mit immer weiter heraushängender Zunge hinterher, macht zahllose Anstrengungen zur Überwindung, muß aber trotz aller Mühen erleben, daß die Probleme nur anwaschen, und begreift nicht, wo die tieferen Ursachen liegen."*end of quote.

Anyway, I would say the above-described problems are to be blamed for the less than desired development of the renewable energy and in particular renewable heat in Slovenia (or Europe/World to that matter). It seems that business as usual approach is just not the right option for that.

Some scientists, and not only, have become already aware of these facts. For example, Lučka Kajfež Bogataj, prof. at University of Ljubljana, in one of her presentations titled "*Measuring of "invisible" economy: Index of genuine progress and index of natural capital*" talks about monetising the value of nature. In the presentation she cites Deutche Bank Research from 2006 and concludes with these thoughts: "*Earth is not a free supermarket and natural capital is of the same value as the physical capital made by man*." (Kajfež Bogataj, 2010) Sounds familiar?

One could ask what all this has to do with this paper. Well, a lot actually. I believe it puts the support systems for renewable energy, and hence also for the renewable heating, in the right perspective. The forever-repeated mantra of the opponents of the renewable energy support -"*free market and its distortion*" this way becomes a bit out of place. This, of course does not mean that the support mechanisms should not be very carefully planned, designed and implemented.

1.1.2 Objective of this paper

Being involved in RES sector already for some years now, I had the opportunity to see some successful examples and some less successful ones. I was particularly stricken with the RES heat (un)development in public sector. Although it seems like the most appropriate one (for example see Bioheat II, 2003), and in spite the fact there seems to be a great deal of awareness among the principals of the public institutions, RES-H project were simply not given the right support. On the other hand, we could observe a relatively success story of the so-called green electricity production through adoption of the feed-in tariffs support system in the recent years.

My intention is therefore to make use of these experiences and to look upon a possible solution which could be used to improve the situation in the RES-H deployment, with an emphasis on the public sector, which, besides from very practical reasons, has also an important symbolic meaning in the efficiency-and-boundaries sense from the beginning of this chapter.

It has to be noted that RES-H in this paper stands for both renewable energy heating and cooling, although the latter is not discussed here. Cooling of the buildings is getting more and more important and energy consumption in that respect is growing fast. Moreover, new technologies are being developed and also those that are based on renewable energy, e.g. solar thermal cooling. Therefore, also these technologies should be supported and given the same treatment as their heat counterparts. The same principle of supplying RES heat and getting bonus for it would go for RES cool supply.

This paper by all means has no ambitions to propose a detailed final solution. For something like that it falls much too short. Furthermore in order to get more puzzles in the picture a much broader scope should be used. It means various sizes of appliances from smaller, household’s size, to district heating systems and also other technologies other than biomass, such as solar- and geothermal. What it hopefully can do, is to make a small contribution in searching for better options for the needed RES-H support and provide a solid platform to build the case of RES-H support policies further.

1.2 The questions raised

The main question to which I would like to find an answer in this paper is:

Would it make sense, in terms of efficiency and effectiveness of the incentives', to use some kind of "feed-in" tariff system for RES-H support for the public buildings in Slovenia?

My **hypothesis** could therefore be:

Tariff system for RES-H support in public sector in Slovenia would mean a valuable contribution to enhance development in renewable heating and help in achieving the set goals for RES-H deployment by 2020.

The first confirmation, as he put a question mark next to it on one of his slides (Haas 2008), another one that this idea is not completely unfounded gave already the lectures of Dr. Haas was the fact such system was designed in the UK.

In order to confirm or discard it, and with the supposition the answer would be positive, we would have to find answers to many further questions that arise, such as:

- *What have we learned from the feed-in tariff system for RES-E?*
- *What are the possible synergies?*
- *What are the differences and how it compares with other RES-H support mechanisms?*
- *Is there already similar system in existence to look upon?*

If yes:

- *What are its characteristics?*
- *What could be used from it?*

- *Important issue is also the costs for such system. Does it pay off for the society?*
- *Is it feasible in Slovenia?*
- *How to implement it?*

and further:

- *Who should be involved in its development and implementation?*
- *What is the right amount of the bonus and how long should it be paid?*
- *On what basis should it be paid?*
- *What are the criteria for eligibility?*
- *How to know the actual produced (needed) amount of heat?*
- *How to ensure justice of passing the costs/bonuses to energy consumers and which mechanism could be used to do that?*
- *How to lower transaction costs?*
- *Where to start, which sector to address (first)? Etc.*

The first obvious place to look for some answers is the already mentioned Renewable Heat Incentive scheme from UK. But first things first, let us make an overview of the support systems available and gathered experience so far. Of course I looked at the existing sources of information. The following chapter explains where exactly.

1.3 Main literature used

The first source is naturally the master course with handouts and lectures. Then there are projects reports, scientific articles, internet publications and books.

1.3.1 Handouts and lectures' notes

Renewable Energy in Central and Eastern Europe, 2008-2010 edition

1.3.2 Projects that I look upon their findings:

- RES-H Policy, "Policy development for improving Renewable Energy Sources Heating & Cooling penetration in European Member States", Intelligent Energy Europe (EIE), 2008–2011

- K4RES-H, "Key issues for Renewable Heat in Europe" Intelligent Energy Europe, EIE/04/204/S07.38607, 2005-2007
- BAP-Driver, Leveraging the development of national biomass strategies & action plans, based on a balanced assessment approach for policy makers, EIE/07/118/SI2.467614, 2007-2010
- SUPPORT–ERS, Optimisation of Support Schemes for Renewable Energy Sources for Electricity Generation, Heating in Cooling, EIE, 2007-2010
- 4Biomass, Central Europe cooperating for success, 2010-2013
- Biosouth, ALTENER, Heat from renewable energy sources, EIE, 2005-2007
- BUDI**,** Directive on the energy performance of buildings**,** EIE, 2005-2007
- ELVA, Establishing Local Value Chains for RES Heat in local communities, EIE, 2005-2007
- Bioheat II, ALTENER AL/2000/163: BIOHEAT - Promoting biomass heating in large buildings and blocks, EC, 2000-2004
- FUTURES-E, Deriving a Future European Policy for Renewable Electricity, EEG,
  12/2006-11/2008
- GREEN Net Guiding Large Scale and Least Cost Grid and Market Integration of RES-Electricity in Europe, GreenNet-Europe, 2003-2009
- INVERT, Rational use of energy and renewable energy sources – a review of current policy strategies and promotion schemes, EC, 2003-2005
- REFUND +, Refund individual investments in RES heating systems through direct tax measures, EIE, 2006-2009
- REN21, Renewables 2010 Global Status Report, Renewable Energy Policy Network for the 21st Century, 2010
- TRINITY, 3-fold initiative for Energy planning and sustainable development at local level, EC, 2006-30/06/2008
- INTERNATIONAL FEED-IN COOPERATION, Federal Ministry for the Enviromment, nature Conservation and Nuclear Safety, Ministerio de industria, turismo y comercio and RS Ministry of the Economy, 2004-2007

1.3.3 Scientific articles and conference reports

Here it is worth notice that although considerable effort was put into the searching of articles considering RES-H not may were actually founded. It is to say that the topic is indeed underfed in comparison to the RES-E sector, where there numerous reports and science articles from all over the world can be found on support mechanisms, feed-in tariffs seem to particularly popular topic, electric grid operation and challenges, etc.

Bürger, V. *et. al.* (2008): »Policies to Support Renewable Energies in the Heat Market.« In: Energy Policy 36, 3150-3159.

Held, A. *et.al.* (2006): »On the success of policy strategies for the promotion of electricity from renewable energy sources in the EU«. In: Energy and Environment 17, No.6, Fraunhofer ISI, pp.849-868.

Fouquet, D. (2010): »Environmentally Harmful Subsidies«. DNR, Forum Umwelt und Entwicklung workshop, Brussels, 11 January 2010.

Fouquet, D. (2007): »European Renewable Energy: Clarity, targets and level playing field«.
Sustainable Energy Seminar, Brussels, 20 March 2007.

Fouquet, D. and Johansson, T.B. (2008): » European renewable energy policy at crossroads Focus on electricity support mechanisms«. In: Energy Policy doi:10.1016/j.enpol.2008.06.023.

Fouquet, D. (2007): »Prices for Rewenerable Energies in Europe: Feed in tariffs versus Quota Systems – a comparison.« European Renewable Energies Federation.

Fouquet, D. (2010): »The renewable future to build – now.« EREF Spring Seminar Brussels.

Haas, R. and Biermayr, P. (2000): »The rebound effect for space heating Empirical evidence from Austria«. In: Energy Policy, Volume 28, Issues 6-7, Elsevier, pp. 403-410.

EEA (2008) »Maximising the environmental benefits of Europe's bioenergy potential«, European Environment Agency, EEA Technical report, No. 10/2008

1.4 Methodological approach

1.4.1 Basic idea

The paper was conceived with somewhat intuitive idea in mind of using feed-in tariff (FIT) system for the support of renewable heat/cold. The reason is described in more details further in text, but let just say the good experience with the FIT in the so-called green electricity production and the slow process in the RES-H development, especially in the public sector, were the main decisive factors.

In space heating there is of course no common grid as it is the case with electricity. The exception is maybe district heating network, but even in this case the prices of the heat are not unified and even with the big systems the grid is really small in comparison to the electric one. However, we could make a mind experiment and make a picture in our minds of the imaginary grid where, for example, all the public building connect to. Those which would "feed-in" the renewable heat into the grid would be awarded for their effort (as is usually more expensive than heat generated by use of conventional fuels) and for contribution to emissions reduction. Their award would be a fixed fee (tariff or bonus) per every kWh of heat generated per fixed period, e.g. 10 years.

There is also one particularity in our case what makes for another reason for this paper. Usually to solve a particular problem or implement a certain idea, one founds first the best option and then looks for the needed (financial) means. In this case this means are already available (see Uradni list RS (2009)) and the suitable options for its utilisation are searched. Namely, government issued a decree on assuring the minimum amount of energy savings for electricity and (fossil) energy suppliers. A special supplement to the price for consumers is set and mother gathered for this special purpose. For smaller suppliers money is gathered and energy efficiency measures (also RES-H applies) are proposed by Eco Fund.

1.4.2 The questions set

At the beginning the main question on feasibility and suitability of the tariff system for RES-H support in the public buildings in Slovenia was set. I made a hypothesis the answer would be positive. In order to find out whether this is true or not I followed a certain logical procedure.

Various other questions arose immediately (see Chapter 1.2). In order to be able to give more grounded answers to them I looked at what has been found out on the subject by others already. Furthermore we put the *Bonus Model* – this appears to be the common name for the *tariff support system* in heating sector among experts – in perspective and looked at the other support possibilities as well. A comparison among different systems is made, respective pluses and minuses are checked and experiences shown. The results are then compared with Slovenian experiences.

1.4.3 RES-H in Slovenia

First I looked at the domestic situation of what the renewable heating and its supporting policies is concerned. Since I had already some years of experience in this sector I was able to provide some information from personal experience and view. Others were found at related ministries web-sites and reports, e.g. Ministry of the Economy, Ministry of the Environment and Spatial Planning and Ministry of Agriculture, Forestry and Food, reports from the related Intitutes (Forestry and "Jozef Stefan" for example) and projects, BAP Driver for instance, articles from the expert revues (e.g. EGES) internet portals such as Energetika.net, and others more.

1.4.4 RES-H support mechanisms overview

Next step was to look at what the experts on the field have to say about the topic and make an overview of different RES-H support mechanisms from the literature available. These findings were than confronted with the actual situation and experiences in Slovenia. Later I looked at the experiences and lessons learned from RES-E support. Again various reports, articles, projects were used. Main focus was on the feed-in tariff system.

Majority of the information that I was able to find were more or less positive and suggesting the tariff system or bonus model would make sense. Furthermore a first such model was going to be introduced in the UK. Therefore I looked at the concrete application possibility at the chosen public buildings.

1.4.5 Case studies

To make things more practical I used two examples of the public buildings in Slovenia, for which I was able to get real data on consumption and potential investment costs. For one the RES heat option was considered but not realised because of the unavailable financial support. We could see it as an example of a missed opportunity, which might have not happened if tariff system would be in place instead of the unreliable grants system. Both would use biomass as main fuel. The other project was realised but without any form of financial incentives and hence with great difficulties. It is only merit of the principal and her perseverance in convincing the Ministry of education and sport that it is a project worth-wile since they were a forestry school after all.

I chose a middle size boiler projects, 300 and 500 kW respectively, in order to use an average and most common example of public building heating in Slovenia. An economic analysis for a biomass heating system was made by use of he (Excel) calculation model of ApE, which is used for calculation of the standard economic criteria for projects evaluation. Results are presented in cash flows and indicators like Net present value of the project, Internal rate of return and payback period.

I made three calculations for three different scenarios; first without subsidy, second with 25% investment grants and third with a bonus payment per kWh (renewable) heat produced. Comparison of the two approaches – the classic grants versus bonus and expected effects was then made.

The economic analysis of the case study is basically a pre-feasibility study of the biomass heating system that is based on heat (fuel oil) consumption and biomass heating system design. I used the calculation model that is used in company ApE. From the known amount of the heat needed, which is expressed through a load curve, the suitable size boiler is derived and the needed investment estimated. The economic evaluation of the project is then made based on both support schemes. The case study showed that this kind of support would be beneficial for the RES-H project.

To see what would be the optimal height of the bonus also the calculation of the net present value (NPV) of the incentives is performed. These values are then confronted with the NPVs of the project.

At the end of the chapter, an estimation of the needed funds for public buildings retrofitting with renewable heating system and confronted with the actual amounts of the grants given by Eco Fund as well as the planned needed financial means defined within the national REAP is made.

1.4.6 Interviews

To get an insight into what people, that could actually be using this support scheme, would think of, I also made a few short interviews. Some of them confirmed my thoughts others were not in favour of the tariffs idea. The main message however seems to be more in favour than not. The interviews made were not an option that I would deliberately have chosen at the start but rather a spontaneous, but nevertheless, logical step made in the process of looking for the input data for the case study.

If the interviews would be given greater importance, I would choose a different approach, such as written questionnaires with larger number of interviewees. Since my experiences are telling me that such questionnaires are not very popular and results many times questionable I decide not to use this approach.

1.4.7 Conclusions on the tariffs or bonus scheme

At the end I made an overview of what such bonus scheme could look like and tried to define all the basic parameters. I used the set questions at the beginning as a guide. Moreover, I derived essential conclusions with respect to policy design and comparison of effects.

2 RES HEAT IN SLOVENIA

One of the priorities of Slovenia with regard to the sustainable development is without doubt the use of bioenergy, heating being the primary target area. This direction dictates the abundance of natural resources. Namely, in Europe only Finland and Sweden have grater share of forest cover. The share has grown from 36% in 1875 (according to the first official registered data available) to more than 60% in 2008 (ZGS, 2009) and is growing further. Clearly, a result of many years of, what would be now called sustainable forest management.

Use of wood for energy purposes has got long tradition in Slovenia, especially so in rural areas. According to the estimations of the forestry experts around 150,000 Slovenian households out of 745.000 as of 2007 stand (ARSO, 2009), which means about 20%, are using wood for energy purposes. Most of the appliances used are outdated, though. According to the same experts a big share of the forest goes unused and there is considerable potential for energy purposes usage without affecting other forest functions. The current yearly use of 1.3 million m^3 of forest wood (households) could be raised to at least 3 million m^3, on long run even 4, without jeopardising other forest functions (Beguš, 2009).

Slovenia expressed the importance of bioenergy in the National Energy Programme from 2004 (NEP, 2004). However, the actual bioenergy development is not following the goals set. In fact, only a fraction of the goals set were actually achieved. One of the main reasons is also the ”holding back” of the public sector.

Taken into account that around 40% of the final energy used is within building sector, where heat is a predominant type of energy usage, it is clear that this is the sector that needs to be addressed in much greater extent than it was till now. Moreover, at present, around 90% of this heat demand is covered by fossil fuels and electricity. If we look at households the predominance of heating sector is even more apparent. Even considering the fact that it was reduced a bit, if we compare years 1973 and 1998 (figure 1), is still clearly visible that we talk about the main energy consumption sector in households as it can be seen on a graph from the IEA report *"30 Years of Energy Use in IEA Countries"* from 2004 shown in figure below.

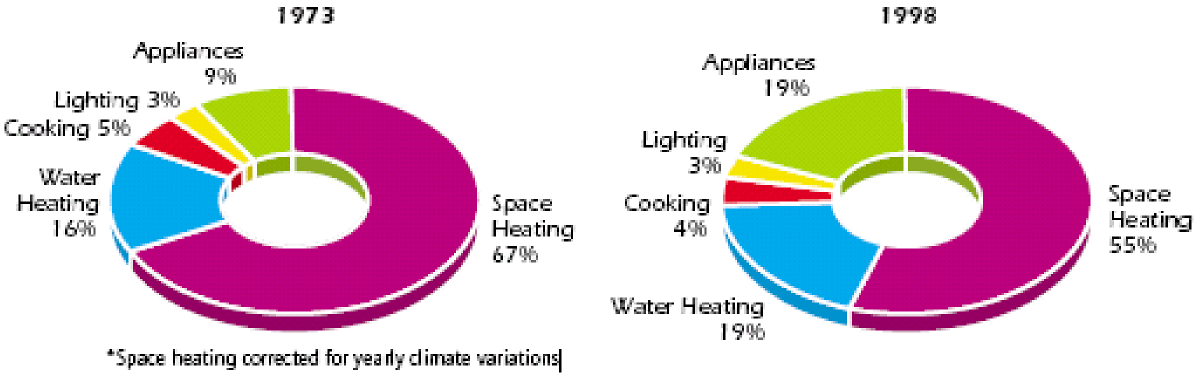

Figure 1. Residential Energy Use by End Use, IEA-11*

Source: 30 Years of Energy Use in IEA Countries, 2004

If we look at domestic situation in households, we see that almost exactly two thirds of the energy goes for space and sanitary water heating.

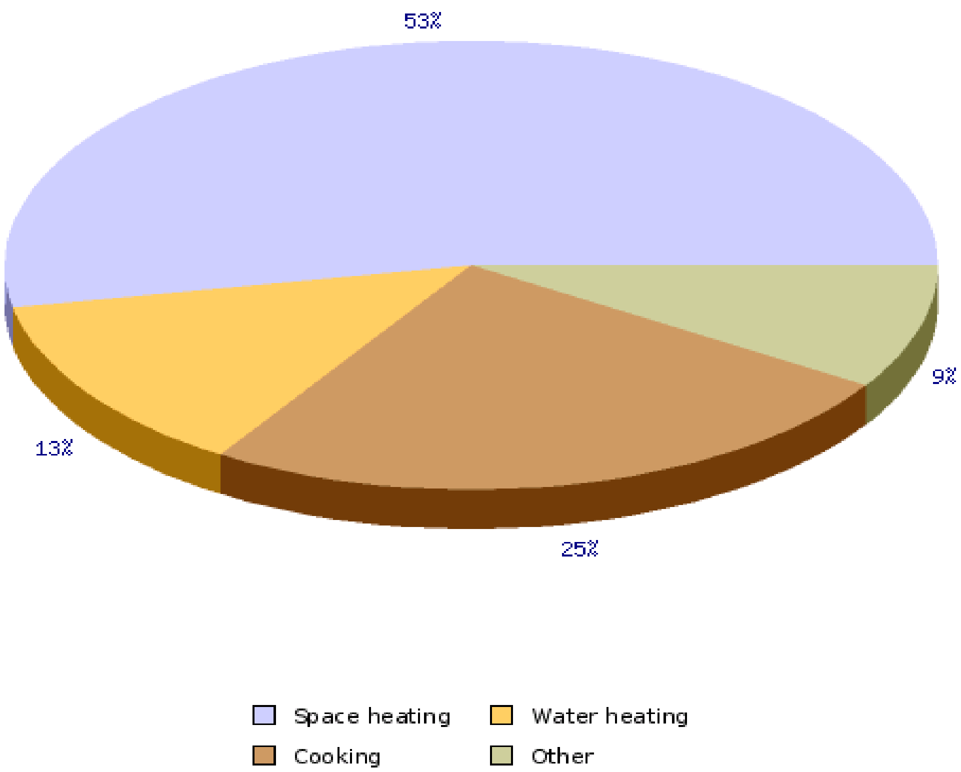

Figure 2. Final energy consumption in household by use in 2002 in Slovenia

Source: ARSO, 2009

Slovenia has now got new international obligations to raise the RES share and to lower the greenhouse emissions. There are also new national regulations in place or in process of adoption. For example; PURES ("*Pravilnik o učinkoviti rabi energije v stavbah*"), regulation on efficient use of energy in buildings, just got into force in July 2010 (Uradni list, 2010). There seems to be enough regulations that push the use of RES, the main problem, however, remains financing and the missing long-term strategy.

That there is a need for new financing can be seen also from the graph below. It shows the actual and projected amount of the financial support for the renewable (RES) and energy efficiency measures (EEU), not counting transport and green electricity production (FIT scheme) in Slovenia by different sources. The top pink column shows the expected shortage according the national Energy efficiency action plan (MOP, 2009). It can be seen that the support started with governmental grants based on state budget. From 2009 Eco Fund took over and Cohesion funds were activated with the 2010. Already for the next year 2011 a shortage was expected.

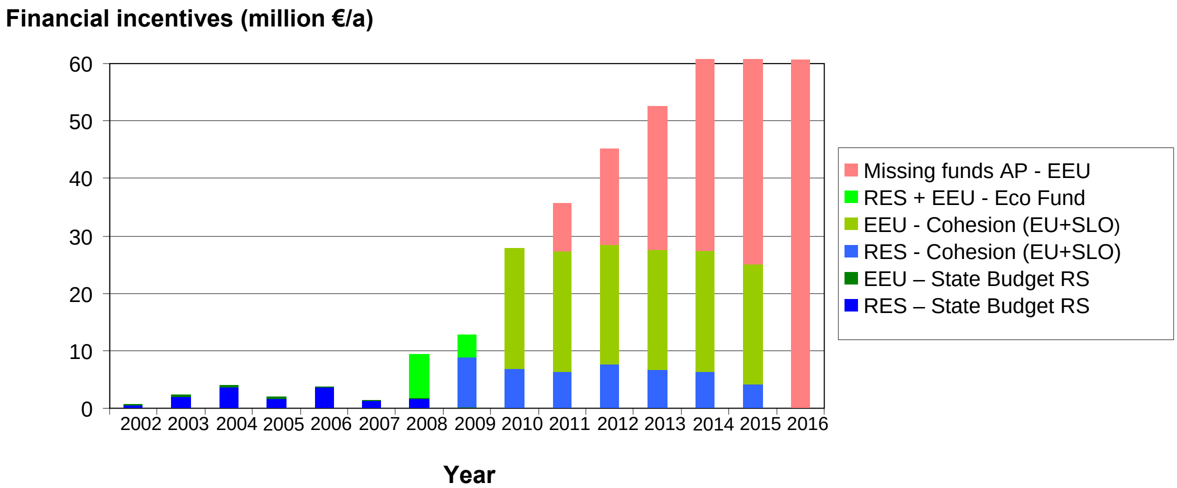

Figure 3. Financial incentives for renewables (RES) and energy efficiency (EEU)
Source: MOP, 2009

Therefore a new source of financing was needed. In December 2009 the government passed the "*Decree on assuring the energy savings at the final customers*" (Uradni list, 2009) based on Energy act (Uradni list, 2007). The minimum annual energy savings are set to 1% with respect to the previous year amount of energy supplied. The target has to be achieved by energy suppliers to final consumers of electricity, gas, and liquid fuels.

For this purpose a special supplement to the price of electricity, (district) heat and fuels was defined. The supplement is added to the energy price and paid by the final consumers. E.g., for the fuel oil it is set at 1.0 €c/l for the year 2010 and respectively 2.0 €c/l and 3.5 €c/l for the next two years. For the electricity this figure is constant for the same period and amounts to 0.05 €c/kWh delivered. Supplements for other energy carriers are also defined and shown in the Annex 1 of the decree. The money has to be collected on the separate account.

Based on the quantities supplied two categories are defined; small and large subjects. Bigger service providers – annually more than 75 GWh of heat or 200 GWh of electricity - are obliged to prepare the programmes for achieving such savings by themselves, for smaller providers Eco Fund Public Fund is responsible, which reports to the government. Bigger companies present the programmes to the Energy Agency, which approves (or rejects) them and informs Centre for Support (Borzen), where the money from electricity sector is collected. The money is then passed to Eco Fund on monthly basis. The smaller providers of heat and fuels pass the collected funds to Eco Fund every month directly. In case a bigger supplier collects more money than needed for the already approved programme or fails to achieve the same has to return the money with interests to Eco Fund.

Renewable energy for heat is one of the eligible services and measures defined in Article 4 of the decree. It looks like not many ideas for such programmes have arisen so far. Furthermore, a supplement for supporting energy efficiency and renewable energy use is paid from every kWh of electricity used in Republic of Slovenia as defined by government.

Tariffs or bonus model for RES-H discussed in this paper could represent one of the possible options for Eco Fund in terms of preparing programmes within the said decree on energy savings.

2.1 Experience with RES support so far in Slovenia

The importance of renewable energy in Slovenia is a long known fact. Its systematically support began in 1991 with the state independence and when an (independent) special agency *Agencija za prestrukturiranje energetike* (ApE, Energy restructuring agency) was founded in order to set path to renewable and efficient use of energy in Slovenia.

Incentives used were mainly state *grants***,** based on open calls with tendering procedures, and later *soft loans* from Eco Fund.

In year 2002 a special programme for biomass (energy) utilisation support (co-financed by Global Environment Found) named "*Odstranjevanje ovir za povečano izrabo biomase kot energetskega vira* (Removing obstacles for enhanced utilisation of biomass for energy)« was launched which was mainly focused on bigger district heating systems and education and awareness raising.

While support for households was more or less adequate (Figure 4 shows the development), we could hardly say that for middle sized systems (100-500 kW), where companies and public buildings mostly occur. The budget for the sector was not big enough, incentives insecure and the amount to be received many times unknown. Hardly conditions an enterprise or a public entity for that matter would long for. The result was obvious, although the most suitable sector in terms of investment and suitability, at least according to the findings of the Bioheat II project (Figure 5), there was the least done.

In years 1998-1999 Styrian Chamber of Agriculture and Austrian Energy Agency (at the time EVA) made a study on biomass heating based on real case studies. One of the results is also the mentioned diagram in Bioheat II project. It shows the specific amount of investment per installed kW for three different groups; households, district heating systems and large buildings. It can be clearly seen that the middle size boilers (150-700 kW) are the most efficient in terms of investment.

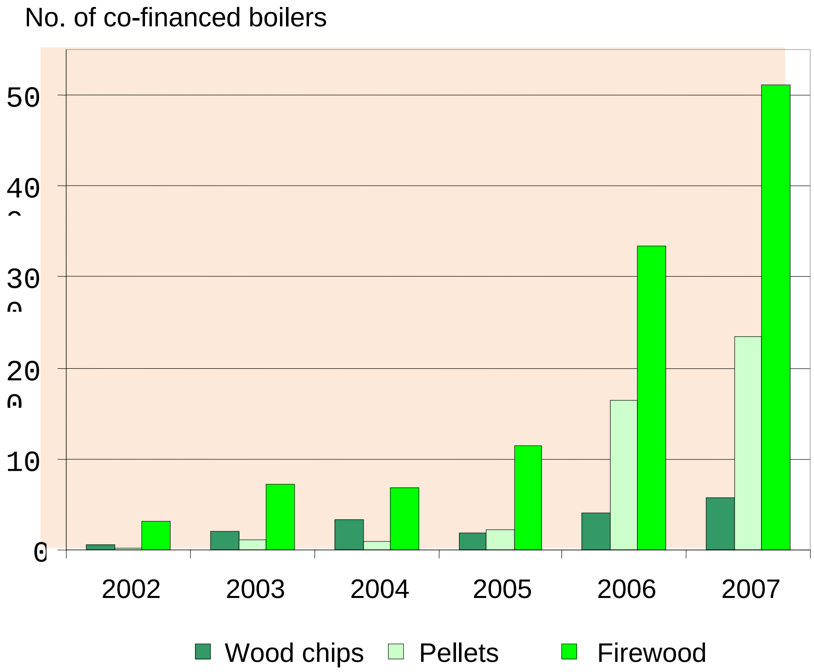

Figure 4. Growth of the subsidised RES-H applications in households in Slovenia
Source: MOP, 2009

We could say support declared and expressed on paper through biomass action plans and National Energy Programme did not receive its materialisation through the actual financial means allocation. Support was based on a yearly budget allocation which was not sufficient and in reality reached only a fraction of what was seen as needed for reaching the set (NEP) goals.

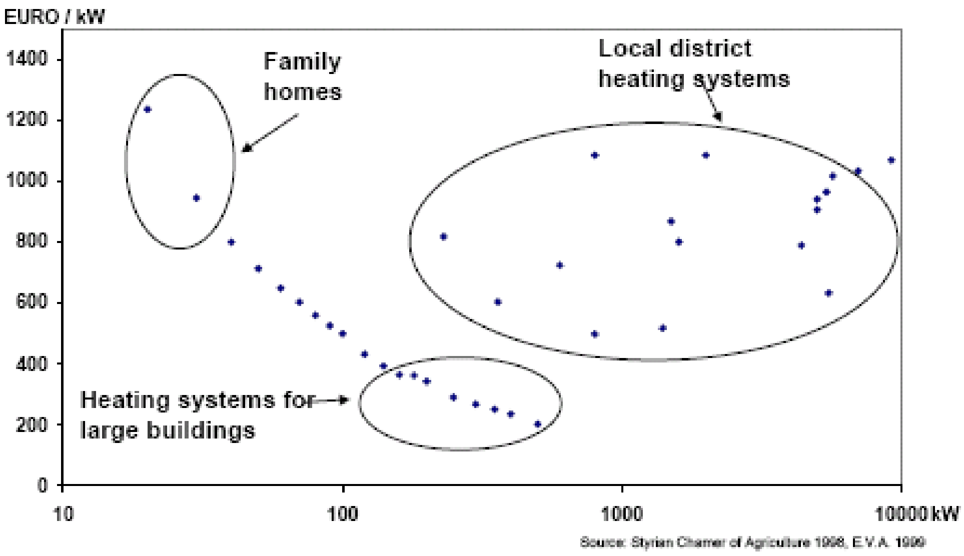

Figure 5. Investment costs for biomass heating systems
Source: EVA, 2003

In the meantime in 2002 Slovenia introduced new supporting system, namely the *Feed–in Tariffs* (FIT) scheme for electricity produced from renewable energy sources or produced with high efficiency (CHP) by the so-called qualified producers. The system needed to be changed in 2008/9 because of the EU state aid regulation. The system proved to be the most efficient support mechanism for renewable energy in Slovenia so far.

The most successful RE sectors seems to be the biogas and PV sector. With photovoltaics it all started with the 1kW (PV plant ApE) in 2001. It was the first grid connected PV plant in Slovenia and served as a pilot for further development. The real development started in 2005 with the new feed-in tariffs in place. (Uradni list, 2004) The FIT system with the so-called qualified (RES) producers of electricity (Uradni list, 2002) was adopted already two years before but the purchase price was set to low in order to really trigger the PV market development. At the end of 2008 there was 2.1 MW of installed PV power. The real intensive growth, however, the market experienced in 2009 with the new FIT system in place (in the meantime it had to be changed in order to comply with the EU state aid regulation) and the second important reason probably is the lower prices of the PV modules on global market. Despite the economic crisis the growth was almost 400% resulting in 230 PV plants installed with 8 MW cumulative power. This shows that there is growing interest of potential investors and under suitable conditions it is also being realised.

The graph below shows the development in the PV sector in Slovenia in terms of cumulative installed power (kW_p). The actual growth is far greater than planned.

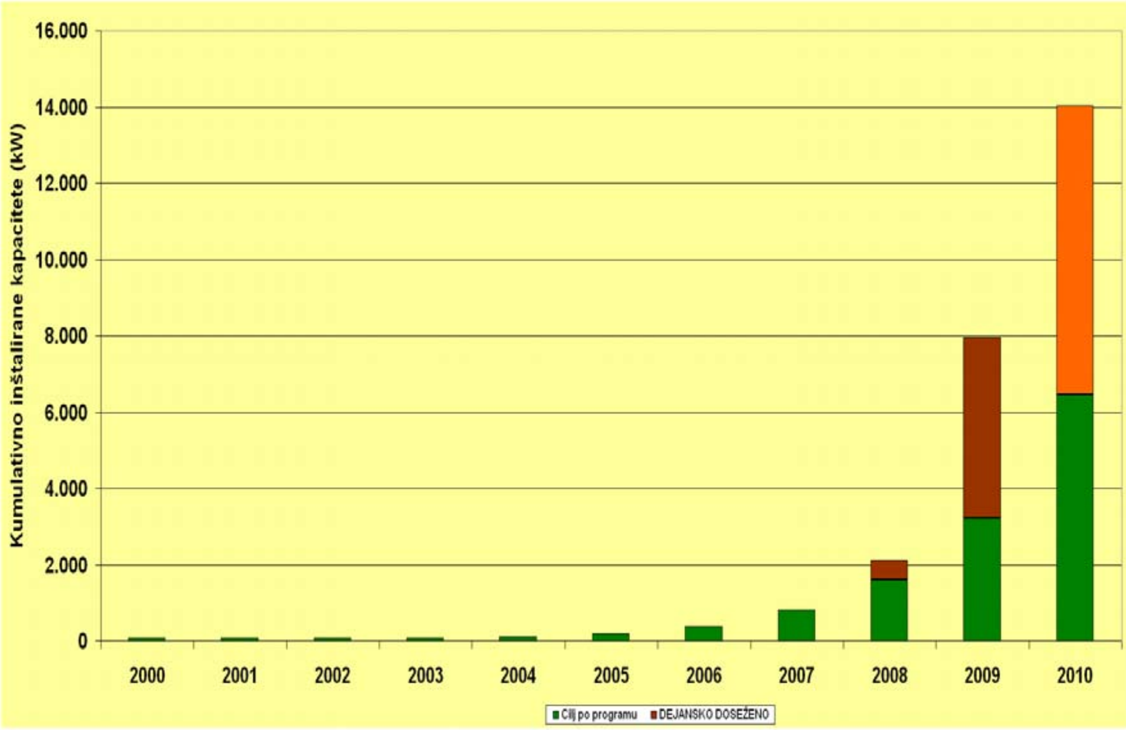

Figure 6. Cumulative installed PV capacities; planned (green), actual (orange)
Source: ApE, 2009

Figures talk eloquently and the question rises all by itself:

Would it make sense to use similar system for RES-H support?

The reasons for such systems have partly already been mentioned above; however there are now others – more binding. In Slovenia we were at 15.5% share of RES in final energy demand in 2006 (Europe's Energy Portal, 2010), which is actually lower than two years before with 16.2%. We can surely say that there is still considerable work to be done to achieve the target of the 25% from national REAP (obligation from the RES Directive).

3 RENEWABLE HEAT SUPPORTING SCHEMES

3.1 Why and how to support RES-H

Globally, heating and cooling account for an estimated 40% of total energy demand (heating far prevailing). In Europe, heating accounts for 48% of total energy demand (EREC, 2006). This is significantly more than in either electricity or transport.

European Union has set very ambitious targets for the growth of renewable energy by 2020. To reach the goal of 20% the current share has to be risen significantly. This means enhanced development and deployment of RES-H/C technologies is needed. Without the adequate political and financial support this is not possible.

The share of heat from renewable energy sources in the total heat demand (cooling included) currently amounts to less than 10% in the EU (CEC, 2007). In Slovenia it is much higher at about 20% in 2008 (EBRS, 2010). However, in order to reach 25% share of the RES in energy final demand a sectoral target of 30.8% RES-H by 2020 was set (MG, 2010).

In 1997 the goal of 12% energy share from RES has been set within the EU-15, implicitly also creating an incentive to increase the share of RES-H in Europe. Biomass seems to be the most prominent RES for heating purposes so far, with the largest share due to heat generation with wood in private households. The implementation of efficient heat and CHP appliances for biomass, as well as solar-thermal and geothermal systems, was rather slow in Europe. As it looks at the moment contributions from the heat sector is very likely not even sufficient to fulfill the 12% goal set for 2010, let alone the later, more ambitious 20% goal.

The graph below also confirms that the development is much slower in RES-H sector than it is in RES-E (confirms also the graph below). The development of renewable energy contribution in sectors of heating, electricity production and transport for the period 1990-2004 is shown.

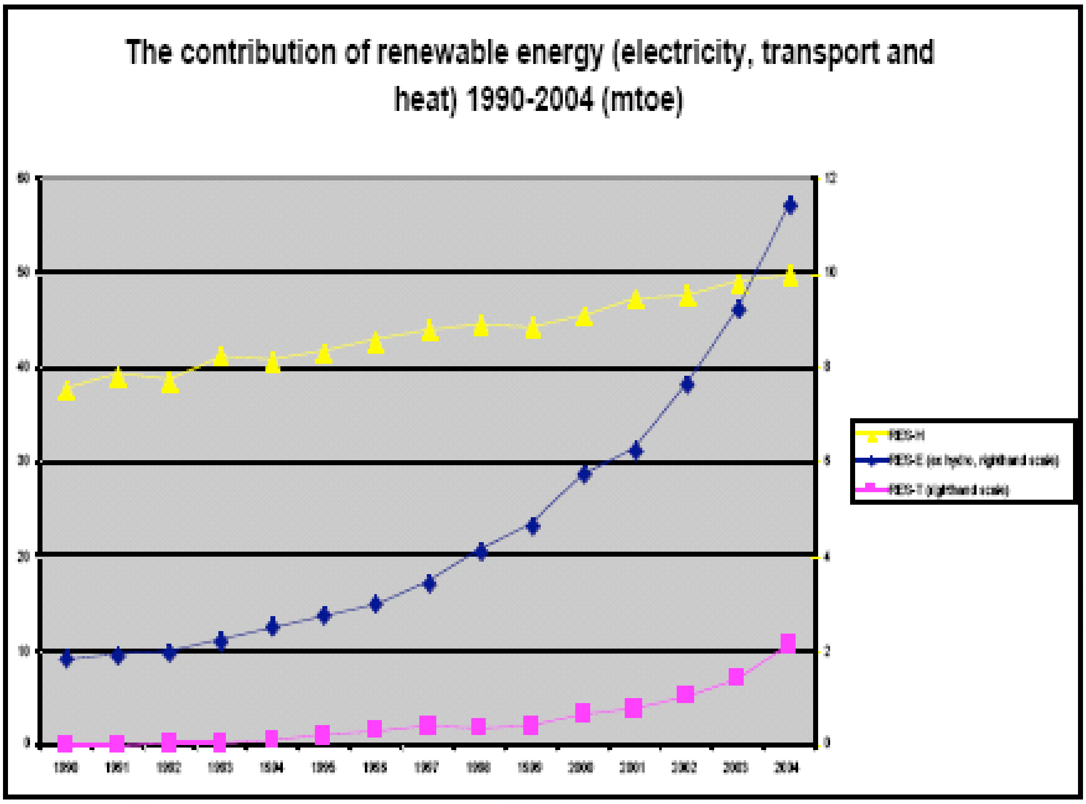

Figure 7. Development of renewable energies since 1990, RES-H yellow line
Source: Summa, 2008

Further more, there seems to be much less experience gained and far less public debate with RES-H in comparison to RES-E and transport sector. (Connor *et. al.*, 2009). In order to improve this situation several EU projects were carried out, for example within the programme Intelligent Energy Europe. I looked at the results of some; among others RES–H Policy, K4RES–H, BAP Driver, etc.

The key lesson learned from their analysis is that financial supporting mechanisms can play a decisive role in promoting RES–H. The needed condition for this is that they are well designed, carefully managed and accompanied by appropriate flanking measures. If this is not the case, their efficiency can be limited and even counterproductive in the medium and long term.

3.1.1 Why flanking measures are needed

In most cases RES-H systems have lower running costs but usually higher investment costs than conventional systems. Due to rising prices of fuels a positive return on investment timeframe is becoming shorter and shorter. Often, it is already well below the average lifetime of the equipment. To motivate a large number of potential users, however, even payback times in the range of five years are often not enough. Therefore, financial incentives alone are not sufficient and they need accompanying measures such as:

- Awareness raising campaigns
- Specific training for key professional groups (installers, engineers, etc)
- Visible demonstration projects of best RES-H technologies
- R&D programs to foster technological development
- Reduction of administrative barriers
- Support for creating, improving and harmonising standards and procedures

By all means a lot of work. So why bother in the first place? Should not be the ‘invisible hand’ that should put things in order anyway? Well, the answer is quite obvious as exactly this ‘magic’ hand put us in the position where we are now and where we try to correct things. Nevertheless, let see what the main reasons for such support are.

3.1.2 Justifications of Financial Incentive Schemes (FIS)

FIS for RES-H are justified by a number of reasons, such as positive externalities of private investments, reduction of CO_2 and other emissions, security of energy supply, local economic development, contribution to the creation of economies of scale and thus to cost reductions in the medium and long term. Below are the main reasons as seen by authors of the report within K4RES-H project. Among others this reflects also the AEBIOM (European Biomass Association) positions, which was one of the project partners and one of the main promoters of bioenergy in Europe.

External utility of the private investment

The financial incentive rewards private investors for the positive externalities they create. External utilities created are society benefits from the reduction of emissions and other external costs linked with the use of fossil fuels or electricity for heating or cooling.

Security of energy supply

Use of RES-H system reduces dependency on imported and scarce energy sources. This means decreasing need for taking public measures such as strategic energy reserves, investment on infrastructure for transport of energy sources and even diplomatic and military costs. By increasing indigenous energy supply, in the long-term a financial incentive for RES-H can be cheaper than alternative measures.

Gaps in market development within the EU

There are big differences in market development of different RES-H technologies among various European countries. Estimation was made that if the whole EU was at the same level per capita as the most advanced countries today, the European market for renewable heating equipment would be more or less ten times the size of today's (K4RES-H, 2007). Even in the countries with the RES-H technology at the forefront, the technical potential for RES-H use is far from being exploited. Therefore it is possible and necessary to correct this unbalance by promoting RES-H markets in the less advanced countries.

Developing economies of scale

FIS help creating economies of scale, thus reducing the price of RES-H energy in the medium term. This holds true not only for manufacturing but also for subsequent steps of the value chain, such as marketing and distribution, system design, installation, customer care, etc, which are usually made at the local level.

Lowering the burden of upfront investment costs

Private investors in RES-H systems are often discouraged by the high upfront investment costs when compared with conventional solutions investments. Reduction of this financial and to a certain extent also psychological burden encourages investments in RES-H. Thus making possible investments, which economically sound from the point of view of society: where the time for return on investment is shorter than the lifetime of the system, which also provides a substantial benefit in form of energy savings.

Creating local jobs

Majority of the RES-H devices installed in Europe are produced within the EU. Furthermore a substantial part of the turnover linked to the installation of a RES-H system is of inherently local nature: design, installation, marketing, distribution as well as education and training. When looking at bioheat fuels, there is a big potential for converting the EU agricultural and forestry sectors to support an extensive growth in the use of bioheat. The benefits for the local and the European economy are therefore created by FIS for RES-H. What is more, the need for imported fossil fuels and uranium is decreased at the same time.

Psychological effect: positive message from the public authorities

Giving a financial incentive by public authority means a positive signal for the citizens, thus building market confidence in both the technology and the installers supported by the FIS.

A marketing tool

FIS can help with marketing RES-H systems. FIS alone are not enough though and should be accompanied by a public awareness raising campaign. At the same time, private market actors will communicate the FIS to their customers. Even in cases when financial incentive is not particularly high, its existence nevertheless motivates the general public because of the sort of "should-not-be-missed-discount" feeling that creates.

Economic aspect

Economic performance of RES-H systems is quickly improving due to oil, gas and electricity prices increasing, and this reflects also in their market growth. However, because of the low starting level of market penetration and the non-financial barriers, it may take a very long time before the potential for RES-H use is exploited, unless promotion policies are used.

The main common point of all RES-H technologies is that they have higher upfront investment costs but lower running costs, compared with conventional heating systems. This high share of upfront investment costs is a major barrier to growth and the main justification for the need of Financial Incentive Schemes.

There is of course one other reason, maybe the most important one, to subsidise RES-H and RES in general; namely the

Fair competition with the fossil fuels

As far as it may seem unbelievable we still support (subsidize) fossil fuels in far greater extent than we do renewable energy, even so in Europe.

Dr. Dörte Fouquet from Kuhbier sprl. in her presentation "*Harmful subsidies in the energy sector*" used this citation: "*UNEP, the World Bank and the International Energy Agency put global annual subsidies for fossil fuels in the range of US$100-200 billion, representing "a substantial market distortion, discourage new entrants into the market, and undermine the pursuit of energy efficiency*" and this one: "*More than half of the subsidies (in real terms) ever lavished on energy by OECD governments have gone to the nuclear industry.*" Very illustrative are also these sentences from the same presentation: "*The European Commission acknowledges that funding for renewables and energy efficiency dropped from an average of 138 million EUR per year in Research programme FP-5 (1999-2002) to 108 million EUR1 per year so far in FP-6 (2003-2006)". _* "*In comparison, the European Commission increases the nuclear research budget under the Euratom R&D framework programme from 1352 million EUR in the period 2002-2006, to 3103 EUR million in the period 2007-2011.*" (Fouquet, 2010) The graph below shows the development.

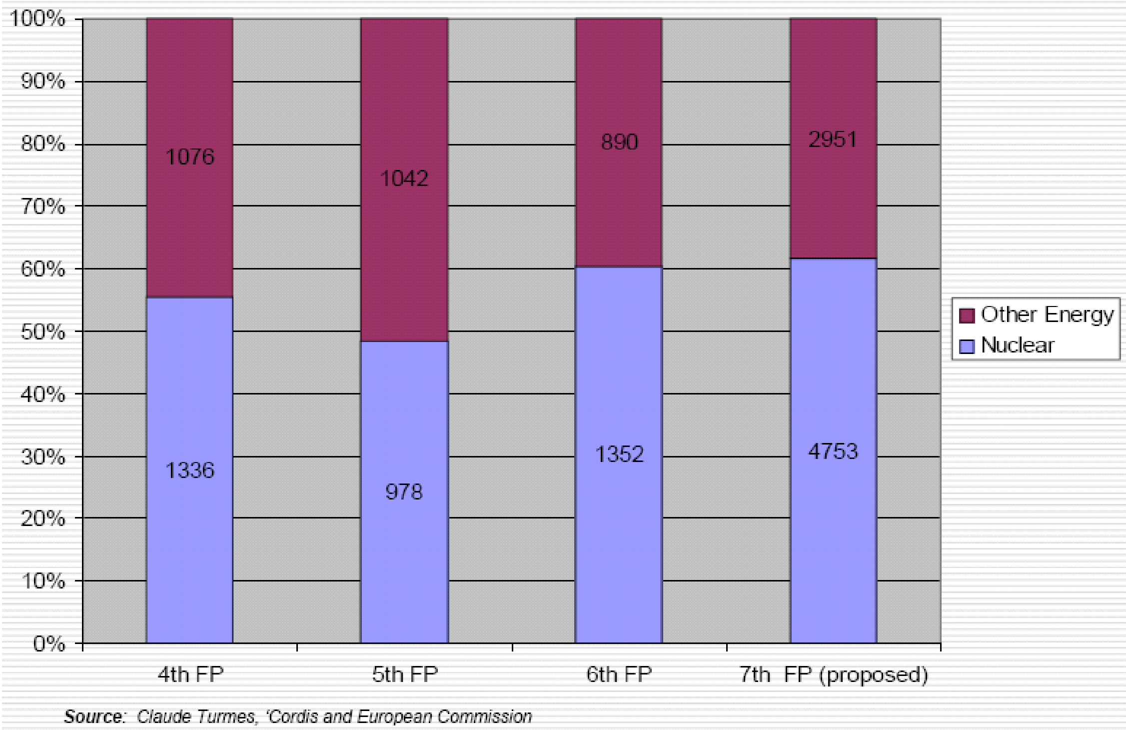

Figure 8. Comparison of Energy and Nuclear Research and Development Budgets
Source: Fouquet, 2007

Nevertheless, it is worth mentioning that there are millions of buildings in Europe, where a RES-H system has a positive return on investment with the current prices of conventional heating. However, the experience shows that even in case of payback times in the range of five years, many potential investments do not materialise. There are many reasons why this is so. Perhaps the most important are: the difficulty of changing traditional technology patterns in the building sector, lack of awareness, the short windows of opportunity and the fact that the many private actors pretend a very short return on investment.

We can say that there are more than enough reasons to use financial incentives for support of the RES-H. The question is how to do it in order to achieve the best results. So let us look at the best principles for successful FIS.

3.1.3 Principles of the best practice Financial Incentives Schemes

Experience gained so far show that most people tend to assume stable energy prices when deciding on new heating system. Calculating the needed amount of support for making investment profitable is therefore the logical consequence and usually the main way of designing FIS, however, it is not enough. These are the main reasons why:

- The cost of fossil fuels used for conventional heating, for the next decade or two represents the main variable in the equation and is unknown.
- There is a tendency to discount future running costs in comparison with immediate investment costs by many potential investors, even more so for households.
- There are other barriers rather than financial alone (as seen above).

Financial incentives schemes for RES-H should be therefore designed based on the market development targets. The goal should be to achieve the critical mass of the market level that allows for self-sustained further market development. The example is Greece with subsidies and investment-based tax measures for solar thermal collectors in the 1980-90s. (K4RES-H, 2007). Greece is one of the most successful countries in the use of solar thermal energy in the world. For many years, the number of installed solar collectors per capita has been the highest in Europe. The solar thermal market started in 1980s when, almost all Greek households were using electric heaters. The main solar thermal technology type used then as well as today is the simple thermosiphonic water heater. For a decade, between years 1993 and 2004, the domestic market experienced between 150.000–200.000 m^2 of collectors installed annually, depending on the new building production, electricity prices, incentives etc. It has to be noted, however, that a considerable contribution to the development gave high prices of electricity at the time.

Several other recommendations for best practice to promote RES-H were gathered within the K4RES-H project by conducting specific studies on solar thermal, bioheat and geothermal heat. Principles followed were *continuity, coherence, clear targets, simplicity, open markets* and *fair amounts*.

The conclusion was that the most important aspect of the well designed and managed FIS for RES-H was **continuity**.

According to these findings FIS should be planned to last for several years, with conditions as *stable as possible*. Abrupt interruptions and reintroductions of the incentive should be avoided. Nevertheless, as the market growths the adaptation of the conditions to the new reality is necessary. These changes should, however, be discussed with market experts and introduced in such a way that minimise any negative implications for the market itself.

Experiences from many countries have shown that discontinuous financial incentives can create a stop-and-go effect on the market, which is harmful for its healthy development. On the demand side it contributes to postponing of purchase decisions and short period of boosting demand but the supply side is discouraged to invest in long terms. This of course does not mean that any change of FIS should not occur during its duration, some adaptation to the market conditions might be necessary. However, all actors involved should be given the possibility to plan their investments.

Budget limitations have been the main reason for discontinuity in financial incentives for RES-H in the past. It is important to foresee ways of funding for several years and at the same time taking into account the possible (and probable) increase in the number of applicants as a consequence.

In *Slovenia* we surely experienced such problems. Namely, the RES-H support system was primarily based on open calls for government grants and hence dependent on the yearly budget adoption and the funds allocated within the budget. Sometimes state budget was delayed and confirmed only in April, which further meant the call was opened even months later. What is more, the time for applications was limited to couple a months (because of financial year closing), during the summer break, and this excluded large systems that usually have a longer planning time. In this case, there was hardly any application and the budget of the financial incentives remained unspent. Needles to say the signal given to potential investors in industry as well in the public sector was very negative. This of course does not make the grants system inappropriate in general; it just shows its weakness and the need for different way of funding it. One of the possible ways could be also the above mentioned special-purpose gathered money from obligation deriving energy savings decree.

Coherence

When designing a FIS for RES-H a number of parameters such as eligibility of the subjects, applications and technologies, minimum technical parameters demanded and, of course, the amounts offered should be defined. All these parameters should be carefully tuned one with the other and coherent with the aims of the FIS. Sine qua non for this is a close *collaboration* of the public authorities with industry associations and market experts. If this is not the case the complete failure of the FIS is possible.

Simplicity

The procedures should be as simple as possible, both for the applicants and for the public administration. In the ideal case, the user should deal with only one application, opening the door to any financial incentive available.

Again, a topic that could be handled much better in Slovenia, where procedures tend to be long and complicated. User friendliness is not exactly the term one would use in this relation.

Open markets

European standards and certification procedures should be considered when applying technical parameters in relation to the eligibility for FIS. If this is not the case, the result could be the "isolated markets" at the national level. The consequence could be increased costs for the users.

Fair amounts of incentive

Incentive should not be too high nor too low. It should be designed on a basis of the target set and with respect to the market conditions that imply the needed FIS intervention. The main driver for investing in RES-H should remain the reduced use of fossil fuels. Important and not to be neglected aspect are also the non-economic barriers in terms of general acceptance of the incentives and the willingness to pay for them. In case incentives are set too high and a windfall profits can be made then this is not (and rightly so) very well seen among tax payers. For this reason and with technology learning curve as well as scale of economy bringing the costs down, also incentives should follow the same dynamic. In case of FIT scheme for green electricity a digressing factor is used for this purpose. However, if the incentive is set too low, the transaction costs (application, procedures, etc) for the beneficiary may be higher than the benefit itself. For the public authorities, on the other hand, the risk might be higher than the value of the awarded incentive and result less than desired market growth.

The amount of the subsidy should correspond to the amount of renewable energy delivered. Again, the costs should not overgrow the benefits. For example the requirements on measurement of renewable heating should be related to their costs and benefits. Exact measuring of energy in the heating sector is not usual as it is in the electricity sector. In the case of large heating systems the FIS can be based on the measured amounts if justified. For small systems, however, exact measurement is not a standard feature of RES-H systems because its costs are higher than the technical benefit. From a technical point of view, a function control is in many cases more appropriate. In this case it is recommended to link the financial incentive with the calculated energy output based on the installed capacity.

Important aspect that needs to be taken into account when designing the incentives is also the base upon they are given. It is not the same if the incentive is given according to the installed power, as it is normally the case with the grants system, or by energy delivered as with feed-in case. For example, when grants are given according to the size of the plant, this tends to be bigger than actually needed. This effect was noticeable also in Slovenia with subsidies for biomass district heating. On the other hand if someone gets paid for the energy delivered (FIT and Bonus model) it is logically he/she tends to deliver a little more.

Therefore these issues have to be addressed in advance. Possible options are of course different and depend on the type of the incentive and technology supported.

For instance there is an eligibility limit in terms of energy efficiency of the building (age of construction) for getting the grants for RES-H systems in current (2009-2011) open calls of Ministry of Economy. There are size classes in FIT scheme. There could be metering obligation used with the Bonus model for larger buildings or alternatively calculation of the justified heat consumption based on current standards (new energy building regulation) and the bonus set upon that figure and not actual consumption if excessive (as it s the case with RHI for smaller households), etc.

It is recommended to link the amount of the incentive to the assumed or measured amount of renewable energy provided by the system. However, the requirements on measurement of renewable heating or cooling should relate to their costs and benefits. For the time being, and with the contrast to the electricity sector, measuring of energy is not usual in the heating sector. Therefore, for small systems, exact measurements are not justified because their costs are higher than the technical benefit. From a technical point of view, a function control is in often more appropriate choice.

These are the first parameters one may think of when discussing FIS parameters. Experience from various countries so far shows us that continuity is being the decisive one. There are of course other important aspects. Who and how should pay for the RES-H support for example? Here we could learn from renewable electricity.

Polluter Pays Principle

In principle, the best solution for the financing of FIS would be use of revenues coming from the non- renewable heat consumers instead from the public budget. This is quite common solution in the renewable electricity (RES-E) sector. Several countries, including Slovenia, finance their feed-in tariffs through a small fee paid by the final electricity users. This is in line with the polluter pays principle and allows for a substantial promotion of the renewables without consequences for the public budget and has a very low impact on the overall electricity costs.

In the renewable heating sector, the revenues could come from the wholesalers of the heating fuels. The wholesalers could be obliged by law to transfer the necessary amounts to an agency that distributes the incentive to the owners or operators of RES-H systems, following the principles of best practice described above. Such "*Bonus System*" is already introduced in UK, starting in April 2011.

This is actually the mentioned mechanism now in place in Slovenia and it could be used for financing the RES-H tariffs.

Another option represent the *tradable certificates*: the providers of fossil fuels and/or electricity are obliged to surrender a politically determined quota of tradable certificates, which are awarded to the operators of RES-H systems. Their expected advantage would be the market finding the cheapest ways to reach the desired quota of RES-H energy. In reality such systems bring uncertainty about the effective incentive to be earned in the future due to the possible substantial fluctuate of certificates prices. Furthermore, such systems are complex and cause significant transaction costs, particularly in the case of RES-H where the beneficiaries of the certificates should be a very large number of building owners. When taking into consideration the frequent problems which have occurred in tradable certificate schemes in other sectors, such a system can not be recommended for renewable heating.

The polluter pays principle can be achieved also by *direct taxation* of non renewable energy consumption for heating. By increasing the costs of conventional heating, the competitiveness of RES-H is improved. For the users direct comparison of the fuel costs is the most evident feature. In some Scandinavian countries this has been sufficient to stimulate the growth of biomass heating. It has to be noted, however, that general energy taxation does not directly effects the non-financial barriers. In order to promote RES-H it is therefore recommended to use direct FIS even with direct taxation on non-renewable heating in place.

We have made an overlook of what should be the best principles of financial incentives for renewable heat according to the experts. Let us now look at the situation in reality, comparing the European experience with the domestic ones.

3.2 Kinds of incentives currently in place and Slovenian relevance

During the last decade, the political and academic debate about the policies to promote renewable electricity has been very much focused on the choice of the instrument, for instance feed-in tariffs vs. quotas with tendering.

The main financial incentive types for RES-H used in Europe are:

- Direct grants
- Loans at privileged rates
- Tax breaks (direct and indirect taxes)
- Incentive linked to housing subsidies

In Slovenia we mainly use the first two options.

3.2.1 Direct grants

This the most widespread kind of incentive used in Europe until now . Some of the countries that use this kind of support policies are Austria, Belgium, Czech Republic, Denmark, France, Finland, Germany, Greece, Poland, Portugal, Slovenia, Slovakia, Spain, Sweden etc. Some of them were very successful, others were a complete failure. One of the positive aspects of the system is the positive psychological effect on the investors, particularly households. Receiving a certain amount of money from the public authority makes for a very tangible incentive.

Direct grants can be awarded to any kind of potential user of RES-H systems, including those who are unable or unwilling to benefit from tax breaks or privileged loans. The negative side is the high administration costs, both for the public authority and for the beneficiaries, which are higher than in the case of tax breaks. The most problematic, however is their dependence on the state budget allocations. Direct grants are usually most exposed to interruptions or shortenings due to the lack of available funds to cover the grant which results in undesired stop-and-go effect. In Slovenia, for example, in case of subsidies for companies this resulted in completely unreliable scheme and hence ineffective support.

3.2.2 Tax reductions (direct taxes)

Tax breaks schemes can be very successful, as it shows the case of France in 2005, and their main advantage is the low cost of administration. (K4RES-H, 2006). There is also a downside however; such scheme excludes all those that do not have to pay this tax. Furthermore, it is socially unequal, as it privileges high-income households. Tax breaks schemes are less exposed to the instability related to the availability of public budget. After in place, the incentive remains at least for one fiscal year.

3.2.3 Tax reductions (indirect taxes)

This can be a powerful way of supporting RES-H. Namely, the majority of the potential investors are private persons who cannot recharge VAT to others. Several EU countries apply a reduced VAT rate on electricity and/or gas consumption, but the full rate on investments in RES-H systems or energy efficiency measures. The same is true with Slovenia. In practice, this means an incentive to increase energy consumption, rather then decreasing it. It seems it would be good to make an amendment to the relevant EC Directive (388/77) that regulates VAT in the EU market in order to allow for reduced rate for RES-H and energy efficiency.

3.2.4 Soft loans

The so-called soft loans are in principle a good way of supporting investments in renewable energy systems. Somewhat to the contrary of the rest of EU is quite common in Slovenia and managed by the Slovenian Eco Fund. The problem is however in the “soft” part. Many investors have reported it is not that good as it sounds and that they opted for commercial loans instead. For the time being private households purchased the most RES-H systems sold in Europe (and Slovenia). Again, to the contrast with the EU it is quite common to take loans for them.

3.2.5 Incentives linked to housing subsidies or regulations

Some countries or regions, offer investment grants for the construction of new or retrofitting of residential buildings. For example, some Austrian regions provide incentives for energy efficiency and renewable heating measures. Also in Slovenia there are incentives (soft loans and grants) for energy efficiency measures, mainly for households. Experience show that such schemes are contributing to the very high market penetration of the RES-H systems.

In the following chapter this actual mechanism is analysed in a more theoretical way and we should get the answer where our proposed bonus model fits. If this theoretical consideration shows good results its implications in the real case studies it is going to be checked later.

3.3 International RES-H support mechanism – possible options

European experience with support schemes in the heat market shows that only very few non-budgetary instruments have been implemented so far. The majority of them being use obligations. Current measures in the EU for promoting RES-H production concentrate on three classes of budget financed instruments such as investment incentives, tax measures (investment- and fuel-based), and soft loans. Although in some countries considerable successes were achieved using such mechanisms (e.g. Austria and Germany in biomass heating and Greece in solar-thermal), still much more has to done in order to achieve the set 20/20/20 target. This calls for some new ways of supporting mechanisms.

What are the possibilities? Let see the options first. For start let look at the more developed RES-E sector support mechanisms.

3.3.1 Overview of the RES-E policy instruments

If we would to use the experience made in this sector and try to make a more comprehensive overview in one picture then we could make use of classification used in the paper that evaluates *policy strategies for promotion of electricity from RES* (Held *et. al.* 2001). It is shown in the table 1.

Table 1. Policy mechanisms for RES- E support

Source: Held *et. al.* 2001

		Direct		**Indirect**
		Price-driven	**Quantity-driven**	
Regulatory	Investment focussed	• Investment incentives	• Tendering system	• Environmental taxes
		• Tax incentives		
	Generation based	• Feed-in tariffs	• Tendering system • Quota obligation based on TGCs	
		• Rate-based incentives		
Voluntary	Investment focussed	• Shareholder programmes		• Voluntary agreements
		• Contribution programmes		
	Generation based	• Green tariffs		

The first distinction, that is apparent here, is the separation between direct and indirect policy instruments. Meaning, the former aim at the immediate stimulation of the RES-E, whereas the latter focus more on long term perspectives. The next division, that is immediately clear, is the regulatory and voluntary approach. And finally, there is a distinction between policy instruments that address price or quantity, and whether they are designed to support investment or generation.

3.3.2 Overview of the RES-H policy instruments

Authors of the article "*Policies to support renewable energies in the heat market"* (Bürger *et al*, 2008) argue that current measures in EU for promoting RES-H offered only limited incentives for dynamic, lasting growth. There was also no standard procedure for the systematisation and classification of political instruments in environmental economics. Bürger and colleagues suggest division by similarity from a legal point of view into four categories:

- Fiscal instruments
- Purchase, sale, and remuneration obligation
- Use obligations
- Other regulatory approaches

The first three are the main categories of the promotion instruments used and we shall limit ourselves to them here further.

3.3.3 Fiscal instruments

The present use of renewable energy is often still more expensive than the use of the fossil fuels. These additional costs have to be taken into account. This fact can be effectively addressed using fiscal instruments. One option is to make fossil fuels more expensive for the consumer and the other is reducing the price of renewable energy. In principle there are four types of measures available:

- New and/or increased taxes on fossil fuels
- Government grants for renewable energy
- Tax breaks for renewable energy systems (exemption from VAT, improved depreciation opportunities, etc.)
- New revenues raising to promote renewable energy (more options).

3.3.4 Purchase, sale, and remuneration obligations

This category includes models which aim is to achieve economic leverage effects without the use of a public agency. They can be described as quota or as price regulations. In practice, these means obligations for traders to purchase or sell specific amounts of renewable energy (*Quota Model*), or entitlements for the producers of heat from renewable energy to receive additional remuneration for RES-H used by other economic operators (*Bonus Model*).

3.3.5 The Tariffs or Bonus Model

The model represents a rather new approach of support to RES-H. It can be seen as a purchase/remuneration obligation with fixed reimbursement rates. The model is very similar to the well-known feed-in tariff scheme of the RES-E sector. Operators of renewable energy systems receive a fixed price per kWh (bonus) of heat produced. As with the FIT for RES-E the bonus level is set by the government and bonus payments depend on the technologies used. The bonus level can be easily adapted and periodically adjusted to the specific needs of the various RES-H technologies.

There is one big difference between the two; namely the relationship between the operators of RES-H installations eligible to receive a bonus and the obliged party to pay the bonuses in the case of the heating sector is very much different to that in the electricity sector. The prevalent production of heat is happening in the individual houses and there is no wide distribution network available. This means there could be a very large number of potential beneficiaries and as a consequence an equivalent number of transactions needed. Bürger and co-authors therefore suggest the introduction of the intermediate, pooling organisations, called “transactors”. Their role would be to aggregate the interests and bonus claims of the beneficiaries.

Bonus payments for small beneficiaries (the big majority) could be simplified by aggregating them over several years so that they would receive funding for RES-H generation by only a few (e.g. two) payments. On the other hand, larger RES-H producers would be subjected to a more stringent monitoring and should provide evidence of the amount of renewable heat produced.

The bonus payments are claimed from the producers and importers of (fossil) heating fuels and not from the authorities as it is the case with government grants systems. We can assume that the fossil fuel traders will pass the additional costs on to consumers, this would mean that the scheme is ultimately funded by fuel consumers but not however by tax-payers, as before and therefore comply to a greater extent with the ‘‘*polluter-pays*’’ principle in comparison to a support system based on state budget and tax money.

Positive aspects of the model

One is already mentioned, flexibility of the scheme in the sense that it allows for easily adaptation and periodically adjustment to the specific needs of the various RES-H technologies. The main advantage would be its efficiency and effectiveness if looking to the success of the feed-in tariffs in RES-E sector. What is more, tariffs incentives can be applied where the RES-H applications are most profitable (in contrast with the use obligation). For example solar thermal appliances, and finally, it may stimulate new industry opportunities. (Connor, 2009)

Here is how its advantages were seen by the company Ernst&Young (2007), when preparing an analysis for the Department for Environment, Food and Rural Affairs and the Department for Business, Enterprise and Regulatory Reform, UK. (DEFRA/BERR), *quote*:

- A relatively simple, secure, long term and guaranteed revenue stream, which links benefit directly to output and production.
- Feed-in tariffs can provide more stable revenue streams for application than a market-based mechanism such as RHO (FITs remove revenue risk), which should aid the bankability of projects.
- The tariff could be fixed according to the relative economics of technologies or flexed according to movements in heat prices, to provide a quasi-feed-in tariff, as overall revenue is fixed.
- Feed-in rates may be reduced over time as technology costs come down.
- Tariff-based supply mechanisms are likely to be compatible with existing grant support an tax incentive mechanisms. *End of quote*.

Negative sides of the model

The first negative aspect could be that if the scheme is open to more or less all, this would make for unknown, potentially very high number of beneficiaries and hence would call for the financial funding that is also unknown (as it is the case with the RHI from UK) but could be substantional. If we now propose the cap on the eligible volume, this creates uncertainty and instability in the market. (Connor, 2009) Another difficulty that the bonus presents through the potentially large number of beneficiaries is the need for intermediate body between beneficiaries and the paying party. This of course means higher transaction costs.

Ernst&Young (2007) have seen the following disadvantages of the model, *quote*:

- A departure from the main principles underpinning the liberised energy market.
- Long-term funding will need to be provided by government to fuel suppliers.
- Paying the tariff to the heat users to incentivise their own installations may be complex. Therefore, this mechanism is likely to be suited to large installations and stand alone projects only.
- A wide and potentially complex set of tariffs will be required to meet the wide range of applications.
- The same metering issue as the RHO mechanism, as the support is based on output.
- Fails to provide up front funding to overcome higher capital cost, particularly for small installations. *End of quote*.

And finally, because it means a new approach in supporting RES-H it is likely to run across the problems with acceptance, which calls for greater promotional efforts and again contributes to higher transaction costs. The below presented Polish case, and of course the RHI from the UK, show us that this may not necessarily be so, at least not on the principle level.

First example

As already mentioned the first system of bonus model for RES-H in place is the UK example of Renewable Heat Incentive scheme (RHI), which should be introduced in June 2011. More about RHI it can be seen at the end of this chapter.

Polish considerations

Within the project RES-H Policy the Polish partner KAPE made a survey among stakeholders on the suitable RES-H support mechanism. The bonus model got the best scoring. The below graphs are showing the results of the two questions from the survey "Stakeholders consultations on qualitative assessment of selected support options".

The first question was on sufficiency of the existing support mechanisms for achieving the RES-H/C targets according the Polish REAP. The answer was unanimous 100% no.

The second question was: "Do you think one of the proposed support instruments or a concise combination of them would be capable to achieve the RES-H/C targets that has been or will been established in the context of the Directive 2009/28/EC? The table and figure below show the results.

Table 2. Proposed policy mechanisms for RES-H support evaluation

Source: KAPE, 2010

	Fiscal instruments	Use obligations	Bonus or tariff models
City Hall of Nowy Sacz	✖	✖	✖
The Ministry of Environment	✖	✖	✖
The Energy Management Agency			✖
The Heating Industry Chamber of Commerce	✖		✖
The Industrial Development Agency			
The Polish Solar Energy Society	✖	✖	✖
The Polish Economic Chamber of Renewable Energy			✖
The Warsaw University of Technology	✖	✖	
The Warsaw University of Technology	✖		✖
City Hall of Mlawie	✖	✖	✖

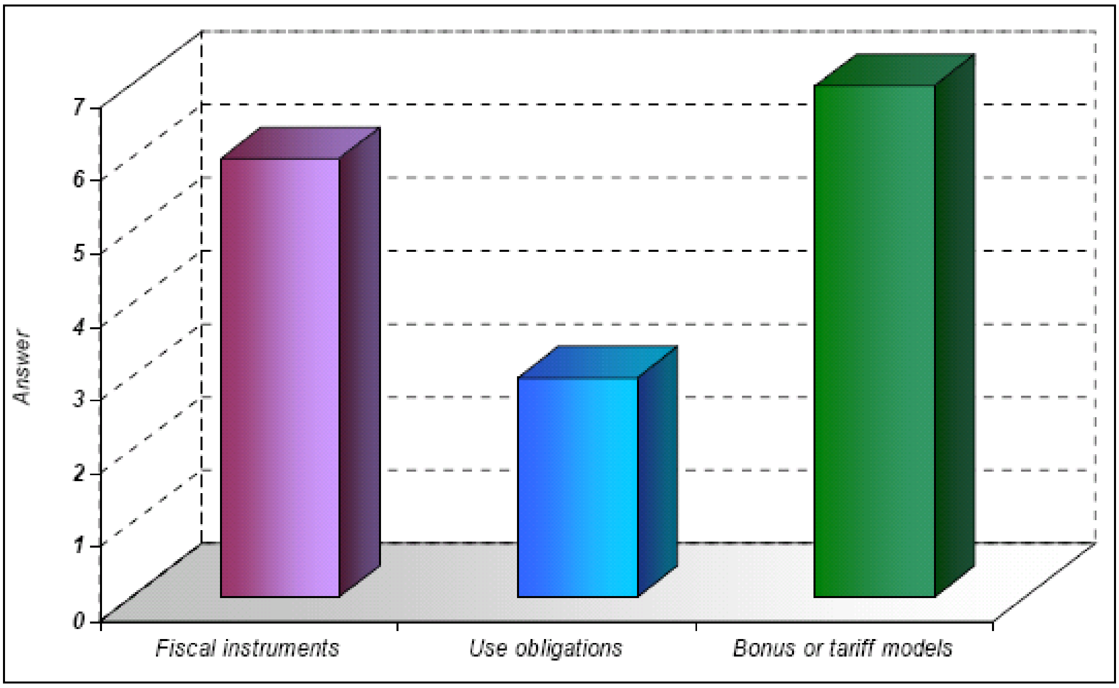

Figure 9. Scoring of the proposed mechanisms for RES-H support in Poland

Source: KAPE, 2010

3.3.6 Use obligations

The first country in EU to introduce any sort of use obligation of the renewable energy systems was Spain for the solar thermal installations. In the meantime we have the system in place also in Slovenia. It was introduced trough the new building regulation – PURES (see page 12). Basically it demands for 25% coverage of the energy needs of a building through the use of renewable energy for new buildings or major renovations.

The negative aspect of the model could be that some building owners would want to postpone exchanging their heating systems or renovate the building in order to avoid having to install a renewable energy heating system. A possible solution could be to define a time period after which every building must meet the use obligation (e.g. by 2025), regardless of whether or not the heating system has been replaced by then. Another problem could arise from applying the obligation to all building owners at the same time. This could lead to problems with the RES heating systems supply. Some sort of progressive system should be therefore considered.

There are of course more variants of the model. Some of them are also allowing for the compensation levy instead of executing RES appliances. Bürger with co-authors suggests that building owners should be able to choose whether they want to meet their obligation directly by RES installation, or contribute indirectly to achieving the target goals through a substitute levy.

3.3.7 Juristic and economic criteria for the selection suitable instrument

In order to choose the best suitable option we need to check also some other criteria, juristic and economic for example. It goes without saying that all proposed actions should comply with national and EU laws. E.g. Community guidelines on state aid for environmental protection (2001) should be respected. A new FIT scheme for RES–E was made in 2009 for this reason in Slovenia for example.

Economic criteria

An instrument to support RES-H must lead to the achieving of the goals set for expanding renewable heat use in practice. The goals should be achieved at minimum costs (Haas *et. al*., 2010); however. This should hold true for both, cost in form of direct financial expenditures or the accompanying administration costs. Windfall profits should be avoided as much as possible. There is also an additional group of potential costs. Namely if the instrument is not well accepted within interest groups or the general public this will likely cause additional costs such as lawsuits, etc. Furthermore, if the administrative implementation of an instrument is too complex, this means also higher transaction costs.

Further criteria

Instruments for the (RES) heat market should be designed with longer perspective in mind as short term instruments tend to produce scarce results. Furthermore development of new technologies has to be tackled. These technologies as not mature yet are often also not yet economic. Support instruments that lead to a market behaviour that tends to align short-term demand with investment return are very much blind to such long-term requirements. Bürger talks about the need for "learning investments" and the necessity for shifting promotion instruments in the RES-H sector from the tax revenue sources, which would reach its limits, to the budget independent forms of financing.

3.3.8 Comparison of the Bonus model with Grant and Obligation model

Bürger *et al.* (2008) now select the most promising variants from each category mentioned above and compare one with the other.

The classic and most usual government grants look like the most suitable among the financial instruments despite the fact they depend on a budget allocation. On the other hand tax breaks offer almost no advantage in comparison but they do have some negative sides, social partiality for one. Additional taxing of the fossil fuels should be very high if to make a significant impact. This would certainly cause problems with public acceptance.

In the second category the most promising seems to be "our" Bonus model. Competing mainly with the Quota system it does not have very difficult task. Also the European experiences with it in RES-E sector are not very encouraging.

For the use obligations the best seems to be the model that allows for payment of a substitution levy instead of investing in the new RES-H plant.

Valuation of main instruments

Valuation of the three models consists of the qualitative and the quantitative economic assessment Bürger *et al.* (2008). For the latter the Invert Simulation Tool was used.

a) Qualitative assessment

Qualitative economic comparison is shown in the table below. It can be clearly seen that the government grants are better form of RES-H support than the use obligation and the Bonus model to Grants model. Here it has to be said, that the performance of the latter two is much similar when compared to the use obligation.

Government grants are popular at the recipients and politicians are familiar with this type of support. Transaction costs are particularly low for this model.

This holds true also for Slovenia with exception perhaps of the companies that either want to invest or to sell RES-H equipment, because of the stop-and-go effect. Also Bürger *et. al.* (2008) confirm it would be rather difficult to provide stable subsidy conditions and that is the main negative feature of the instrument.

Table 3. Instruments comparison

Source: Bürger *et al.* (2008)

	Government grants	Bonus Model	Use obligation with substitute levy
Cost efficiency and transaction costs			
Establish stable and reliable investment conditions		+	+
Medium-term efficiency	+	+	o
Long-term efficiency	+	++	o
Avoid windfall profits	o	+	+
Transaction costs, total	++	+	o
Transaction costs, regulatory	+	+	o
Incentive for efficient system operation		+*	
Acceptance			
Degree of change/communication	++		+
Politics	+/o		o
Citizens	++	+	o
RES trade associations		+	o
Fuel associations	o		
Other			
Promotion of technology development	+	+	
"Polluter-pays" principle		++	+
Distribution and social justness	+	+	
Contra-productive secondary effects	+	+	

* Here an observation is needed; namely Bürger *et al.* (2008) see the bonus model as a positive incentive for the energy efficiency issue. This might not be the case and there are argument saying the exact opposite. In fact one of the arguments against the Bonus Model from the made interviews (see chapter 5.1) was exactly that.

Bonus model strong side is the possibility of precise targeting as with the Grants model, but without the downside of budget dependency. Moreover the model is compliant with the polluter pays principle. Its probable disadvantage lays in acceptance, because of something new. Furthermore resistance from the fuel suppliers can be expected as it is the case of the power companies with the Feed-in scheme for RES-E.

b) Quantitative assessment

The designed 2020 quantitative target for all three models were set equal. The model (Invert Simulation Tool) used uses a bottom-up approach and its algorithm is based on the modelling of the decision-making process of various stakeholders regarding a certain heating/cooling system option and the energy efficiency measures. One of its important features is the possibility of implementing different restrictions, such as technological, economic, or cultural parameters like comfort aspects of energy systems. One very interesting option that can be implemented in the Invert model is also the so called willingness to pay of private consumers, which has been observed in the past for many renewable heating technologies.

The results of the quantitative comparison of the three models based on the conditions in Germany are shown in Table 3.

The same share of renewable energy in the heat market of 12.3% or 570 PJ in 2020 stands for all the three models. The most important categories in this table demonstrate the advantages of investment grants or a Bonus Model over a use obligation:

The number of systems that must be installed by 2020 in order to reach the goal is significantly larger in the use obligation model than for the other two models. The other two models also feed more renewable energy into heat networks, which is a structural advantage over the use obligation.

For investment grants and the Bonus Model, the total investment cost (including heat networks) is lower than in the use obligation model. The origin for this difference lies in the construction of cost-efficient large systems, which can be specificaly targeted by investment grants or through the design possibilities in the Bonus Model. The lower total investment costs indicate an overall better economic efficiency of these two models.

The overall transaction costs are low for all models. However, here the investment grants and the Bonus Model both indicate advantages, especially in the costs for the authorities.

Table 4. Quantitative comparison of the instruments for the example of Germany
Source: Bürger *et al*., 2008

	Government grants	Bonus Model	Use obligation with substitute levy
Heat production from renewable energy in 2020	570 PJ	570 PJ	570 PJ
Proportion derived from local district heating	48%	48%	31%
Investment to 2020	h47.6 billion	h47.6 billion	h68.1 billion
Proportion derived from the substitute levy	–	–	h5.6 billion (8%)
Grants or bonus payments in 2020	h1.1 billion	h1.1 billion	–
Total grants or bonus payments to 2020	h13 billion	h10.6 billion	–
Number of new renewable energy systems to 2020	4.0 million	4.0 million	11.4 million
Transaction costs in 2020	h20.9 million	h29.3 million	h31.5 million
Proportion of transaction costs resulting on the authorities' side	h13.7 million	h1.7 million	h8.7 million

The overall transaction costs are low for all models. However, here the investment grants and the Bonus Model both indicate advantages, especially in the costs for the authorities.

For the implementation of a supporting scheme in practice the current perception of the general public tend to be decisive. Here the investment grants and use obligation perform better. However, from the climate and environmental perspective today's subjective acceptance is not crucial. What really matters are the future impacts and the efficiency of the applied instruments. Here the advantages of the Bonus Model can be found. The need to build the acceptance of the model seems obvious.

Conclusion

The results speak for themselves, nevertheless let see for a quick summary as drawn from Bürger *et al*. (2008) Quote: "*The Bonus Model received the best valuation. This model uses an allocation procedure to distribute the additional costs that are still involved today with the use of RES systems among all fuel consumers according to the ''polluter-pays'' principle. The Bonus Model is distinguished on the one hand by being sufficiently flexible to be able to primarily exploit cost-efficiency potentials and also to advance the necessary long-term infrastructure changes. On the other hand, it enables a reliable return on investment due to the legally guaranteed bonuses for renewable heat, providing the operators of RES systems with a secure calculation base. Risk surcharges can thus be avoided and the bank loans necessary for the construction of systems are also easier to obtain. Some countries already have similar allocation methods to the advantage of renewable energy in the electricity market. This method is still new in the heat market and therefore runs into problems with acceptance*." end of quote.

For our purposes we could conclude that judging on the above results, perhaps the best way would be to leave the grants in place where they seem to function well and the burden to the budget is not that high, as it is the case with the RES-H support scheme for households. Bonus model seems to be the right approach for bigger investments in the public sector. Because of the problem with acceptance it is maybe better to start just with this sector and later broaden it to the private companies as well. There is also the use obligation in place that would be perhaps better suited if substitute levy would be introduced.

At this point it looks appropriate to look at the lessons already learned from the RES-E sector and what it could be used from there to implement in the Bonus Model. A good collection of these lessons can be found in the "*Overview of RES-H/RES-C Support Options*" (Connor *et. al.* 2009), a report made within the project RES-H Policy.

3.4 Lessons learned from support of RES-E (feed-in tariffs scheme)

The policy experience with supporting renewable energy sources use for electricity production (RES-E) provides a number of lessons that can be applied in ensuring the more efficient adoption of RES-H support. It is important to learn from these lessons, while also taking into account the specifics of the heating and cooling sector.

3.4.1 Limitations on the lessons of the RES-E policy experience: the differing nature of electrical and heat energy delivery and trading

Delivery

In industrialised countries delivery of electricity is very straightforward. After generation it is transformed to an appropriate voltage and dispatched via transmission and distribution networks to the final consumers. Input of electricity to the grid and its consumption are metered. This provides a simple way to measure its whole production and consumption and provides a mechanism through which consumers receive essentially the same product on demand. Supporting mechanisms for the RES-E of course reflect this model.

On the other hand, delivery of heat energy to consumers is rather different and much more complex and heterogeneous process.

Heat can be delivered to households for example through a district heating system a smaller heating network or it can be generated within homes. Energy used to produce can be even more varied; from wood and coal to fuel oil and natural gas and in some cases (and countries) even electricity. Similar is the situation with the demand for cooling. Currently, almost 90% of the heating and nearly 100% of the cooling in the EU is produced and used in single buildings, the rest being delivered through district heating and cooling networks. In Slovenia we are slightly better off in this regard with 20% (Šolinc, 2009) of the heat demand for households covered from district heating.

This complexity with delivery and the fact there many times is no central delivery mechanism existent means that delivery of heat can be more difficult to administer and therefore more expensive then it is the case with electricity. These are all factors that needed to be addressed when designing a (renewable) heating support mechanism.

Trading

Similar to the delivery specifics is also the situation with trading. The heat market is again less defined in comparison with the one for electricity. Its heterogeneous and fragmented nature implies the mix of regulation that applies for different elements, which can again be subjected to various different taxes. Furthermore this situation implies also a much larger number of individual stakeholders. To influence and change behaviour of such a complex group of stakeholders is of course much more of a challenge than it is with the electricity.

However, we have gathered already a vast portfolio of practical experience through the decades of development and application of support for electricity production from renewable energy sources. Many lessons and also mistakes have become apparent, some at considerable expenses, and which can we avoid in application to RES-H sector.

Let see what are the main lessons learned according to the findings of the K4RES-H (2006) project.

3.4.2 Key Lessons of the RES-E policy

Outline of market structure and barriers to growth

Despite all the differences there are of course also some common features among RES-E and RES-H sectors. For both there is an urgent need of reducing the dependency from polluting and more and more scarce conventional energy sources that we import. On the other hand, there is a lot of unexploited potential for renewables which means there is also a high potential for developing economies of scale and hence cost reductions. However, the market deployment of renewable energy used for heating follows very different paths than in electricity production. This means that also financial incentives should be designed accordingly and should pay attention to the specifics in heating sector, both for barriers as well for the opportunities.

Short windows of opportunity

Installing a RES-H system in new buildings is usually cheaper and many times technically more efficient than in existing ones. In existing buildings occasions to switch to RES-H option do exists but are rather rare and occur only every 15-20 years or so and are linked to the needed replacement of the heating system or to the major refurbishing of the roof or the building envelope. These facts need to be taken into consideration when designing FIS for RES-H. In the case of new buildings, there is a good opportunity for the introduction of binding regulations, making the use of renewable heating obligatory, like in Spain and now partly also in Slovenia, where a 25% share of energy consumption covered by RES, not necessarily the heating, is required.

However, there is a negative side of this, namely even where such obligations exist, they usually will only oblige to cover just a minimum share of the heating demand (typically only domestic hot water), as they address all buildings. This leads to a considerable much higher potential share of the overall heating demand that is not covered by renewables and which is left to the voluntary decision. This means, financial incentives should be conceived to promote a higher use of RES-H, even perhaps under an obligation.

The driving forces in the market

Promotional activities and mechanisms should address a number of stakeholders on the *demand side*, like building owners, developers, construction companies, district heating operators, etc. Here the economic aspect is not the only barrier there are others like the lack of awareness which leads to the fact that in majority of cases (when looking at Slovenia for example) RES-H option is not considered and hence not offered as a standard option by the construction industry and the heating designers. This again means higher transaction costs in comparison with the conventional options. The FIS for RES-H should therefore give enough incentive to overcome the financial as well as stop-&-go dynamic in the market.

On the other hand at *supply side*, the rather small market for RES-H equipment in most European countries means that manufacturers are still at an early stage in the development of economies of scales. Moreover, there are big differences among EU Member States in the level of market development.

Creating stable conditions

According to Jacobsson and Bergek (2002) the most desirable characteristics of the policies necessary to create the right conditions can be summed up in three words: "*powerful*, *predictable* and *persistent*". Powerful, as the support should be high enough in order to achieve sufficient impact on the economics of the relevant technology so that demand is enabled. Persistent means that they stay in place for a sufficiently long period to stimulate the desired growth. And finally, they need to be predictable to enable investors to take their decisions about future development, develop meaningful business plans and more easily design financing of the projects and access financial institutions.

If we look back at the past situation in Slovenia what RES-H support is concerned, especially so for companies, we can easily see that policies failed to reach anyone of these recommendations. Hence the poor result – as only a fraction of what was planned in the NEP was actually achieved is not surprising, although this is, of course, not the only reason.

Furthermore, when policies once have been adopted it is also important they do not change too much. One negative example represents the case of the Danish government attempt to switch from a tariff to a quota mechanism for RES-E in 2000. It generated considerable uncertainty, causing domestic demand for wind turbines to drop drastically (Meyer and Koefoed 2003).

Minimisation of public cost

Haas *et al* (2006, 2008) suggest that one of the major goals for policy should be the minimisation of public cost. However, there is some disagreement over how minimisation of cost might best be achieved. The adoption of quota mechanisms, as for example, in the UK, tends to imply a short term approach to minimising cost, wherein targets are set and the aim is to minimise costs in achieving them. Other perspectives allow for a longer term approach, where reducing the long-term cost of the technology provides the greatest benefit. However, as is noted later in this text, the growing evidence that quota mechanisms do not deliver greater short-term efficiency may undermine the short-term approach entirely.

Who pays?

There is a strong argument that the polluter pays principle should apply in determining which stakeholders bear the costs of any instrument adopted to support the growth of renewable energy. Support is primarily intended to mitigate and replace the use of fossil fuels. While the most economically efficient way to apply the polluter pays principle would be the internalisation of all environmental externalities, this is often not politically acceptable (Owen, 2006).

3.5 Renewable Heat Incentive (RHI) example from UK

The world first known Tariff System or Bonus model for RES-H was prepared in Great Britain in 2010 and it is coming into force in June 2011, two months later than initially planned. It is the proof that the intuitive idea we got at the start can be realised in practice. The motivation may well be different from ours; in fact the main reason would be the general non acceptance of the grants system linked to the society norms and the relatively big change in share of RES-H that is needed according the UK Renewable Action Plan – from 1% to 12% till 2020. Nevertheless, let see what the characteristics of this innovative supporting scheme are.

The information stated here onward are taken from the information web site *www.rhincentive.co.uk*. The information was based on the original consultation document published in February 2010.

Originally it was planned RHI would be financed trough a levy on energy bills. The same way Bürger *et al*. (2008) and this paper suggest it. Because the opposition and lobbying of the industry was too high it was then changed to be paid by the Treasury. This fact already reduced its scope by 20% and its start is still a bit uncertain. In total RHI would represent over £860 million of investment over the Spending Review period (Renewable Heat Incentive, 2010)

3.5.1 What is the Renewable Heat Incentive?

The Renewable Heat Incentive is a fixed payment for the renewable heat generated. It is very similar to the Feed-in Tariffs for RES-E, which would have done more than anything else to accelerate the installation of renewable energy capacity in Europe. That is the reason for the so active campaign to introduce them in the UK of the founders of RHI.

3.5.2 How does it work and who is it for?

In simple words: installation of renewable heating systems, e.g. solar thermal panels, heat pumps or a biomass (wood burning) boiler it is the first out of 3 steps of the procedure. The next step is estimation about how much heat the RES-H systems will produce and finally, based on that estimate a fixed amount is paid to the owner. It means an award for the contribution to reaching of the RES share target and diminishing GHG emissions. As the founders puts it: it is for everyone, including households, landlords, businesses, farmers, schools, hospitals, care homes etc. The RHI can even be used by entire communities that are investing in common RES-H system from which they will all use the heat and share the income.

3.5.3 Eligibility and Tariff levels

In order to be eligible to claim the RHI renewable heating system has to qualify for that. However, most forms of renewable heat generation in all sizes it is suitable. Somewhat in contrast to the Feed-In Tariffs for RES-E where (in UK) a 5MW ceiling applies, there is no such limit for the size of heat equipment eligible under the Renewable Heat Incentive. All installation of RES-H systems that produce heat after July 15th 2009 is eligible to claim the Renewable Heat Incentive. The claim itself, however, can be made as of July 2011.

This can be made individually or, alternatively, by the RES-H system provider, who can do it on the customers' behalf. Tariff depends on the size and type of a system as shown in table 2 below and can be subjected to change. They last between 10 and 23 years and stay fixed for the whole period with compensation for inflation after the system was registered on the scheme. However, for the installations after April 2012 a digression mechanism, which is generally used in FIT for RES-E schemes, is going to be implemented.

Table 5. RHI tariffs

Source: Renewable Heat Incentive2010

To give an idea of the tariffs; 9 pence is about 10 Euro cents (November 2010).

Technology	Scale	Tariffs (pence/kWh)	Tariff lifetime (years)
Small installations			
Solid biomass	Up to 45kW	9	15
Biodiesel (restricted use)	Up to 45kW	6.5	15
Biogas on-site combustion	Up to 45kW	5.5	10
Ground source heat pumps	Up to 45kW	7	23
Air source heat pumps	Up to 45kW	7.5	18
Solar thermal	Up to 20kW	18	20
Medium installations			
Solid biomass	45kW-500kW	6.5	15
Biogas on-site combustion	45kW-200kW	5.5	10
Ground source heat pumps	45kW-350kW	5.5	20
Air source heat pumps	45kW-350kW	2	20
Solar thermal	20kW-100kW	17	20
Large installations			
Solid biomass	500kW and above	1.6-2.5	15
Ground source heat pumps	350kW and above	1.5	20
Biomethane injection	All scales	4	15

4 CASE STUDIES

To make my case more solid, and to see what such support scheme could mean for economy of possible RES-H projects, I used two case studies from public sector. The first is a home for elderly people located in Črni Vrh, which is a private institution with the concession from Ministry of Labour, Family and Social Affairs. Biomass heating system was planned there but not realised. This is mainly because the absence of the grants meant it was not economically feasible or interesting enough for the investor. I wanted to see what it would mean for the project's economics to use tariffs incentives for the produced heat instead.

Figure 10. Home for elderly Bor in Črni Vrh

Source: ApE, 2006

The second is a secondary forestry school centre in Postojna. There the conditions were more favourable and the project was realised, however, it took a hard work for the principle to convince the Ministry of Education and Sport it would be worth-while.

4.1 Case study limitations

For simplicity I chose only two cases, however for a successful design of the scheme the right level ob the bonus is crucial, as we saw in the case of the feed-in tariffs. To be able to really define the suitable height of the bonus much more calculations are needed, taking various possibilities into consideration. Much like the way FITs have been calculated, with a special study on “Methodology of defining reference costs of electricity produced from renewable energy sources” (MG, 2009). Moreover, for the purpose of renewable heating support probably much more complex study would be needed. Therefore, one or two more cases would not make much difference, to do all that, would be too ambitious task and out of scope for this paper.

4.1.1 Variables to consider

Nevertheless, it is worth mentioning that parameters, which should be considered as variable in such calculation are various renewable heating (or cooling) technologies in use (e.g. also solar thermal and geothermal, heat pumps); different size of heat plants (from kW to MW range); various climate’s conditions, which vary a lot from region to region in Slovenia and hence also heat demands and heat load (degree days); furthermore, broader selection of the price ranges of the equipment should be considered, from cheaper – but still eligible for RES-H support in terms of needed efficiency and emission limits – to more sophisticated and hence more expensive options; moreover case of self heat providing and selling heat also to others through a micro grid or district heating should be discussed, etc. Taking most of the possibilities into account and then find a way in the middle seems to be a much more complex task than it is the case with feed-in tariffs for RES-E.

4.2 Case study structure

4.2.1 Selected public buildings

Two real cases of biomass heating were chosen, one that was not yet realised and another one that was implemented. The first is a home for elderly in Črni Vrh, and the other is a secondary forestry school centre in Postojna.

4.2.2 Methodology and input data

An economic calculation for the new biomass heating system (basically is a pre-feasibility study) for both projects was made; one without investment subsidies, the second with 25% grants (which is a realistic share when looking back at the realised projects) and third with the tariffs/bonus incentive.

The calculation was made by means of the tool used in company ApE. It is basically an Excel calculation tool composed of thirteen sheets. For the purpose I made use of seven:

Fuel – heat consumption

The first sheet is used for the calculation of the need heat in kWh. The average of three years was calculated and taken into account.

Biomass price

Next sheet is used to define the fuel (biomass) price for the heating system. For the biomass a reference price of €19/MWh (without 20% VAT) defined in the methodology for defining the reference costs for electricity production from renewable energy sources (MG, 2009), and for fuel oil price from the supplier Petrol for the October 2009 was used for the calculation. I checked also the real costs on the market (interviews) and it showed out that they can be both higher and lower. Therefore it seemed the right value.

Heat load curve - selection of the biomass boiler

The basic input data for the studies represents the heat load or fuel consumption. Data for 3 years were used and then average figure taken into account. With use of the climate data (Degree Days value) for the respective location a heat load curve was made and hence suitable power range of the boiler selected. For the purpose the calculation model of the company ApE was used.

Investment structure

Investment costs were then searched for the selected and needed technology, depending from the case. Costs include all the costs born at the project realisation, from building cost, boilers, heat and biomass storage and equipment necessary, to instalment and planning. These are in both cases based on real offers from the actual (for the realised project in Postojna) and potential supplier.

Heat costs

Heat costs based on the price for biomass and fuel oil were set here.

Main input parameters

The specific technology and investment parameters of the project are gathered and serve as an input to the final step.

Economic calculation

Here main economic parameters were calculated, by use of the cash flows and standard economic criteria, like simple and discounted payback period, internal rate of return and the cash flows for the time span of the project, i.e. 20 years. For the tariffs ten years contract period was chosen. Although it was mentioned before that calculating the needed amount of support just by making investment profitable is not enough, is essentially what was made here; simply, because other options would be too complicated.

Three different scenarios in terms of financial incentives for the project were calculated for each case. The bonus was simply added to the heat earnings and then adjusted by iteration until a desired payback period was achieved. 10 years seemed like a reasonable result, which is on the lower side of the (successful) PV sector deployment. The 6% discount rate was chosen, which is usual for economic calculations in the public sector.

For the evaluation of the projects standard economic calculation is used with investment financial criteria like the net present value (NPV) of the project, internal rate of return, discounted and simple payback period, etc. NPV means the sum of discounted cash flows over the life span of the project. In our case it is 20 years. The bonus incentive was (arbitrary) set for the period of ten years.

4.2.3 Results for the home for elderly Bor

Input data and costs

In the table below the input data for the calculation model can be seen. These are the amount of the heat needed, for covering of which a biomass and fuel oil biomass boiler is used. In order to use the bonus only for renewable heat part the respective shares of the heat loads are applied. For the calculation purposes also investment and heat costs are needed. Discount rate of 6% was applied.

Table 6. Input data and investment costs for Bor

Basic input data

Average annual heat consumption	kWh	1,036,000
Biomass boiler	kW	300
Boiler fuel oil (existent)	kW	500
Heat share biomass	%	76
Heat share fuel oil	%	24

Investment (costs)

Biomass Boiler + installment	[EUR]	80,000
Boiler fuel oil (existent)	[EUR]	0
Installation	[EUR]	7,500
Building and planning + unpredicted costs	[EUR]	62,500
Investment total	[EUR]	**150,000**

Economic results

Based on the above input data economy of the project is calculated. The main economic results, such as the net present value (NPV) of the project, internal rate of return (IRR) and discounted as well as simple payback period are shown.

The results of the case home for elderly Bor are shown in the table below. Respective cash flows are to be found in Annexes 1.1-1.4.

Table 7. Economic results for Bor

1-Option without subsidy

Investment (EUR)	150,000
Net present value (NPV) EUR	18,600
Discount rate	6.0%
Discounted payback period (break even point) year	16
Simple payback period (year)	11
Internal rate of return (IRR)	6.7%
Heat price (average price, connected power included, heat from both sources)	0.06 EUR/kWh
Biomass price	0.019 EUR/kWh

2-Option with 25% investment subsidy

Investment grants (EUR)	37,500
Net present value (NPV) EUR	72,197
Discount rate	6.0%
Discounted payback period (break even point) year	9
Simple payback period (year)	8
Internal rate of return (ISD)	10.9%

3.1-Option with bonus payment; 0.6 €c/kWh

Bonus payment	0.6 €c/kWh
Bonus payment total annually (EUR)	4,723
Net present value (NPV) EUR	51,522
Discount rate	6.0%
Discounted payback period (break even point) year	10
Simple payback period (year)	8
Internal rate of return (ISD)	9.2%

3.2-Option with bonus payment 0.8 €c/kWh

Bonus payment	0.8 €c/kWh
Bonus payment total annually (EUR)	6,297
Net present value (NPV) EUR	62,647
Discount rate	6.0%
Discounted payback period (break even point) year	9
Simple payback period (year)	7
Internal rate of return (ISD)	10.4%

Commentary on the results for Bor

As it can be seen from the above tables was the first option without financial incentives with 16 years of payback period was really not very interesting for the investor and their decision not to go into the project hence justified.

If financial incentives are applied, the picture will change. With the 25% percent grants on investment costs, which in the case of home for elderly amounts to €37,500, the discounted payback period shortens quite a bit and reaches 9 years, with 10.4% internal rate of return.

The third option was calculated with several different bonus rates (from 0.5 to 0.8 €c/kWh), using the iteration method. The bonus was applied for an arbitrary period of 10 years (the actual period could be longer, e.g. 15 years as it is the case with FIT system). For simplicity only two options are shown here. The bonus was applied only to the renewable heat produced, which in this case is 76% of the whole heat needed. In the second case the same results are achieved as with the grants model. Cost over the 10 years period are higher than in the grants case, however if interest are applied this is no longer true.

4.2.4 Results for forestry school centre Postojna

The same considerations as for home for elderly Bor applies also here. The results of the case forestry school centre are shown in the table below. Respective cash flows are to be found in Annexes 2.1-2.4.

Input data and costs

Table 8. Input data and investment costs SGLŠ

Basic input data

Average annual heat consumption	kWh	1,435,000
Biomass boiler	kW	500
Boiler fuel oil (existent)	kW	850
Heat share biomass	%	85
Heat share fuel oil	%	15

Investment (costs)

Biomass Boiler + installment	[EUR]	85,200
Boiler fuel oil (existent)	[EUR]	0
Installation	[EUR]	52,700
Building and planning + unpredicted costs	[EUR]	78,000
Investment total	[EUR]	**215,900**

Economic results

In the table below economic results of the case secondary forestry school Postojna are shown. Cash flows are to be found in Annexes 5-8.

Table 9. Economic results SGLŠ

1-Option without subsidy

Investment (EUR)	215,900
Net present value (NPV) EUR	131.145
Discount rate	6.0%
Discounted payback period (break even point) year	10
Simple payback period (year)	8
Internal rate of return (IRR)	11.5%
Heat price (average price, connected power included, heat from both sources)	0.06 EUR/kWh
Biomass price	0.019 EUR/kWh

2-Option with 25% investment subsidy

Investment grants (EUR)	53,975
Net present value (NPV) EUR	223,268
Discount rate	6.0%
Discounted payback period (break even point) year	6
Simple payback period (year)	5
Internal rate of return (ISD)	17.7%

3.1-Option with bonus payment; 0.1 €c/kWh

Bonus payment	0.1 €c/kWh
Bonus payment total annually (EUR)	1,220
Net present value (NPV) EUR	139,765
Discount rate	6.0%
Discounted payback period (break even point) year	9
Simple payback period (year)	7
Internal rate of return (ISD)	12.1%

3.2-Option with bonus payment 0.9 €c/kWh

Bonus payment	0.9 €c/kWh
Bonus payment total annually (EUR)	10,978
Net present value (NPV) EUR	208,725
Discount rate	6.0%
Discounted payback period (break even point) year	6
Simple payback period (year)	5
Internal rate of return (ISD)	17.0%

Commentary on the results of SGLŠ Postojna

Here we can see that with the prices considered, and in contrast with the case above, the investment pays back already without subsidies within 10 years. Hence the principal decision looks correct.

If they would to get a subsidy in the amount of 25% of the investment costs or €53,975 the discounted payback period shortens to a low 6 years, with 17.7% internal rate of return.

The third option was calculated again with several different bonus rates. These times were lower than in the first case (from 0.1 to 0.9 €c/kWh), using the same method. The bonus was applied for the same period of 10 years. Again only two options are shown here. The bonus was applied only to the renewable heat produced, which in this case is 85% of the whole heat needed. In the first case, with the minimum bonus of 0.1 €c/kWh, which makes for annual amount of €1,220, the payback period already falls below 10 years. In the second I wanted to see what bonus should be applied to achieve the same results as with the grants model. This was approximately achieved with the 0.9 €c/kWh. The same as in the case of Bor applies also here; costs over the 10 years period are higher than in the grants case, however if interest are applied this is no longer the case.

4.2.5 Estimated application of the scheme

In the following lines an attempt of the simulation of the scheme application in public buildings sector it is made. I tried to found the data on the existent stock on the public buildings in Slovenia; however this information does not exist as the

Statistical Office of Republic of Slovenia does not gather that kind of information. Instead I used an estimation of the Building and Civil engineering institute ZRMK from one of its reports within the project BUDI.

Public buildings stock in Slovenia

According to their estimations (ZRMK, 2005) there were 7676 public buildings with the surface greater than $1000m^2$. If we know further estimate that adding also smaller and counting the newly built we could come to a figure of 10,000 public buildings. If we now make a preposition, based on previous experience, that 60% are not suitable for RES-H system, there are now 4000 buildings left. There are many factors that exclude this possibility to be applied, just a few major ones: there are a high number of the buildings that are connected to the DH system, others are located in a way that does not allow for e.g. biomass heating system – because of the storage and logistic demands, or in case of the solar thermal – there is no adequate solar irradiation because of the shading, etc. For newer building it is very likely that new gas boilers are used and much more reasons could be found.

Retrofitting programme

Let us suppose a ten years programme would be developed for the substitution of non adequate and old-dated heating systems for the remain stock of public buildings with the RES-H systems.

Heat consumption

According to ZRMK (2005) the average heat consumption in public buildings in Slovenia is 157 kWh/m^2. The majority of the older public buildings are rather energy inefficient. Therefore energy efficiency measures would apply first and a 30% lowering of the average consumption is taken into consideration. This leads are to still quite high but realistic figure of 110 kWh/m^2 heat consumption.

Financial incentives costs calculation

4000 buildings in ten years is 400 per year. If we make another arbitrary assumption the average heated surface would be 1000 m^2 then we talk about 400,000 m^2 of the heated surface and 44,000,000 of kWh of heat needed.

For simplicity let presume all would be biomass heating systems and 80% coverage of the heat load would be archived with biomass. That leads us to 35,200,000 of kWh to pay for. The calculation of the needed amount of money annually and in ten year period (which is how long should it take to retrofit all the selected buildings) and with different tariffs' rates is shown in the table below.

Table 10. Calculated amount of financial incentives per different bonus

Bonus (€/kWh)	Heat consumption (kWh)	Incentives amount annually (€)	Incentives amount in 10 years (€)
0,001	35,200,000	35,200	352,000
0,005	35,200,000	176,000	1,760,000
0,009	35,200,000	316,800	3,168,000

We can see even in the case of the highest bonus chosen (which is still lower than in case of the UK RHI) the amounts needed are not exaggerated and do not exceed those of the investment grants system. If we now compare these amounts to those foreseen in the national REAP (look at the table 12 below), we can state that about 10% of the foreseen for the biomass support would be needed. Of course it should be mentioned that these are only costs for the incentive not for the support scheme as such. However, these costs should not be much or at all higher than in the case with the investment grant support.

In the yearly report for 2009 of the Eco Fund (Eko sklad, 2010) it can be seen that €6,382,403 were spent in total for the grants for renewable and energy efficiency measures (4952 investment in total) in 2009, from which 561 investment were made in biomass heating systems for €683.527 of grants were spent. Clearly the figures are completely in line with those from mine estimations.

Since the decree on the energy savings and supplement raising is only in force for first year in 2010 there are now data on the amount gathered available so far. Nor are the studies for its implementation.

Table 11. Estimated costs and benefits of the RE policy support measures

Source: ANOVE (2010)

Measure/technology	Increased use of renewable energy sources 2010-2020 [ktoe]	Costs of support 2010-2020 [EUR million]	Investments 2010-2020 [EUR million]	Reduction in greenhouse gas emissions (2020) [ktCO2/year]	Job creation for operation and maintenance (2020) [No. of jobs]	Job creation (design, construction, installation) (2010-2020) [man years]
Electricity	**150.13**	**456.06**	**1.313.60**	**607.62**	**339**	**10,603**
Hydroenergy	**79.39**	**57.34**	**692.71**	**321.30**	**87**	**3,226**
sHE (< 1MW)	0.71	2.39	4.41	2.85	1	36
sHE (1 - 10MW)	6.69	7.97	30.60	27.07	7	247
HE (10 - 125MW)	71.99	46.98	657.70	291.38	78	2,944
Solar energy	**11.52**	**90.09**	**311.03**	**46.62**	**40**	**5,487**
Wind energy	**16.39**	**22.90**	**115.88**	**66.34**	**11**	**1,625**
Geothermal energy	**0.00**	**0.00**	**0.00**	**0.00**	**0**	**0**
Biomass	**42.83**	**285.72**	**193.98**	**173.36**	**202**	**266**
Solid	20.96	92.60	43.60	84.82	77	89
Biogas	21.88	193.12	150.38	88.54	125	176
Heating and cooling	**189.28**	**442.06**	**1.801.77**	**435.86**	**246**	**817**
Geothermal energy	**3.24**	**4.14**	**10.34**	**7.47**	**/**	**/**
Solar energy	**17.95**	**32.87**	**469.58**	**41.32**	**/**	**/**
Biomass	**114.62**	**303.85**	**759.63**	**263.93**	**246***	**817****
Solid	86.41	303.85	759.63	198.98	246	817
Biogas	0.00	0.00	0.00	0.00	/	/
Liquid biofuel	28.20	0.00	0.00	64.94	/	/
RES (heat pumps)	**53.48**	**101.21**	**562.22**	**123.14**	**/**	**/**
aerothermal	13.29	6.36	51.94	30.61	/	/
geothermal	36.91	83.76	478.60	84.99	/	/
hydrothermal	3.27	11.09	31.68	7.54	/	/
Transport	**192.21**	**/**	**/**	**592.17**	**/**	**/**
Bioethanol/bio-ETBE	18.50	/	/	56.54	/	/
Biodiesel	173.71	/	/	535.63	/	/

* - direct employment; ** - indirect and induced employment

4.2.6 Evaluation of the case study results

In order to better understand the financial implications of the tariffs scheme implementations I used the first case of Bor and made some simple comparison of the economic criteria. I made calculations of the NPVs for the incentives with different bonus height and compare them to the NPVs of the project and discounted payback period.

I compared the NPV of the incentive to thst of the project and realised that a lower support is generally more efficient than a big one. We can also see that already a minimal incentive sometimes is enough to make a project economically feasible, especially in the case of public buildings. Calculations results are shown in the table below.

Table 12. Calculated NPVs and discounted payback period for Bor

Bonus (€/kWh)	NPV incentives	NPV project	Discounted payback period	Efficiency Factor
0,005	33,575	45,959	11	1.37
0,006	40,288	51,522	10	1.28
0,007	47,001	57,085	10	1.21
0,008	53,715	62,647	9	1.17

The relation of the both NPV values; for the incentive and for the project, in relation to the bonus height is shown in the figure11 and 12. The figure 13 shows the respective discounted payback period. It can be seen that bonus of 6 €c would be already enough and that the "return" on the invested bonus (efficiency factor) for the society/state are higher with the lower bonus in comparison with more elevated bonus of 7 €c. The respective factors are 1.28 versus 1.21.

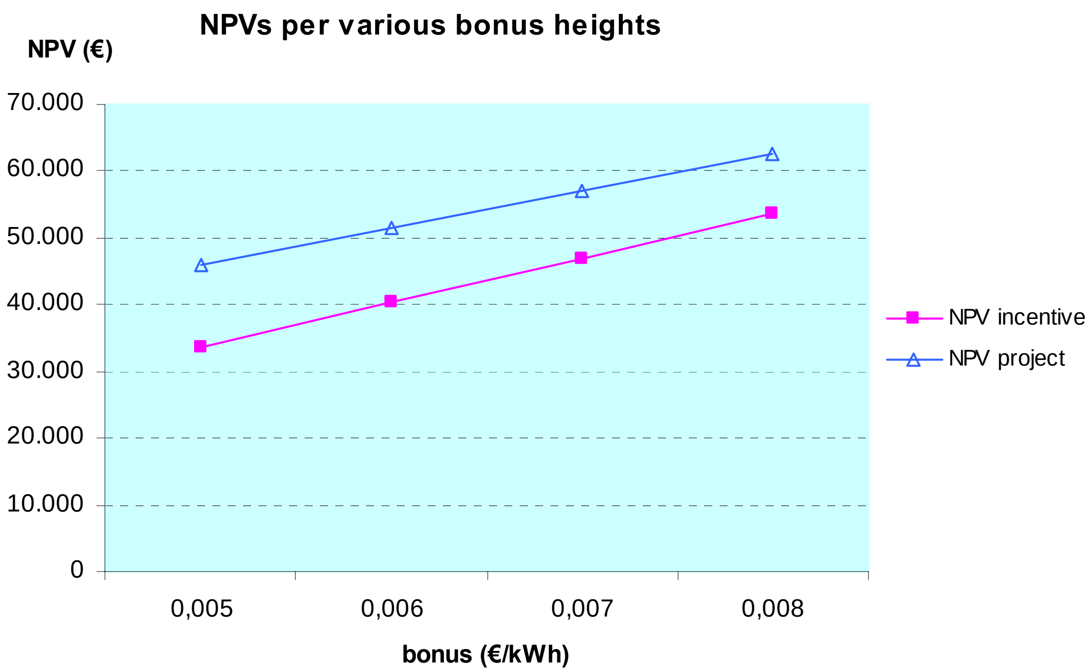

Figure 11. NPVs of the project and of the incentive in relation to the bonus height

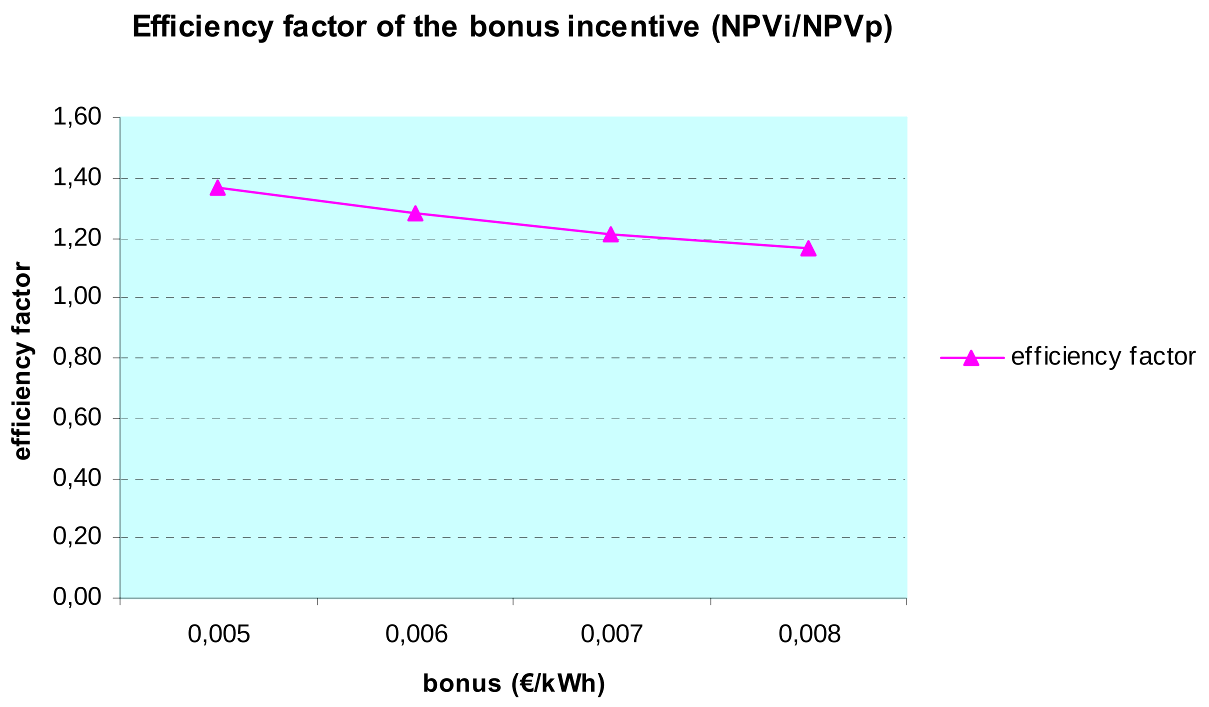

Figure 12. NPVs quotient – efficiency factor of the bonus

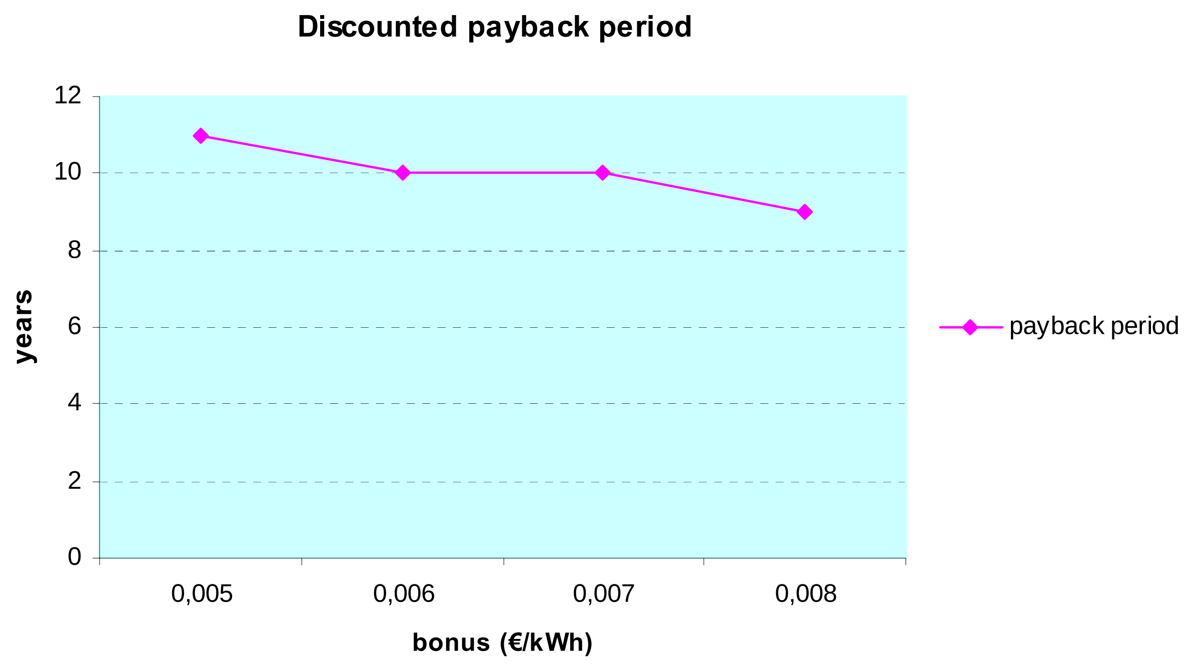

Figure 13. Discounted payback period per bonus height

5 TARIFFS FOR RES-H SUPPORT IN SLOVENIA

From all the said above it looks like supporting renewable heating production by use of the bonus model in Slovenia could be a good idea. Also the case studies showed that it would be possible. So let us look at its possible implications and design.

5.1 General design of the scheme

The proposed scheme is basically made upon the existing Feed-in tariff system for RES-E and the British RHI.

To make a complete picture would be a bit out of scope for this paper. Therefore we have to except quite a few presumptions here and make certain choices.

As already mentioned above, one of the main obstacles in introducing bonus model lies in its acceptance. Therefore, and also because of its complexity, I have chosen to apply it only for public buildings for start. For one, because this is perhaps the most important sector to work on, and the most neglected in the past at the same time; second because it is likely to get better acceptance with the general public there; third because grants system that is in place for households functions much better and it is therefore less need for changing it; and forth because taking only public buildings into eligibility borders would mean smaller extent that could be handled by the existent organisations, like Eco Fund Public Fund (already offering loans and grants) and Borzen, which deals with the feed-in tariffs for RES-E sector.

One could argue that applying the scheme just to particular segment could be problematic also from the acceptance perspective. This is of course true. However, if we take into account that already now there are tailor made supporting instruments, aimed at specific groups, (e.g. for energy efficiency measures in homes for elderly) of temporally nature, based on open calls, that should not cause too much of a problem.

There are also other reasons that back up the above decision. In the chapter, where bonus model is discussed, we learned about possible downsides of the model. Limiting the scope of the tariff scheme to public sector already addresses some of them. E.g. the number of potential beneficiaries is much lower. Moreover, restrictions for energy inefficient buildings as well as low quality RES-H appliances that are being applied already when supporting RES-H options and would stay also for tariffs scheme. This of course limits the eligible number of buildings and stimulates their energy efficiency retrofitting first. Lack of energy efficiency stimulation would otherwise be one of the weak points of the bonus model.

Also the already mentioned Ernst&Young study seems to confirm this decision. Within the analysis they made also a survey on suitability of the proposed tariff system. Industry and service sector gave much higher score that they it did the household sector. Ernst&Young finds the grants system for the latter group more appropriate as the main obstacle would be the high investment at the start. The table below shows the scoring on various fields questioned for both groups.

Table 13. Indicative scoring for the tariffs

Source: Ernst&Young, 2007

Weighted scores – see Appendix B	Commercial / industrial	Residential
Recognition of carbon benefit	0.53	0.42
Longevity	0.60	0.12
Performance focus	0.68	0.14
Capital payment	0.03	0.15
Transaction simplicity	0.11	0.53
Compatibility with similar market-based mechanisms	0.02	0.03
Feasibility of implementation	0.06	0.06
Weighted score (max 3)*	**2.0**	**1.4**
Carbon saving potential (max 1.75)*	**0.8**	**0.7**
Cost effectiveness (max 1.75)*	**1.0**	**0.7**
Total weighted score (max 6.5)	**3.8**	**2.8**
Overall Rating**	HIGH	LOW
Rank (overall)	2	6

*Refer to Appendix B for the scoring methodology.
**Overall rating within range of total weighted scores for all support mechanisms (ranging from 2.6 to 3.9): Low – 2.6 to 2.9; Medium – 3.0 to 3.4; High – 3.5 to 3.9.

This would take also the function of unwanted capping the scheme. Therefore, existent organisations like Eco Fund and Borzen could deal with it and there would be no need for additional transactors. Furthermore, the gathered money from special fund from electricity and fuels price supplement should be sufficient. This mechanism is also in line with the "polluter pays principle" as it is being paid by consumers and not by taxpayers. Another advantage is of lowering the selection of technologies in terms of installed power ranges, as these tend to be much more homogenous in just one sector in comparison to the option also industry and households sector would apply. As already mentioned the public buildings fell mostly in the middle size range heating appliances, where the investment per kW installed is the lowest. This would again mean the money is well invested.

There are also no tariff table and technology and power specific classes either. Nevertheless, there is an estimation made of the needed bonus that was calculated through economics analysis of a concrete project of biomass heating. In order to set reliable tariff amounts much more examples should be used and various scenarios and technology specific options considered. Such as solar thermal, geothermal, heat pump etc. heating and cooling. Biomass heating was chosen as the most well-known and used renewable heating option in Slovenia.

5.2 Stakeholders’ considerations

In order to get a more clear idea of what it might such supporting mechanism for the potential user mean I made short interviews with Srečko Trojer, from the home for elderly people Podbrdo, Anton Homar from the catholic educational institution “Zavod Sv. Stanislava” in Ljubljana,Rajko Leban from local energy agency GOLEA and Nike Krajnc from the Forest institute of Slovenia. The interviews were made in an informal way on telephone. The main issues that I raised were: “How were they satisfied with their RES-H projects, what problems did they encounter in terms of financing and what was their opinion on the proposed Bonus model. What would that imply in their concrete projects and in general?” Their thoughts on the subject are presented here further.

5.2.1 Positive view on the model

Dom Podbrdo

is surely one of the most successful examples on deploying biomass for heating in public sector in Slovenia, if not already the best. They manage to find the needed synergies at their local environment and have already two such RES-H systems in place. One is an individual system in their home on Petrovo Brdo and the other is a so-called micro district heating system in Podbrdo. Both were done without any financial incentive whatsoever. They are functioning well and to investors and (local) fuel provider content. Because of the missing support that was not easy to achieve.

When asked about the bonus model possibility, he agreed that indeed it would be a nice step further. Four steps actually if his exact words are to be used. The main problems that he perceives from their experience are the very *uncertain conditions* linked with the government grants.

Especially with the second example, as they had to negotiate for the selling price of the heat for the nearby block of flats, they had quite some trouble with the economy of the project. At the time they could not count on the grants, because there was no call open, and it was not certain if there would be any in the foreseeable future. It would be much easier if they could count on some known financial support as it would give them more space for negotiating both with the fuel and equipment providers on one hand and their energy 'customers' on the other. Furthermore, if such system would be in place they've could have built the second (as well as the first) project much faster and perhaps of even better quality.

In his view the bonus model is a better option for the investor when building with own capital and grants when using borrowed money. However, this only stands when both systems function equally well, what was far from reality when looking at the actual conditions in Slovenia.

GOLEA

is a local energy agency and its director was involved in the above mentioned project as equipment provider, at the time. He now continues with the work on RES-H within the scope of the agency and he gained much broader perspective since there.

He founds the bonus model a good way of support especially in the case of primary schools as they come to the "burden" of the municipalities and not the state as for example secondary schools. This means they are in fact deprivileged in comparison. Since most municipalities in Slovenia now are rather small they many times do not have the financial capacities needed for such projects. Here the so-called *contracting model* of external investor comes in place. Because of the non-functioning (at least not well) public-private partnership system in Slovenia this represents a problem. With the bonus system in place it would be much easier and with less risk for potential investors to develop RES-H projects in (municipal) public buildings. The main problems, however, he sees in the current legislation and regulation that not allows for easy and clear projects in public sector. Contracting and public procurement is not designed in a way that it would support investments and projects in RES and energy efficiency.

Forest Institute of Slovenia

Dr. Nike Krajnc is the head of the Forest Techniques and Economy department at the institute. She is actively involved in bioenergy already for some time now and she is one of the leading Slovenian experts in the field. She has learned about the RHI model first handed from her English colleagues and she finds it a good solution, much better than grants system anyway.

She made a reference to the subventions for farmers for wood chippers, which brought many farmers to the decision of purchase and what caused overcapacities and many are more or less dead investment and the owners not know what to do with them. Though not directly linked this shows the importance of planning the support measures according to the targets one wants to achieve and the needed accompanying measures. In this respect she sees the stable support through heat prices much better option and the signal for he users that they do what is right.

Furthermore, she mentioned the Finnish example presented at the Biomass conference in Graz in 2008, where she participated also as one of the panellist. A Finnish participant would explain that government grants for bioenergy in Finnland would be one of the worst experience made in supporting renewable energy.

5.2.2 Negative view on the model

Zavod Svetega Stanislava

The catholic school from Ljubljana is another example. Anton Homar, the estate manager, is clearly in favour of grants model. They were able to receive 30% grants on investment (which is above average the Slovenian biomass heating projects) and are very satisfied with the procedure and the project itself. He pointed out also a possible negative side of the bonus model, namely he said he would not be stimulated in the *energy efficiency* of the building that way. This is a good point and needs to be addressed within the bonus model regulation, as it is also the case with the RHI.

5.3 Answers to the questions set

At the beginning, in the chapter 1.2 I set a number of questions that I wanted to look for the answers. They could be divided into four groups; for start there are questions regarding FIT scheme for RES-E support, then I looked at the only so far existent such system – the RHI from UK, next I asked myself, if the support system is possible in Slovenia and supposedly the answer would be positive, at its possible design.

5.3.1 Feed-in tariff system for RES-E

In the first group there were three questions:

1. *What have we learned from the feed-in tariff system for RES-E?*
2. *What are the possible synergies?*
3. *What are the differences and how it compares with other RES-H support mechanisms?*

What it is now definitely clear is that the FIT system is really a powerful and reliable support tool in the RES-E sector, provided that is well designed of course. RES-H sector seems much more complex and more difficult to address in comparison to the RES-E sector. Nevertheless, we could use experience from there and learn from mistakes made as they can be valuable lessons.

Since the FIT system has the organisation structure already in place these organisations (mainly Eco fund and Borzen) could be use in synergy with the new scheme. The synergies could be made also between the two sectors, namely RES-H and RES-E in terms that also renewable electricity production would become more and more decentralised and hence a usual part of everydays life of many of the buildings, especially with the application of the PV or building integrated PV plants. The scheme could be linked and dealt with “under ne roof” so to say.

Of course the differences between the two, such as the lack of common grid and market for the renewable heat, have still to be taken into account. Furthermore a potentially much larger number of the incentive beneficiaries is to be expected; every household in principle could be eligible, what would call for the new intermediate elements or the so-called “transactors”, which would then act on their behalf versus the authorities.

As we could see from the analysis of the various RES-H support policies, the tariff or bonus model in theory performs well against other forms of financial incentives. Although, we had some bad experience with the otherwise already well established government investment grants, this can be a very successful mechanism nevertheless. The condition for that is that they are well designed, which is also the most important feature for the efficiency of the support scheme. With thoughtful design and implementation, however, it seems that both support systems (i.e. bonus and grant model) can perform equally well. Nevertheless, there are some advantages of the tariffs over the currently prevailing investment subsidies that can be pointed out:

- It better complies with the “polluter pays principle”.
- It is a stable, long-term oriented incentive that enables a reliable return on investment, which improves bankability of the projects.
- The bonus scheme can be compatible with the existing subsidy support (or other forms); e.g. it can coexist with the grants for households for example.
- It allows for a more comprehensive view on the energy consumption and production in the near future as it could be nicely linked with the FIT scheme for RES-E production support as it would essentially use the same principle of “*getting rewarded*” for something you provide for the benefit of the society as a whole.

5.3.2 Existent tariffs system for RES-H support

1. *Is there already similar system in existence to look upon?*
2. *What are its characteristics?*
3. *What could be used from it?*

As we found out there is now such a system in existence ant it is coming in force in June 2011. It is the Renewable Heating Incentive (RHI) scheme from the UK. It can serve as a good tool to better understand how such support system could really look in practice. It appears to offer relatively high tariffs (in comparison with the results from the case studies above at least) for the RES heat produced for period between 15-23 years. It is eligible for everyone, who produces heat from renewables and for all types of technologies and sizes of the appliances.

When designing such system we could use a lot from it. E.g., we could learn, which all the aspects are that need to be considered, how to ensure the energy efficiency compliance of the heating system (in order to avoid the support of inefficient use of renewable energy), how to deal with smaller beneficiaries, and also how to promote it efficiently.

5.3.3 Feasibility and costs of the tariffs/ bonus model

1. *Important issue is also the costs for such system. Does it pay off for the society?*
2. *Is it feasible in Slovenia?*
3. *How to implement it?*

As we could see from the calculations made with the case studies. Cost of the incentives seem to be in the feasible boundaries and completely comparable with the costs of grants. This only stands for the actual incentives and not for the model cost as a whole, e.g. transactions costs. For this I was only able to see what experts say in theory. However, with the scope limited to the public sector and with make use of the existing organisations, which are already involved in feed-in tariffs scheme for the RES-E, for example Eco Fund and Borzen, I have reason to believe that they could be not much higher than in the case with the grants model or even lower. Here especially the synergy with the FIT scheme for the public buildings that would also produced green electricity could be of significance. I do believe that also acceptance for the case of applying the bonus scheme to public sector would be good.

5.3.4 Implementation

I put following questions at the beginning of this paper for the implementation part of the bonus scheme:

1. *Who should be involved in its development and implementation?*
2. *What is the right amount of the bonus and how long should be paid?*
3. *On what basis should be paid and what are the eligibility criteria?*
4. *How to know the actual produced (needed) amount of heat?*
5. *How to ensure justice of passing the costs/bonuses to energy consumers and which mechanism could be used to do that?*
6. *How to lower transaction costs?*

Ad1: **Responsible organisations**

As already mentioned I believe the already active organisations in the fields of financial incentives for renewable and efficient use of energy like Eco Fund and Borzen could take the task over. It is worth mentioning that participation of the relative ministries would be beneficial and desired not only in relation to the singular public buildings but also in terms of adapting legislation and regulation more in favour of RES heat. Namely, the specific nature of this kind of projects demands for longer-term perspectives, the current regulation, however, clearly favours short term solutions, which are more suitable with fossil fuels installations

Ad2: **Tariffs height**

In the case studies I made basic calculations and estimations of the needed bonus to the established heat price. One can see that the values can be very volatile, depending on the case parameters, such as power range, RES-H coverage of the needed heat, funding of the project, heat price etc. Another observation that can be made here is that even though the selected period was shorter that in case of RHI in UK the tariffs were much lower in comparison. However, to determine the right amount and period a much more detailed analysis would be needed.

Ad3: **Payment and eligibility criteria**

Payment could be made based on the application form, with included basic heat load calculations or based on metering. For the smaller installations estimation could be made based on the buildings data and values that are considered as appropriate for such buildings and location in Slovenia. Already now there are certain criteria that apply in order to be eligible to grants payment, such as energy performance or age of the building. These could stay and be further detailed. It is to avoid paying for inefficient use of heat, even if it comes from renewable source. This would be one of the weak points of the model, hence a special attention to this needs to be paid.

Ad4: **Heat amount**

As said above, this could be based upon the data from the metering of heat production of the RES-H installation. Alternatively, for new and smaller buildings/installations an estimation based on heat load calculation could be used. For the new buildings the existent building and energy planning documents should be used.

Ad5: **Passing the cost to consumers**

As mentioned at the beginning in Slovenia we could use the already existent mechanism of the money that is being collected for the energy efficiency purposes with a supplement on price for fuels and electricity produced from the suppliers and paid by final consumers. The money is already gathered and need programmes for its use. For the small suppliers to prepare these programmes is the Eco Fund responsibility. Beside energy efficiency measures also RES-H is eligible for inclusion in the programmes. Since these supplements are paid by final consumers of the fossil fuels also the "polluter pays principle" is this way better attained than when the money comes from taxpayers.

Ad6: **Transaction costs optimisation**

Already with narrowing the scope of the tariff scheme to public sector only, which allows for use of existent organisations means much lower costs than in the case all sectors would apply. Further improvement could be done by including responsible ministries and municipalities (in case of primary schools and kindergartens); the former within their investment plans and the latter through the use the local (municipal) energy concepts (which obligatory). Also the local energy agencies could participate, e.g. through promotion and education. A long planned and never really born (for the time being there is only pilot version) of the EnGIS, Energy Geographical Information System, could mean a further improvement in terms of information gathering, updating and also in the promotable sense.

6 CONCLUSIONS

In order to achieve the set goals within the national REAP a significant improvement of the renewable heat support mechanisms and in some parts also for the renewable electricity production is needed. Building a twice to expensive lignite power plant, not to mention the unwanted GHG emissions, just maybe is not the right direction.

Irony apart, as we could see, there are a number of options available and new are developed still. Not all instruments apply for every sector and every purpose. In order to make support mechanisms successful they should be "*powerful, predictable and persistent*" if I am to borrow from Jacobsson and Bergek.

One of the tools or ways for excellence is to *model* the excellent. We do not need to go far to find that.
If we look at the neighbouring sector of RES-E the champion is easy to spot. Development of photovoltaic's in the recent years is quite astonishing in Slovenia. One asks oneself what is the reason for that. I am sure there are more; however, one thing is certain a well *designed* feed-in tariffs system.

The emphasis is on "***designed***". It is true that the things in the RES-E sector seems much easier than in RES-H, nevertheless, we can use experience from there – as it was not always that bright, we made our share of mistakes for sure. But they are valuable lessons and they do not need to be repeated again. Furthermore, we could make use of the existing apparatus (organisations that already deal with RES support) in place for setting in motion also the RES-H tariffs engine. In order to do that successfully, however the specifics of the RES-H sector with respect to the electricity needs to be respected and taken into consideration. Such differences are the lack of common grid and market for the renewable heat. A potentially much broader spectre of the incentive beneficiaries is to be expected; every household in principle could be eligible, what would call for the new intermediate elements or the so-called "transactors", which would act on their behalf versus the authorities.

The tariff or bonus model (for now still in theory) **performs** well against other means of financial incentives. The already well established government investment grants system can be a very successful mechanism, providing they are well designed too. The most important **features** of the efficiency of the support scheme are their thoughtful design and implementation. This is true also for the bonus model; however there are some **advantages** of the tariffs over the currently prevailing investment subsidies:

- It complies better with the “polluter pays principle” than grants system.
- It is more flexible than other mechanisms and allows for easier adaption to the circumstances, for example to the learning-curve-digressing costs of technology and hence the coming down of the tariffs; it can be shaped according to the relative economics of various technologies.
- It is a stable, long-term oriented incentive that enables a reliable return on investment, which improves bankability of the projects.
- The bonus scheme can be compatible with the existing subsidy support (or other forms); e.g. it can coexist with the grants for households for example.
- It allows for a more comprehensive view on the energy consumption and production in the near future as it could be nicely linked with the FIT scheme for RES-E production support.

To better understand how such support system could really look in practice, we can now look at the existing RHI scheme in the UK. It is already in place ant it is coming in force in June 2011. With respect to mine calculations it seems to have very high rates incorporated and for longer period (15-20 years). It is eligible for everyone, who produces heat from renewables and from all technologies. It covers also all sizes of the appliances.

When designing such system we could learn from it. E.g., which are all the aspects that need to be considered, how to ensure the energy efficiency compliance of the hating system (in order to avoid the support of inefficient use of renewable energy), how to deal with smaller beneficiaries, and also how to promote it efficiently.

From the case studies it is shown that the costs for such scheme can be at pair of the costs for the grants. With the tariffs in the range from 0.1 €c/kWh up to 0.9 €c/kWh should be able to achieve the desired effect in order to make investment feasible and attractive, e.g., 10 or less years of discounted payback period. A more thorough and comprehensive analysis for other technologies (e.g. solar thermal) and sizes (e.g. DH) should be made first. Transaction costs could be reduced if existent organisations like Eco Fund and Borzen would be involved and the scope at least for the start limited, e.g. to public buildings. Existent financing mechanism of the supplement on the fossil energy supplying, paid by consumers should suffice to cover the expenses for the tariffs RES-H support in the public sector.

Furthermore, it is likely that tariffs needed for smaller **scale** appliances in households sector would need to be higher and economic criteria set for the investment more attractive. This could raise the costs for the support mechanism and for the state/society they could be higher than in the case of the investment subsidises. Similar is the case with the greater scale, especially with the district heating, where mainly because of the additional costs for the heat grid but also because of the more demanded logistic, e.g. for biomass heating systems, the specific investment cost per kW of installed power tend to be higher than with the stand alone appliances.

Tariff system could mean a good way for supporting DH systems, when the bonuses would be passed to the plant operators or investors in case of contracting. However, an adaptation of the legislation on the green public procurement and private-public partnership should be made in order to act supportive toward RES-H projects.

If we design the tariff/bonus support system in such a way that it rally becomes *powerful, predictable and persistent* (as we managed with the PV sector) then it can really be a valuable piece of the puzzle in the big RES-H picture. The need to enhance the development in this sector but also in the renewable energy and in sustainable development as a whole is clear and maybe "*the man in different way than in the past at the end must return to the comprehension that he has to thank the free gift of the sun for his existence.*" Nicolas Georgescu-Roegen and Лéв Никола́евич Толсто́й (Lev NikolayevitchTolstoy) before him, were aware of that, the question is are we?

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Annexes

Annex 1.1 Economic calculation, Bor, no incentive

Project: **Bor Črni Vrh**
Connection rate: **100%**
Subvention: **0%**
Fuel: **Biomass**

	Periods/Years	0	1	2	3	4	5	6	7	8	9	10
Operational Balance	Connection rate:	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Sold heat [MWh]	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107
	Net revenue (€)											
	+ Incone from selling heat	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987
	Costs											
	- Biomass costs	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428
	- Heating costs with fuel oil	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233
	- Electricity	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439
	- Staff	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000
	- Other costs (material costs)	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830
	- Maintenance district heating grid	0	0	0	0	0	0	0	0	0	0	0
	- Maintenance boiler room	0	0	0	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275
	- maintenance heating stations	0	0	0	0	0	0	0	0	0	0	0
	= Operational Result EBITDA	16.056	16.056	16.056	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781
	- Depreciation	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133
	= Operational Result EBIT	6.923	6.923	6.923	3.648	3.648	3.648	3.648	3.648	3.648	3.648	3.648
	+ Gained interest		80	152	224	285	345	406	467	528	589	650
	= Gross profit EBT	6.923	7.003	7.075	3.872	3.932	3.993	4.053	4.114	4.175	4.237	4.298
	- Tax	0	-1.751	-1.769	-968	-983	-998	-1.013	-1.029	-1.044	-1.059	-1.075
	= Net profit	6.923	5.252	5.306	2.904	2.949	2.995	3.040	3.086	3.131	3.177	3.224
Money Flow Balance	+ neutral costs (Accounting linear and subvention)	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133
	- Investment	-150.000	0	0								
	+ Deinvestment											
	+ Capital input	0										
	+ Subvetion	0	0	0								
	+ Own equity	150.000	0	0								
	= Deficit/Suficit of cash flows	16.056	14.386	14.440	12.037	12.083	12.128	12.173	12.219	12.265	12.311	12.357
	Account condiion	16.056	30.442	44.881	56.919	69.001	81.129	93.302	105.521	117.786	130.097	142.454
	+ Net interest on account condition	0	80	152	224	285	345	406	467	528	589	650
Investment Financing	**Pay means**											
	- Proprietorial capital	150.000	0	0								
	- Gained interest	0	80	152	224	285	345	406	467	528	589	650
	+ Paid interest	0	0	0	0	0	0	0	0	0	0	0
	= Undiscounted net revenue	-133.944	14.305	14.287	11.813	11.798	11.783	11.768	11.752	11.737	11.722	11.706
	Discount rate	**5,00%**										
	x Discount factor	1,00	0,95	0,91	0,86	0,82	0,78	0,75	0,71	0,68	0,64	0,61
	Discounted net revenue	-133.944	13.624	12.959	10.205	9.706	9.232	8.781	8.352	7.944	7.556	7.187
	Cumulative discounted net revenue	-133.944	-120.320	-107.361	-97.156	-87.450	-78.218	-69.437	-61.084	-53.140	-45.584	-38.397
	Net prasent value (NPV)	**10.916**										
	Relativ net present value (RNPV)	**7,3%**										
Tax Calculation	**tax calculation**											
	= Business result	6.923	7.003	7.075	3.872	3.932	3.993	4.053	4.114	4.175	4.237	4.298
	- Investiment tax break 40% (max in height of taxable amount)	-6.923	0	0	0	0	0	0	0	0	0	0
	Loses transfer from previous years	0	0	0	0	0	0	0	0	0	0	0
	= Profit before tax	0	7.003	7.075	3.872	3.932	3.993	4.053	4.114	4.175	4.237	4.298
	Tax (taking into consideration the past losses)	0	-1.751	-1.769	-968	-983	-998	-1.013	-1.029	-1.044	-1.059	-1.075

	Periods/Years	11	12	13	14	15	16	17	18	19	20
Operational Balance	Connection rate:	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Sold heat [MWh]	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107
	Net revenue (€)										
	+ Incone from selling heat	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987
	Costs										
	- Biomass costs	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428
	- Heating costs with fuel oil	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233
	- Electricity	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439
	- Staff	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000
	- Other costs (material costs)	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830
	- Maintenance district heating grid	0	0	0	0	0	0	0	0	0	0
	- Maintenance boiler room	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275
	- maintenance heating stations	0	0	0	0	0	0	0	0	0	0
	= Operational Result EBITDA	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781
	- Depreciation	-9.133	-9.133	-9.133	-9.133	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000
	= Operational Result EBIT	3.648	3.648	3.648	3.648	9.781	9.781	9.781	9.781	9.781	9.781
	+ Gained interest	712	774	837	899	962	1.017	1.073	1.128	1.184	1.240
	= Gross profit EBT	4.360	4.422	4.484	4.547	10.743	10.798	10.854	10.909	10.965	11.021
	- Tax	-1.090	-1.105	-1.121	-1.137	-2.686	-2.700	-2.713	-2.727	-2.741	-2.755
	= Net profit	3.270	3.316	3.363	3.410	8.057	8.099	8.140	8.182	8.224	8.266
Money Flow Balance	+ neutral costs (Accounting linear and subvention)	9.133	9.133	9.133	9.133	3.000	3.000	3.000	3.000	3.000	3.000
	- Investment										
	+ Deinvestment										-5.000
	+ Capital input										
	+ Subvetion										
	+ Own equity										
	= Deficit/Suficit of cash flows	12.403	12.450	12.497	12.543	11.057	11.099	11.140	11.182	11.224	6.266
	Account condiion	154.857	167.307	179.804	192.347	203.404	214.503	225.643	236.825	248.048	254.314
	+ Net interest on account condition	712	774	837	899	962	1.017	1.073	1.128	1.184	1.240
Investment Financing	**Pay means**										
	- Proprietorial capital										
	- Gained interest	712	774	837	899	962	1.017	1.073	1.128	1.184	1.240
	+ Paid interest	0	0	0	0	0	0	0	0	0	0
	= Undiscounted net revenue	11.691	11.676	11.660	11.644	10.095	10.082	10.068	10.054	10.040	5.026
	Discount rate										
	x Discount factor	0,58	0,56	0,53	0,51	0,48	0,46	0,44	0,42	0,40	0,38
	Discounted net revenue	6.836	6.501	6.184	5.881	4.856	4.618	4.392	4.178	3.973	1.894
	Cumulative discounted net revenue	-31.562	-25.061	-18.877	-12.996	-8.140	-3.521	871	5.049	9.022	10.916
	Net prasent value (NPV)										
	Relativ net present value (RNPV)										
Tax Calculation	**tax calculation**										
	= Business result	4.360	4.422	4.484	4.547	10.743	10.798	10.854	10.909	10.965	11.021
	- Investiment tax break 40% (max in height of taxable amount)	0	0	0	0	0	0	0	0	0	0
	Loses transfer from previous years	0	0	0	0	0	0	0	0	0	0
	= Profit before tax	4.360	4.422	4.484	4.547	10.743	10.798	10.854	10.909	10.965	11.021
	Tax (taking into consideration the past losses)	-1.090	-1.105	-1.121	-1.137	-2.686	-2.700	-2.713	-2.727	-2.741	-2.755

Heat price (average price, connected power included)	0,06 EUR/kWh		heat price	0,06 EUR/kWh
Discounted payback period (brake even point)	17 years			
Simple payback period NCF	12 years		biomass price	0,02 EUR/kWh
Internal rate of return (IRR)	**6,0%**			

Annex 1.2 Economic calculation, Bor, 25% grants

	Project:	Bor Črni Vrh																			
	Connection rate:	**100%**																			
	Subvention:	**25%**																			
	Fuel:	**Biomass**																			
	Periods/Years	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Operational Balance	Connection rate:	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Sold heat [MWh]	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107
	Net revenue (€)																					
	+ Revenue from selling heat	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987
	Costs																					
	- Biomass costs	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428
	- Heating costs with fuel oil	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233
	- Electricity	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439
	- Staff	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000
	- Other costs (material costs)	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830
	- Maintenance district heating grid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	- Maintenance boiler room	0	0	0	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275
	- maintenance heating stations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	= Operational Result EBITDA	16.056	16.056	16.056	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781
	- Depreciation	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000
	= Operational Result EBIT	6.923	6.923	6.923	3.648	3.648	3.648	3.648	3.648	3.648	3.648	3.648	3.648	3.648	3.648	3.648	9.781	9.781	9.781	9.781	9.781	9.781
	+ Gained interest		80	152	224	285	345	406	467	528	589	650	712	774	837	899	962	1.017	1.073	1.128	1.184	1.240
	= Gross profit EBT	6.923	7.003	7.075	3.872	3.932	3.993	4.053	4.114	4.175	4.237	4.298	4.360	4.422	4.484	4.547	10.743	10.798	10.854	10.909	10.965	11.021
	- Tax	0	-1.751	-1.769	-968	-983	-998	-1.013	-1.029	-1.044	-1.059	-1.075	-1.090	-1.105	-1.121	-1.137	-2.686	-2.700	-2.713	-2.727	-2.741	-2.755
	= Net profit	6.923	5.252	5.306	2.904	2.949	2.995	3.040	3.086	3.131	3.177	3.224	3.270	3.316	3.363	3.410	8.057	8.099	8.140	8.182	8.224	8.266
Money Flow Balance	+ neutral costs (Accounting linear and subvention)	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	3.000	3.000	3.000	3.000	3.000	3.000
	- Investment	-150.000	0	0																		
	+ Deinvestment																					-5.000
	+ Capital input	0																				
	+ Subvetion	37.500	0	0																		
	+ Own equity	112.500	0	0																		
	= Deficit/Suficit of cash flows	16.056	14.386	14.440	12.037	12.083	12.128	12.173	12.219	12.265	12.311	12.357	12.403	12.450	12.497	12.543	11.057	11.099	11.140	11.182	11.224	6.266
	Account condiion	16.056	30.442	44.881	56.919	69.001	81.129	93.302	105.521	117.786	130.097	142.454	154.857	167.307	179.804	192.347	203.404	214.503	225.643	236.825	248.048	254.314
	+ Net interest on account condition	0	80	152	224	285	345	406	467	528	589	650	712	774	837	899	962	1.017	1.073	1.128	1.184	1.240
Investment Financing	**Pay means**																					
	- Proprietorial capital	112.500	0	0																		
	- Gained interest	0	80	152	224	285	345	406	467	528	589	650	712	774	837	899	962	1.017	1.073	1.128	1.184	1.240
	+ Paid interest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	= Undiscounted net revenue	-96.444	14.305	14.287	11.813	11.798	11.783	11.768	11.752	11.737	11.722	11.706	11.691	11.676	11.660	11.644	10.095	10.082	10.068	10.054	10.040	5.026
	Discount rate	**3,75%**																				
	x Discount factor	1,00	0,96	0,93	0,90	0,86	0,83	0,80	0,77	0,74	0,72	0,69	0,67	0,64	0,62	0,60	0,58	0,55	0,53	0,52	0,50	0,48
	Discounted net revenue	-96.444	13.788	13.273	10.578	10.183	9.802	9.435	9.083	8.743	8.416	8.101	7.798	7.506	7.225	6.955	5.812	5.594	5.384	5.183	4.988	2.407
	Cumulative discounted net revenue	-96.444	-82.656	-69.383	-58.805	-48.622	-38.820	-29.385	-20.302	-11.559	-3.143	4.958	12.756	20.262	27.487	34.442	40.254	45.848	51.232	56.414	61.403	63.809
	Net prasent value (NPV)	**63.809**																				
	Relativ net present value (RNPV)	**42,5%**																				
Tax Calculation	**tax calculation**																					
	= Business result	6.923	7.003	7.075	3.872	3.932	3.993	4.053	4.114	4.175	4.237	4.298	4.360	4.422	4.484	4.547	10.743	10.798	10.854	10.909	10.965	11.021
	- Investiment tax break 40% (max in height of taxable	-6.923	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Loses transfer from previous years	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	= Profit before tax	0	7.003	7.075	3.872	3.932	3.993	4.053	4.114	4.175	4.237	4.298	4.360	4.422	4.484	4.547	10.743	10.798	10.854	10.909	10.965	11.021
	Tax (taking into consideration the past losses)	0	-1.751	-1.769	-968	-983	-998	-1.013	-1.029	-1.044	-1.059	-1.075	-1.090	-1.105	-1.121	-1.137	-2.686	-2.700	-2.713	-2.727	-2.741	-2.755

Heat price (average price, connected power included)	0,06 EUR/kWh		heat price	0,06 EUR/kWh
Discounted payback period (brake even point)	10 years			
Simple payback period NCF	9 years		biomass price	0,02 EUR/kWh
Internal rate of return (IRR)	**10,9%**			

Annex 1.3 Economic calculation, Bor, bonus 0.6 €c/kWh

	Project:	Bor Črni Vrh																				
	Connection rate:	100%																				
	Bonus	0.6 €c/kWh																				
	Fuel:	Biomass																				
	Periods/Years	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Operational Balance	Connection rate:	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Sold heat [MWh]	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107
	Net revenue (€)																					
	+ Revenue from selling heat	66.710	66.710	66.710	66.710	66.710	66.710	66.710	66.710	66.710	66.710	66.710	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987
	Costs																					
	- Biomass costs	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428
	- Heating costs with fuel oil	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233
	- Electricity	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439
	- Staff	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000
	- Other costs (material costs)	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830
	- Maintenance district heating grid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	- Maintenance boiler room	0	0	0	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275
	- maintenance heating stations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	= Operational Result EBITDA	20.779	20.779	20.779	17.504	17.504	17.504	17.504	17.504	17.504	17.504	17.504	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781
	- Depreciation	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000
	= Operational Result EBIT	11.646	11.646	11.646	8.371	8.371	8.371	8.371	8.371	8.371	8.371	8.371	3.648	3.648	3.648	3.648	9.781	9.781	9.781	9.781	9.781	9.781
	+ Gained interest		104	194	284	362	440	519	598	677	757	837	917	980	1.043	1.106	1.169	1.226	1.282	1.338	1.395	1.452
	= Gross profit EBT	11.646	11.749	11.839	8.654	8.732	8.811	8.889	8.968	9.048	9.127	9.207	4.565	4.627	4.690	4.754	10.950	11.007	11.063	11.119	11.176	11.233
	- Tax	0	-2.937	-2.960	-2.164	-2.183	-2.203	-2.222	-2.242	-2.262	-2.282	-2.302	-1.141	-1.157	-1.173	-1.188	-2.738	-2.752	-2.766	-2.780	-2.794	-2.808
	= Net profit	11.646	8.812	8.879	6.491	6.549	6.608	6.667	6.726	6.786	6.846	6.905	3.423	3.471	3.518	3.565	8.213	8.255	8.297	8.339	8.382	8.425
Money Flow Balance	+ neutral costs (Accounting linear and subvention)	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	3.000	3.000	3.000	3.000	3.000	3.000
	- Investment	-150.000	0	0																		
	+ Deinvestment																					-5.000
	+ Capital input	0																				
	+ Subvetion	0	0	0																		
	+ Own equity	150.000	0	0																		
	= Deficit/Suficit of cash flows	20.779	17.945	18.013	15.624	15.683	15.741	15.800	15.860	15.919	15.979	16.039	12.557	12.604	12.651	12.699	11.213	11.255	11.297	11.339	11.382	6.425
	Account condiion	20.779	38.724	56.737	72.361	88.043	103.785	119.585	135.445	151.364	167.343	183.382	195.938	208.542	221.193	233.892	245.105	256.360	267.657	278.996	290.378	296.803
	+ Net interest on account condition	0	104	194	284	362	440	519	598	677	757	837	917	980	1.043	1.106	1.169	1.226	1.282	1.338	1.395	1.452
Investment Financing	**Pay means**																					
	- Proprietorial capital	150.000	0	0																		
	- Gained interest	0	104	194	284	362	440	519	598	677	757	837	917	980	1.043	1.106	1.169	1.226	1.282	1.338	1.395	1.452
	+ Paid interest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	= Undiscounted net revenue	-129.221	17.841	17.819	15.340	15.321	15.301	15.281	15.262	15.242	15.222	15.202	11.640	11.624	11.608	11.593	10.043	10.029	10.015	10.001	9.987	4.973
	Discount rate	**5,00%**																				
	x Discount factor	1,00	0,95	0,91	0,86	0,82	0,78	0,75	0,71	0,68	0,64	0,61	0,58	0,56	0,53	0,51	0,48	0,46	0,44	0,42	0,40	0,38
	Discounted net revenue	-129.221	16.992	16.162	13.252	12.604	11.989	11.403	10.846	10.316	9.812	9.333	6.806	6.473	6.156	5.855	4.831	4.595	4.370	4.156	3.952	1.874
	Cumulative discounted net revenue	-129.221	-112.229	-96.067	-82.815	-70.211	-58.222	-46.819	-35.973	-25.656	-15.844	-6.511	294	6.767	12.923	18.778	23.609	28.204	32.574	36.729	40.682	42.556
	Net prasent value (NPV)	**42.556**																				
	Relativ net present value (RNPV)	**28,4%**																				
Tax Calculation	**tax calculation**																					
	= Business result	11.646	11.749	11.839	8.654	8.732	8.811	8.889	8.968	9.048	9.127	9.207	4.565	4.627	4.690	4.754	10.950	11.007	11.063	11.119	11.176	11.233
	- Investiment tax break 40% (max in height of taxable amo	-11.646	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Loses transfer from previous years	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	= Profit before tax	0	11.749	11.839	8.654	8.732	8.811	8.889	8.968	9.048	9.127	9.207	4.565	4.627	4.690	4.754	10.950	11.007	11.063	11.119	11.176	11.233
	Tax (taking into consideration the past losses)	0	-2.937	-2.960	-2.164	-2.183	-2.203	-2.222	-2.242	-2.262	-2.282	-2.302	-1.141	-1.157	-1.173	-1.188	-2.738	-2.752	-2.766	-2.780	-2.794	-2.808

Heat price (average price, connected power included)	0,06 EUR/kWh		heat price	0,06 EUR/kWh
Discounted payback period (brake even point)	11 years			
Simple payback period NCF	9 years		biomass price	0,02 EUR/kWh
Internal rate of return (IRR)	**9,2%**			

Annex 1.4 Economic calculation, Bor, bonus 0.8 €c/kWh

	Project:	**Bor Črni Vrh**																			
	Connection rate:	**100%**																			
	Subvention:	**0.8 €c/kWh**																			
	Fuel:	**Biomass**																			
	Periods/Years	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Operational Balance	Connection rate:	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Sold heat [MWh]	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107
	Net revenue (€)																					
	+ Revenue from selling heat	68.284	68.284	68.284	68.284	68.284	68.284	68.284	68.284	68.284	68.284	68.284	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987	61.987
	Costs																					
	- Biomass costs	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428	-21.428
	- Heating costs with fuel oil	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233	-19.233
	- Electricity	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439	-1.439
	- Staff	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000
	- Other costs (material costs)	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830	-830
	- Maintenance district heating grid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	- Maintenance boiler room	0	0	0	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275	-3.275
	- maintenance heating stations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	= Operational Result EBITDA	22.353	22.353	22.353	19.078	19.078	19.078	19.078	19.078	19.078	19.078	19.078	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781	12.781
	- Depreciation	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-9.133	-3.000	-3.000	-3.000	-3.000	-3.000	-3.000
	= Operational Result EBIT	13.220	13.220	13.220	9.945	9.945	9.945	9.945	9.945	9.945	9.945	9.945	3.648	3.648	3.648	3.648	9.781	9.781	9.781	9.781	9.781	9.781
	+ Gained interest		112	207	303	388	472	557	642	727	813	899	985	1.048	1.111	1.175	1.239	1.295	1.352	1.408	1.465	1.522
	= Gross profit EBT	13.220	13.332	13.427	10.248	10.332	10.417	10.501	10.587	10.672	10.758	10.844	4.633	4.696	4.759	4.823	11.020	11.076	11.133	11.189	11.246	11.303
	- Tax	0	-3.333	-3.357	-2.562	-2.583	-2.604	-2.625	-2.647	-2.668	-2.689	-2.711	-1.158	-1.174	-1.190	-1.206	-2.755	-2.769	-2.783	-2.797	-2.812	-2.826
	= Net profit	13.220	9.999	10.070	7.686	7.749	7.813	7.876	7.940	8.004	8.068	8.133	3.475	3.522	3.569	3.617	8.265	8.307	8.349	8.392	8.435	8.478
Money Flow Balance	+ neutral costs (Accounting linear and subvention)	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	9.133	3.000	3.000	3.000	3.000	3.000	3.000
	- Investment	-150.000	0	0																		
	+ Deinvestment																					-5.000
	+ Capital input	0																				
	+ Subvetion	0	0	0																		
	+ Own equity	150.000	0	0																		
	= Deficit/Suficit of cash flows	22.353	19.132	19.204	16.820	16.883	16.946	17.009	17.073	17.137	17.202	17.266	12.608	12.655	12.703	12.750	11.265	11.307	11.349	11.392	11.435	6.478
	Account condiion	22.353	41.485	60.689	77.508	94.391	111.337	128.346	145.419	162.557	179.758	197.024	209.632	222.287	234.990	247.740	259.005	270.312	281.662	293.054	304.488	310.966
	+ Net interest on account condition	0	112	207	303	388	472	557	642	727	813	899	985	1.048	1.111	1.175	1.239	1.295	1.352	1.408	1.465	1.522
Investment Financing	**Pay means**																					
	- Proprietorial capital	150.000	0	0																		
	- Gained interest	0	112	207	303	388	472	557	642	727	813	899	985	1.048	1.111	1.175	1.239	1.295	1.352	1.408	1.465	1.522
	+ Paid interest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	= Undiscounted net revenue	-127.647	19.020	18.996	16.516	16.495	16.474	16.453	16.431	16.410	16.389	16.367	11.623	11.607	11.591	11.575	10.026	10.012	9.998	9.984	9.969	4.955
	Discount rate	**5,00%**																				
	x Discount factor	1,00	0,95	0,91	0,86	0,82	0,78	0,75	0,71	0,68	0,64	0,61	0,58	0,56	0,53	0,51	0,48	0,46	0,44	0,42	0,40	0,38
	Discounted net revenue	-127.647	18.115	17.230	14.267	13.571	12.908	12.277	11.678	11.107	10.564	10.048	6.796	6.463	6.147	5.846	4.823	4.587	4.362	4.148	3.945	1.868
	Cumulative discounted net revenue	-127.647	-109.532	-92.302	-78.035	-64.464	-51.557	-39.279	-27.602	-16.495	-5.931	4.118	10.913	17.376	23.524	29.370	34.193	38.779	43.141	47.290	51.235	53.102
	Net prasent value (NPV)	**53.102**																				
	Relativ net present value (RNPV)	**35,4%**																				
Tax Calculation	**tax calculation**																					
	= Business result	13.220	13.332	13.427	10.248	10.332	10.417	10.501	10.587	10.672	10.758	10.844	4.633	4.696	4.759	4.823	11.020	11.076	11.133	11.189	11.246	11.303
	- Investiment tax break 40% (max in height of taxable amount	-13.220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Loses transfer from previous years	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	= Profit before tax	0	13.332	13.427	10.248	10.332	10.417	10.501	10.587	10.672	10.758	10.844	4.633	4.696	4.759	4.823	11.020	11.076	11.133	11.189	11.246	11.303
	Tax (taking into consideration the past losses)	0	-3.333	-3.357	-2.562	-2.583	-2.604	-2.625	-2.647	-2.668	-2.689	-2.711	-1.158	-1.174	-1.190	-1.206	-2.755	-2.769	-2.783	-2.797	-2.812	-2.826

Heat price (average price, connected power included)	0,07 EUR/kWh		heat price	0,07 EUR/kWh
Discounted payback period (brake even point)	10 years			
Simple payback period NCF	8 years		biomass price	0,02 EUR/kWh
Internal rate of return (IRR)	**10,4%**			

Annex 2.1 Economic calculation, SGLŠ Postojna, no incentive

	Project:	**SGLŠ Postojna**										
	Connection rate:	**100%**										
	Subvention:	**0%**										
	Fuel:	**Biomass**										
	Periods/Years	0	1	2	3	4	5	6	7	8	9	10
Operational Balance	Connection rate:	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Sold heat [MWh]	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458
	Net revenue (€)											
	+ Revenue from selling heat	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885
	Costs											
	- Biomass costs	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258
	- Heating costs with fuel oil	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845
	- Electricity	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099
	- Staff	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000
	- Other costs (material costs)	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093
	- Maintenance district heating grid	0	0	0	0	0	0	0	0	0	0	0
	- Maintenance boiler room	0	0	0	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390
	- maintenance heating stations	0	0	0	0	0	0	0	0	0	0	0
	= Operational Result EBITDA	31.589	31.589	31.589	27.199	27.199	27.199	27.199	27.199	27.199	27.199	27.199
	- Depreciation	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753
	= Operational Result EBIT	20.836	20.836	20.836	16.446	16.446	16.446	16.446	16.446	16.446	16.446	16.446
	+ Gained interest		158	290	423	540	658	776	894	1.013	1.132	1.252
	= Gross profit EBT	20.836	20.994	21.126	16.869	16.986	17.104	17.221	17.340	17.459	17.578	17.697
	- Tax	0	-5.248	-5.282	-4.217	-4.247	-4.276	-4.305	-4.335	-4.365	-4.394	-4.424
	= Net profit	20.836	15.745	15.845	12.652	12.740	12.828	12.916	13.005	13.094	13.183	13.273
Money Flow Balance	+ neutral costs (Accounting linear and subvention)	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753
	- Investment	-215.900	0	0								
	+ Deinvestment											
	+ Capital input	0										
	+ Subvetion	0	0	0								
	+ Own equity	215.900	0	0								
	= Deficit/Suficit of cash flows	31.589	26.498	26.598	23.405	23.493	23.581	23.669	23.758	23.847	23.937	24.026
	Account condiion	31.589	58.087	84.685	108.090	131.583	155.164	178.834	202.592	226.439	250.376	274.402
	+ Net interest on account condition	0	158	290	423	540	658	776	894	1.013	1.132	1.252
Investment Financing	**Pay means**											
	- Proprietorial capital	215.900	0	0								
	- Gained interest	0	158	290	423	540	658	776	894	1.013	1.132	1.252
	+ Paid interest	0	0	0	0	0	0	0	0	0	0	0
	= Undiscounted net revenue	-184.311	26.341	26.307	22.982	22.952	22.923	22.894	22.864	22.834	22.804	22.775
	Discount rate	**5,00%**										
	x Discount factor	1,00	0,95	0,91	0,86	0,82	0,78	0,75	0,71	0,68	0,64	0,61
	Discounted net revenue	-184.311	25.086	23.862	19.852	18.883	17.961	17.084	16.249	15.455	14.700	13.982
	Cumulative discounted net revenue	-184.311	-159.225	-135.363	-115.511	-96.628	-78.667	-61.583	-45.334	-29.879	-15.179	-1.198
	Net prasent value (NPV)	**117.207**										
	Relativ net present value (RNPV)	**54,3%**										
Tax Calculation	**tax calculation**											
	= Business result	20.836	20.994	21.126	16.869	16.986	17.104	17.221	17.340	17.459	17.578	17.697
	- Investiment tax break 40% (max in height of taxable amount	-20.836	0	0	0	0	0	0	0	0	0	0
	Loses transfer from previous years	0	0	0	0	0	0	0	0	0	0	0
	= Profit before tax	0	20.994	21.126	16.869	16.986	17.104	17.221	17.340	17.459	17.578	17.697
	Tax (taking into consideration the past losses)	0	-5.248	-5.282	-4.217	-4.247	-4.276	-4.305	-4.335	-4.365	-4.394	-4.424

	Periods/Years	11	12	13	14	15	16	17	18	19	20
Operational Balance	Connection rate:	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Sold heat [MWh]	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458
	Net revenue (€)										
	+ Revenue from selling heat	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885
	Costs										
	- Biomass costs	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258
	- Heating costs with fuel oil	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845
	- Electricity	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099
	- Staff	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000
	- Other costs (material costs)	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093
	- Maintenance district heating grid	0	0	0	0	0	0	0	0	0	0
	- Maintenance boiler room	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390
	- maintenance heating stations	0	0	0	0	0	0	0	0	0	0
	= Operational Result EBITDA	27.199	27.199	27.199	27.199	27.199	27.199	27.199	27.199	27.199	27.199
	- Depreciation	-10.753	-10.753	-10.753	-10.753	-1.560	-1.560	-1.560	-1.560	-1.560	-1.560
	= Operational Result EBIT	16.446	16.446	16.446	16.446	25.639	25.639	25.639	25.639	25.639	25.639
	+ Gained interest	1.372	1.493	1.614	1.735	1.857	1.968	2.079	2.191	2.303	2.416
	= Gross profit EBT	17.818	17.938	18.059	18.181	27.496	27.607	27.718	27.830	27.942	28.055
	- Tax	-4.454	-4.485	-4.515	-4.545	-6.874	-6.902	-6.930	-6.957	-6.986	-7.014
	= Net profit	13.363	13.454	13.544	13.636	20.622	20.705	20.789	20.872	20.957	21.041
Money Flow Balance	+ neutral costs (Accounting linear and subvention)	10.753	10.753	10.753	10.753	1.560	1.560	1.560	1.560	1.560	1.560
	- Investment										
	+ Deinvestment										45.240
	+ Capital input										
	+ Subvetion										
	+ Own equity										
	= Deficit/Suficit of cash flows	24.117	24.207	24.298	24.389	22.182	22.265	22.349	22.432	22.517	67.841
	Account condiion	298.519	322.726	347.023	371.412	393.594	415.859	438.208	460.641	483.157	550.998
	+ Net interest on account condition	1.372	1.493	1.614	1.735	1.857	1.968	2.079	2.191	2.303	2.416
Investment Financing	**Pay means**										
	- Proprietorial capital										
	- Gained interest	1.372	1.493	1.614	1.735	1.857	1.968	2.079	2.191	2.303	2.416
	+ Paid interest	0	0	0	0	0	0	0	0	0	0
	= Undiscounted net revenue	22.745	22.714	22.684	22.654	20.325	20.297	20.269	20.241	20.213	65.425
	Discount rate										
	x Discount factor	0,58	0,56	0,53	0,51	0,48	0,46	0,44	0,42	0,40	0,38
	Discounted net revenue	13.298	12.648	12.030	11.442	9.777	9.298	8.843	8.411	7.999	24.658
	Cumulative discounted net revenue	12.101	24.749	36.779	48.220	57.997	67.295	76.139	84.550	92.549	117.207
Tax Calculation	**tax calculation**										
	= Business result	17.818	17.938	18.059	18.181	27.496	27.607	27.718	27.830	27.942	28.055
	- Investiment tax break 40% (max in height of taxable amount	0	0	0	0	0	0	0	0	0	0
	Loses transfer from previous years	0	0	0	0	0	0	0	0	0	0
	= Profit before tax	17.818	17.938	18.059	18.181	27.496	27.607	27.718	27.830	27.942	28.055
	Tax (taking into consideration the past losses)	-4.454	-4.485	-4.515	-4.545	-6.874	-6.902	-6.930	-6.957	-6.986	-7.014

Heat price (average price, connected power included)	0,06 EUR/kWh		heat price	0,06 EUR/kWh
Discounted payback period (brake even point)	11 years			
Simple payback period NCF	8 years		biomass price	0,02 EUR/kWh
Internal rate of return (IRR)	**11,5%**			

Annex 2.2 Economic calculation, SGLŠ Postojna, 25% grants

Project:	**SGLŠ Postojna**
Connection rate:	**100%**
Subvention:	**25%**
Fuel:	**Biomass**

Periods/Years	0	1	2	3	4	5	6	7	8	9	10
Operational Balance											
Connection rate:	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sold heat [MWh]	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458
Net revenue (€)											
+ Revenue from selling heat	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885
Costs											
- Biomass costs	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258
- Heating costs with fuel oil	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845
- Electricity	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099
- Staff	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000
- Other costs (material costs)	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093
- Maintenance district heating grid	0	0	0	0	0	0	0	0	0	0	0
- Maintenance boiler room	0	0	0	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390
- maintenance heating stations	0	0	0	0	0	0	0	0	0	0	0
= Operational Result EBITDA	31.589	31.589	31.589	27.199	27.199	27.199	27.199	27.199	27.199	27.199	27.199
- Depreciation	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753
= Operational Result EBIT	20.836	20.836	20.836	16.446	16.446	16.446	16.446	16.446	16.446	16.446	16.446
+ Gained interest		158	290	423	540	658	776	894	1.013	1.132	1.252
= Gross profit EBT	20.836	20.994	21.126	16.869	16.986	17.104	17.221	17.340	17.459	17.578	17.697
- Tax	0	-5.248	-5.282	-4.217	-4.247	-4.276	-4.305	-4.335	-4.365	-4.394	-4.424
= Net profit	20.836	15.745	15.845	12.652	12.740	12.828	12.916	13.005	13.094	13.183	13.273
Money Flow Balance											
+ neutral costs (Accounting linear and subvention)	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753
- Investment	-215.900	0	0								
+ Deinvestment											
+ Capital input	0										
+ Subvetion	53.975	0	0								
+ Own equity	161.925	0	0								
= Deficit/Suficit of cash flows	31.589	26.498	26.598	23.405	23.493	23.581	23.669	23.758	23.847	23.937	24.026
Account condiion	31.589	58.087	84.685	108.090	131.583	155.164	178.834	202.592	226.439	250.376	274.402
+ Net interest on account condition	0	158	290	423	540	658	776	894	1.013	1.132	1.252
Investment Financing											
Pay means											
- Proprietorial capital	161.925	0	0								
- Gained interest	0	158	290	423	540	658	776	894	1.013	1.132	1.252
+ Paid interest	0	0	0	0	0	0	0	0	0	0	0
= Undiscounted net revenue	-130.336	26.341	26.307	22.982	22.952	22.923	22.894	22.864	22.834	22.804	22.775
Discount rate	**3,75%**										
x Discount factor	1,00	0,96	0,93	0,90	0,86	0,83	0,80	0,77	0,74	0,72	0,69
Discounted net revenue	-130.336	25.388	24.440	20.579	19.810	19.069	18.356	17.670	17.009	16.373	15.760
Cumulative discounted net revenue	-130.336	-104.948	-80.508	-59.929	-40.119	-21.050	-2.694	14.976	31.985	48.358	64.119
Net prasent value (NPV)	**207.091**										
Relativ net present value (RNPV)	**95,9%**										
Tax Calculation											
tax calculation											
= Business result	20.836	20.994	21.126	16.869	16.986	17.104	17.221	17.340	17.459	17.578	17.697
- Investiment tax break 40% (max in height of taxable amou	-20.836	0	0	0	0	0	0	0	0	0	0
Loses transfer from previous years	0	0	0	0	0	0	0	0	0	0	0
= Profit before tax	0	20.994	21.126	16.869	16.986	17.104	17.221	17.340	17.459	17.578	17.697
Tax (taking into consideration the past losses)	0	-5.248	-5.282	-4.217	-4.247	-4.276	-4.305	-4.335	-4.365	-4.394	-4.424

Periods/Years	11	12	13	14	15	16	17	18	19	20
Operational Balance										
Connection rate:	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sold heat [MWh]	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458
Net revenue (€)										
+ Revenue from selling heat	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885
Costs										
- Biomass costs	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258
- Heating costs with fuel oil	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845
- Electricity	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099
- Staff	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000
- Other costs (material costs)	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093
- Maintenance district heating grid	0	0	0	0	0	0	0	0	0	0
- Maintenance boiler room	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390
- maintenance heating stations	0	0	0	0	0	0	0	0	0	0
= Operational Result EBITDA	27.199	27.199	27.199	27.199	27.199	27.199	27.199	27.199	27.199	27.199
- Depreciation	-10.753	-10.753	-10.753	-10.753	-1.560	-1.560	-1.560	-1.560	-1.560	-1.560
= Operational Result EBIT	16.446	16.446	16.446	16.446	25.639	25.639	25.639	25.639	25.639	25.639
+ Gained interest	1.372	1.493	1.614	1.735	1.857	1.968	2.079	2.191	2.303	2.416
= Gross profit EBT	17.818	17.938	18.059	18.181	27.496	27.607	27.718	27.830	27.942	28.055
- Tax	-4.454	-4.485	-4.515	-4.545	-6.874	-6.902	-6.930	-6.957	-6.986	-7.014
= Net profit	13.363	13.454	13.544	13.636	20.622	20.705	20.789	20.872	20.957	21.041
Money Flow Balance										
+ neutral costs (Accounting linear and subvention)	10.753	10.753	10.753	10.753	1.560	1.560	1.560	1.560	1.560	1.560
- Investment										
+ Deinvestment										45.240
+ Capital input										
+ Subvetion										
+ Own equity										
= Deficit/Suficit of cash flows	24.117	24.207	24.298	24.389	22.182	22.265	22.349	22.432	22.517	67.841
Account condiion	298.519	322.726	347.023	371.412	393.594	415.859	438.208	460.641	483.157	550.998
+ Net interest on account condition	1.372	1.493	1.614	1.735	1.857	1.968	2.079	2.191	2.303	2.416
Investment Financing										
Pay means										
- Proprietorial capital										
- Gained interest	1.372	1.493	1.614	1.735	1.857	1.968	2.079	2.191	2.303	2.416
+ Paid interest	0	0	0	0	0	0	0	0	0	0
= Undiscounted net revenue	22.745	22.714	22.684	22.654	20.325	20.297	20.269	20.241	20.213	65.425
Discount rate										
x Discount factor	0,67	0,64	0,62	0,60	0,58	0,55	0,53	0,52	0,50	0,48
Discounted net revenue	15.171	14.603	14.056	13.530	11.701	11.262	10.840	10.434	10.043	31.332
Cumulative discounted net revenue	79.289	93.893	107.949	121.479	133.180	144.442	155.282	165.717	175.760	207.091
Tax Calculation										
tax calculation										
= Business result	17.818	17.938	18.059	18.181	27.496	27.607	27.718	27.830	27.942	28.055
- Investiment tax break 40% (max in height of taxable amou	0	0	0	0	0	0	0	0	0	0
Loses transfer from previous years	0	0	0	0	0	0	0	0	0	0
= Profit before tax	17.818	17.938	18.059	18.181	27.496	27.607	27.718	27.830	27.942	28.055
Tax (taking into consideration the past losses)	-4.454	-4.485	-4.515	-4.545	-6.874	-6.902	-6.930	-6.957	-6.986	-7.014

Heat price (average price, connected power included)	0,06 EUR/kWh		heat price	0,06 EUR/kWh
Discounted payback period (brake even point)	7 years			
Simple payback period NCF	6 years		biomass price	0,02 EUR/kWh
Internal rate of return (IRR)	**17,7%**			

Annex 2.3 Economic calculation, SGLŠ Postojna, bonus 0.1 €c/kWh

	Project:	SGLŠ Postojna																				
	Connection rate:	100%																				
	Bonus:	0,1 €c/kWh																				
	Fuel:	Biomass																				
	Periods/Years	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Operational Balance	Connection rate:	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Sold heat [MWh]	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458
	Net revenue (€)																					
	+ Revenue from selling heat	87.105	87.105	87.105	87.105	87.105	87.105	87.105	87.105	87.105	87.105	87.105	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885
	Costs																					
	- Biomass costs	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258
	- Heating costs with fuel oil	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845
	- Electricity	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099
	- Staff	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000
	- Other costs (material costs)	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093
	- Maintenance district heating grid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	- Maintenance boiler room	0	0	0	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390
	- maintenance heating stations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	= Operational Result EBITDA	32.809	32.809	32.809	28.419	28.419	28.419	28.419	28.419	28.419	28.419	28.419	27.199	27.199	27.199	27.199	27.199	27.199	27.199	27.199	27.199	27.199
	- Depreciation	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-1.560	-1.560	-1.560	-1.560	-1.560	-1.560
	= Operational Result EBIT	22.055	22.055	22.055	17.665	17.665	17.665	17.665	17.665	17.665	17.665	17.665	16.446	16.446	16.446	16.446	25.639	25.639	25.639	25.639	25.639	25.639
	+ Gained interest		164	301	439	560	683	805	928	1.052	1.176	1.300	1.425	1.546	1.667	1.789	1.911	2.022	2.133	2.245	2.358	2.470
	= Gross profit EBT	22.055	22.219	22.356	18.104	18.226	18.348	18.470	18.593	18.717	18.841	18.965	17.870	17.991	18.112	18.234	27.550	27.661	27.772	27.884	27.997	28.109
	- Tax	0	-5.555	-5.589	-4.526	-4.556	-4.587	-4.618	-4.648	-4.679	-4.710	-4.741	-4.468	-4.498	-4.528	-4.559	-6.887	-6.915	-6.943	-6.971	-6.999	-7.027
	= Net profit	22.055	16.665	16.767	13.578	13.669	13.761	13.853	13.945	14.038	14.131	14.224	13.403	13.493	13.584	13.676	20.662	20.746	20.829	20.913	20.997	21.082
Money Flow Balance	+ neutral costs (Accounting linear and subvention)	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753	1.560	1.560	1.560	1.560	1.560	1.560
	- Investment	-215.900	0	0																		
	+ Deinvestment																					45.240
	+ Capital input	0																				
	+ Subvetion	0	0	0																		
	+ Own equity	215.900	0	0																		
	= Deficit/Suficit of cash flows	32.809	27.418	27.521	24.331	24.423	24.514	24.606	24.698	24.791	24.884	24.977	24.156	24.247	24.338	24.429	22.222	22.306	22.389	22.473	22.557	67.882
	Account condiion	32.809	60.227	87.747	112.079	136.501	161.015	185.622	210.320	235.111	259.995	284.972	309.129	333.375	357.713	382.142	404.364	426.670	449.059	471.532	494.090	561.972
	+ Net interest on account condition	0	164	301	439	560	683	805	928	1.052	1.176	1.300	1.425	1.546	1.667	1.789	1.911	2.022	2.133	2.245	2.358	2.470
Investment Financing	**Pay means**																					
	- Proprietorial capital	215.900	0	0																		
	- Gained interest	0	164	301	439	560	683	805	928	1.052	1.176	1.300	1.425	1.546	1.667	1.789	1.911	2.022	2.133	2.245	2.358	2.470
	+ Paid interest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	= Undiscounted net revenue	-183.091	27.254	27.220	23.893	23.862	23.832	23.801	23.770	23.739	23.708	23.677	22.731	22.701	22.671	22.640	20.312	20.284	20.256	20.228	20.200	65.412
	Discount rate	**5,00%**																				
	x Discount factor	1,00	0,95	0,91	0,86	0,82	0,78	0,75	0,71	0,68	0,64	0,61	0,58	0,56	0,53	0,51	0,48	0,46	0,44	0,42	0,40	0,38
	Discounted net revenue	-183.091	25.956	24.689	20.639	19.632	18.673	17.761	16.893	16.068	15.283	14.536	13.291	12.641	12.023	11.435	9.770	9.292	8.838	8.405	7.994	24.653
	Cumulative discounted net revenue	-183.091	-157.135	-132.446	-111.807	-92.175	-73.503	-55.742	-38.849	-22.781	-7.498	7.037	20.328	32.969	44.992	56.427	66.197	75.489	84.327	92.732	100.725	125.378
	Net prasent value (NPV)	**125.378**																				
	Relativ net present value (RNPV)	**58,1%**																				
Tax Calculation	**tax calculation**																					
	= Business result	22.055	22.219	22.356	18.104	18.226	18.348	18.470	18.593	18.717	18.841	18.965	17.870	17.991	18.112	18.234	27.550	27.661	27.772	27.884	27.997	28.109
	- Investiment tax break 40% (max in height of taxable amour	-22.055	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Loses transfer from previous years	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	= Profit before tax	0	22.219	22.356	18.104	18.226	18.348	18.470	18.593	18.717	18.841	18.965	17.870	17.991	18.112	18.234	27.550	27.661	27.772	27.884	27.997	28.109
	Tax (taking into consideration the past losses)	0	-5.555	-5.589	-4.526	-4.556	-4.587	-4.618	-4.648	-4.679	-4.710	-4.741	-4.468	-4.498	-4.528	-4.559	-6.887	-6.915	-6.943	-6.971	-6.999	-7.027

Heat price (average price, connected power included)	0,06 EUR/kWh		heat price	0,06 EUR/kWh
Discounted payback period (brake even point)	10 years			
Simple payback period NCF	8 years		biomass price	0,02 EUR/kWh
Internal rate of return (IRR)	**12,1%**			

Annex 2.4 Economic calculation, SGLŠ Postojna, bonus 0.9 €c/kWh

Project: SGLŠ Postojna
Connection rate: 100%
Bonus: 0,9 €c/kWh
Fuel: Biomass

Section	Periods/Years	0	1	2	3	4	5	6	7	8	9	10
Operational Balance	Connection rate:	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Sold heat [MWh]	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458
	Net revenue (€)											
	+ Revenue from selling heat	87.105	87.105	87.105	87.105	87.105	87.105	87.105	87.105	87.105	87.105	87.105
	Costs											
	- Biomass costs	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258
	- Heating costs with fuel oil	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845
	- Electricity	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099
	- Staff	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000
	- Other costs (material costs)	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093
	- Maintenance district heating grid	0	0	0	0	0	0	0	0	0	0	0
	- Maintenance boiler room	0	0	0	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390
	- maintenance heating stations	0	0	0	0	0	0	0	0	0	0	0
	= Operational Result EBITDA	32.809	32.809	32.809	28.419	28.419	28.419	28.419	28.419	28.419	28.419	28.419
	- Depreciation	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753	-10.753
	= Operational Result EBIT	22.055	22.055	22.055	17.665	17.665	17.665	17.665	17.665	17.665	17.665	17.665
	+ Gained interest		164	301	439	560	683	805	928	1.052	1.176	1.300
	= Gross profit EBT	22.055	22.219	22.356	18.104	18.226	18.348	18.470	18.593	18.717	18.841	18.965
	- Tax	0	-5.555	-5.589	-4.526	-4.556	-4.587	-4.618	-4.648	-4.679	-4.710	-4.741
	= Net profit	22.055	16.665	16.767	13.578	13.669	13.761	13.853	13.945	14.038	14.131	14.224
Money Flow Balance	+ neutral costs (Accounting linear and subvention)	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753	10.753
	- Investment	-215.900	0	0								
	+ Deinvestment											
	+ Capital input	0										
	+ Subvetion	0	0	0								
	+ Own equity	215.900	0	0								
	= Deficit/Suficit of cash flows	32.809	27.418	27.521	24.331	24.423	24.514	24.606	24.698	24.791	24.884	24.977
	Account condiion	32.809	60.227	87.747	112.079	136.501	161.015	185.622	210.320	235.111	259.995	284.972
	+ Net interest on account condition	0	164	301	439	560	683	805	928	1.052	1.176	1.300
Investment Financing	**Pay means**											
	- Proprietorial capital	215.900	0	0								
	- Gained interest	0	164	301	439	560	683	805	928	1.052	1.176	1.300
	+ Paid interest	0	0	0	0	0	0	0	0	0	0	0
	= Undiscounted net revenue	-183.091	27.254	27.220	23.893	23.862	23.832	23.801	23.770	23.739	23.708	23.677
	Discount rate	**5,00%**										
	x Discount factor	1,00	0,95	0,91	0,86	0,82	0,78	0,75	0,71	0,68	0,64	0,61
	Discounted net revenue	-183.091	25.956	24.689	20.639	19.632	18.673	17.761	16.893	16.068	15.283	14.536
	Cumulative discounted net revenue	-183.091	-157.135	-132.446	-111.807	-92.175	-73.503	-55.742	-38.849	-22.781	-7.498	7.037
	Net prasent value (NPV)	**125.378**										
	Relativ net present value (RNPV)	**58,1%**										
Tax Calculation	**tax calculation**											
	= Business result	22.055	22.219	22.356	18.104	18.226	18.348	18.470	18.593	18.717	18.841	18.965
	- Investiment tax break 40% (max in height of taxable amour	-22.055	0	0	0	0	0	0	0	0	0	0
	Loses transfer from previous years	0	0	0	0	0	0	0	0	0	0	0
	= Profit before tax	0	22.219	22.356	18.104	18.226	18.348	18.470	18.593	18.717	18.841	18.965
	Tax (taking into consideration the past losses)	0	-5.555	-5.589	-4.526	-4.556	-4.587	-4.618	-4.648	-4.679	-4.710	-4.741

Section	Periods/Years	11	12	13	14	15	16	17	18	19	20
Operational Balance	Connection rate:	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Sold heat [MWh]	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458
	Net revenue (€)										
	+ Revenue from selling heat	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885	85.885
	Costs										
	- Biomass costs	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258	-31.258
	- Heating costs with fuel oil	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845	-15.845
	- Electricity	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099	-2.099
	- Staff	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000	-4.000
	- Other costs (material costs)	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093	-1.093
	- Maintenance district heating grid	0	0	0	0	0	0	0	0	0	0
	- Maintenance boiler room	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390	-4.390
	- maintenance heating stations	0	0	0	0	0	0	0	0	0	0
	= Operational Result EBITDA	27.199	27.199	27.199	27.199	27.199	27.199	27.199	27.199	27.199	27.199
	- Depreciation	-10.753	-10.753	-10.753	-10.753	-1.560	-1.560	-1.560	-1.560	-1.560	-1.560
	= Operational Result EBIT	16.446	16.446	16.446	16.446	25.639	25.639	25.639	25.639	25.639	25.639
	+ Gained interest	1.425	1.546	1.667	1.789	1.911	2.022	2.133	2.245	2.358	2.470
	= Gross profit EBT	17.870	17.991	18.112	18.234	27.550	27.661	27.772	27.884	27.997	28.109
	- Tax	-4.468	-4.498	-4.528	-4.559	-6.887	-6.915	-6.943	-6.971	-6.999	-7.027
	= Net profit	13.403	13.493	13.584	13.676	20.662	20.746	20.829	20.913	20.997	21.082
Money Flow Balance	+ neutral costs (Accounting linear and subvention)	10.753	10.753	10.753	10.753	1.560	1.560	1.560	1.560	1.560	1.560
	- Investment										
	+ Deinvestment										45.240
	+ Capital input										
	+ Subvetion										
	+ Own equity										
	= Deficit/Suficit of cash flows	24.156	24.247	24.338	24.429	22.222	22.306	22.389	22.473	22.557	67.882
	Account condiion	309.129	333.375	357.713	382.142	404.364	426.670	449.059	471.532	494.090	561.972
	+ Net interest on account condition	1.425	1.546	1.667	1.789	1.911	2.022	2.133	2.245	2.358	2.470
Investment Financing	**Pay means**										
	- Proprietorial capital										
	- Gained interest	1.425	1.546	1.667	1.789	1.911	2.022	2.133	2.245	2.358	2.470
	+ Paid interest	0	0	0	0	0	0	0	0	0	0
	= Undiscounted net revenue	22.731	22.701	22.671	22.640	20.312	20.284	20.256	20.228	20.200	65.412
	Discount rate										
	x Discount factor	0,58	0,56	0,53	0,51	0,48	0,46	0,44	0,42	0,40	0,38
	Discounted net revenue	13.291	12.641	12.023	11.435	9.770	9.292	8.838	8.405	7.994	24.653
	Cumulative discounted net revenue	20.328	32.969	44.992	56.427	66.197	75.489	84.327	92.732	100.725	125.378
Tax Calculation	**tax calculation**										
	= Business result	17.870	17.991	18.112	18.234	27.550	27.661	27.772	27.884	27.997	28.109
	- Investiment tax break 40% (max in height of taxable amour	0	0	0	0	0	0	0	0	0	0
	Loses transfer from previous years	0	0	0	0	0	0	0	0	0	0
	= Profit before tax	17.870	17.991	18.112	18.234	27.550	27.661	27.772	27.884	27.997	28.109
	Tax (taking into consideration the past losses)	-4.468	-4.498	-4.528	-4.559	-6.887	-6.915	-6.943	-6.971	-6.999	-7.027

Heat price (average price, connected power included)	0,06 EUR/kWh		heat price	0,06 EUR/kWh
Discounted payback period (brake even point)	10 years			
Simple payback period NCF	8 years		biomass price	0,02 EUR/kWh
Internal rate of return (IRR)	**12,1%**			