H2020 Project



SDHp2m - Solar District Heating

.....from policy to market



Economics and financing of solar district heating systems

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SOLID activities

Large scale solar thermal systems

- project development
- engineering
- installation
- operation & maintenance
- financing & ESCo
- research & development





SDH system cost



- land purchase / lease
 - 1,5 1,6 times the collector area → 10.000 sqm gross collector area need 15.000 - 16.000 sqm flat land in Croatia







Main cost factors:

- collector field incl. substructure
- piping, insulation
- hydraulics (heat exchanger, pumps)
- controls, electric
- engineering
- installation work and supervision



Specific system cost mainly depend on

- complexity
- scope of supply
- collector type
- type of substructure (roof, ground-mounted,..) and system size !

Significant economies of scale e.g. in heat exchanger, pumps, controls, engineering and others!

Solar heat generation cost



- Invest
- Operation & Maintenance
- Finance cost
- lifetime of system: >25 years



Example:

System size / m ²	10.000
Solar yield / MWh/a	4500
System cost / Euro	2.400.000
Subsidy	0
Interest	3 %
Payback period /years	17
Operation and Maintenance / €/a	9750
Heat price / EUR/MWh	42,67 €

Solar thermal heat prices in Europe are around 25-45 €/MWh

- A solar district heating plants can be owned by different entities:
- utility (heat distribution company)
- existing heat supply company (e.g. fossil power plant operator)
- new heat supply company (e.g. solar heat ESCo)

ESCo business model





ESCo principle







Technical questions

- How to calculate the solar gains?
 - Source Meteonorm & NASA data
 - Simulation tools
- How to guarantee solar earnings (xy MWh/year)?
 - Calculation safety margin ~ 10%
- How to ensure good quality of the installation?
 - Planner's, installer's know how of collectors & components
 - Online Monitoring



Financial questions

- Minimum amount of investment necessary?
 - Preparation Costs
 - Benchmark: > 1 Mill. EUR system cost
- What about the financial reliability of the ESCO and the client?
 - Contract provisions for bankruptcy/change ownership
- What about insurance of the installation?
 - *Must be insured (part of the contract)*



Financial questions

- How to calculate the energy price?
 - Project specific
 - General "energy demand rate" + "energy capacity rate" (e.g. when solar tank is used for peak load management)
 - Lower energy price, increase by a fixed percentage + index adjustment



Legal questions

- What is the average contract duration?
 - Possibility depends on the payback period
 - Mostly around 20 years
- Who owns what?
 - Exact definition of ownership necessary
- Transfer of ownership & end of contract?
 - Exact definition necessary
 - Customer take over the responsibility/plant, etc.

ESCo contract – main contents I / II

- Scope of services provided by the ESCO
- Contract duration
- Delivery guarantee (xy MWh/year)
- Price, price structure, price index
- Invoicing and payment schedule
- Minimum consumption by the client
- Compensation if energy is not delivered/consumed
- Main technical features of the solar installation
- Right to install solar system and access to the site
- Ownership during and after the contract
- Measurement method and points





ESCo contract – main contents II / II

- Maintenance measures (extent, frequency, costs), technical auditing
- Liability, insurance and warranties in case of damages
- Provisions in case of bankruptcy and/or change of ownership of the ESCO or the customer
- Confidentiality issues, conflicts of interest
- Reasons to terminate the contract, settlement of disputes
- Appendix: technical part, scope of supply and services



An ESCo project is



Suitable for

- Customers with high energy saving potential and high energy demand under steady use
- Owner is willing to adopt innovative, but proven technology
- Opportunity for long-term use and benefit (10 25 years)
- High energy prices & good reliability/rating of the customer <u>Not suitable for</u>
- Recently completed new building projects (except an integration in existing system allowed / possible).
- Site with frequent activity/physical structure changes (difficult to implement a project)
- Low energy prices and low solar radiation



ESCo - advantages

- The utility can focus its activities and investments on its core business
- The utility doesn't need to face a new technology
- Specialized, experienced solar thermal ESCo can work at high efficiency and can offer reliable and affordable services
- ESCo might accept longer payback periods, lower rates of return
- Solar thermal ESCo has easier access to "renewable" funds

Financing sources – civic participation



• What is crowdfunding – civic participation?



→ Driver for awareness of technology and social responsibility

• SOLID Invest: lending based Crowdfunding = Crowdlending

Financing sources – civic participation

Financing concept for new SDH projects:

- National or international funding
- Private bank (loan)
- Crowdfunding (equity)

Advantages for utility

- better image
- attraction of new customers
- stronger customer relation





Financing sources – European Investment Bank



Financing Facilities

- 2 main facilities:
- Direct Loans

Bank Bank The EU bank

- Large-scale projects (more than EUR 25m)
- Intermediated Loans
- Small and medium-scale projects (particularly to SMEs) via national and regional intermediary banks

European Investment Bank Group

 Lending decision remains with the financial intermediary



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Financing sources – European Investment Bank



Project Requirements

- Projects must:
 - Meet at least one of the EIB's key priorities
 - Be technically sound
 - Be financially viable
 - Show an acceptable economic return
 - Comply with environmental protection and procurement regulations



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Financing sources – European Investment Bank

Financial intermediaries in Croatia

- Croatian Bank for Reconstruction and Development HBOR
- Zagrebacka Banka
- Privredna Banka Zagreb
- Raiffeisenbank Austria d.d. Croatia
- Raiffeisen Leasing d.o.o.
- Erste & Steiermärkische Bank d.d.
- SG Leasing d.o.o.







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