Solar thermal ordinances

State of the art in Europe

September 2008

Intelligent Energy Europe

Summary

Table of Contents

1. Introduction

The work here reported has as a starting point the study carried out by ESTIF within the EU Project "Key issues for Renewable Heat in Europe" (K4RES-H), EIE/04/240/S07.38607, entitled "Best practice regulations for solar thermal", August 2007 [1], as well as the country reports on the implementation of the EPBD, available in the website of the EPBD Buildings Platform [2].

The specific objective of the present work is to present an inventory of all relevant cases of STOs and experiences, giving both a complete overview of international STO cases, and a horizontal evaluation of this inventory, in the way of a common business environment, implemented by flanking measures to overcome actual barriers.

The spin-off of this learning process from the past experience will be an ideal model of STO to be implemented by our Local project partners, according to local conditions. This ideal model will be presented separately, within the overall deliverable D.2.1.

The STO case studies referred in this report – 4 from Italy, 4 from Spain, 1 from Germany, 1 from Ireland, and 1 from Portugal – were analysed throughout a questionnaire, in Annex A, with focus on the following questions:

- How it was born (date, promoter)
- Scope (geographic, which buildings, technologies, exemptions)
- Objective of the STO
- Actors involved and roles
- Foreseen checks and sanctioning fees
- Flanking measures (communication, training, etc.)
- Costs (side of the Administration, the building company, etc.)
- Qualitative and quantitative results
- Barriers, errors and success factors

For the horizontal evaluation – according to a matrix of characteristics and indicators, with identification of major similarities and differences, STO types or categories – we have to underline the input given by the relevant results obtained within the European expert workshop, analysing best practice STOs.

2. Overview of international STO cases

The results here reported are extracted mainly from the filled questionnaires by the project partners. The STO cases can be summarized as follow:

- Baden-Württemberg, Germany:

  In November 2007 the parliament of the state of Baden-Württemberg approved its Erneuerbare-Wärme-Gesetz Baden-Württemberg (Renewable Heat Law Baden-Württemberg) [3]. Initially it affects only new residential buildings started after 1st of April 2008, for which house builders are obliged to cover 20 % of the yearly heat demand with renewable heat sources. Beside the use of solar thermal, geothermal, biomass (including bio-oil and biogas) and ground coupled heat pumps the law also foresees alternative measures such as improved house insulation, co-generators or the connection to district heating networks fed by RES or co-generators. Starting from 1st of January 2010 the law will also affect existing residential buildings, which, in the case of a modernisation of the central heating system have to reach a share of renewable heat of 10 % of the yearly heat demand.

- Ireland:

  Under the Planning and Development Act, 2000 [4], a planning authority may at any time, alone or in co-operation with other planning authorities, and for any particular area within its functional area, prepare a local area plan in respect of that area, indicating the objectives in such detail as may be determined by the planning authority for the proper planning and sustainable development of the area to which it applies, including detail on community facilities and amenities and on standards for the design of developments and structures.

  Based on this Planning and Development Act, starting at the end of 2005, a number of progressive local authorities introduced building energy standards as part of planning requirements in their jurisdiction. The first one was that of Cappagh Road Local Area Plan, Fingal County [5]. These building energy standards require a substantial increase in the energy performance of new buildings (between 40% and 60% reduction in energy usage) as well as a mandatory contribution of renewable energy to their thermal energy requirement.

  What is more, a new regulation at national level as been introduced in 2006, transposing article 5 of the EU Directive 2002/91/CE to S.I.

Nº 666 of 2006 [6], following a first step given in 2005, S.I. Nº 872 of 2005 [7], saying that building regulations may be made to make (within other) "provision for the transposition of the requirements of Directive 2002/91/EC". This shows that the local energy standards adopted by several counties were a positive experience.

Moreover, the new regulation [6] introduced the i) BER (Building Energy Rating) Certification, ii) registration of BER assessors, to assess the energy performance of buildings in accordance with the regulations, and iii) appoints the issuing authority (Sustainable Energy Ireland) to appoint persons to be authorised officers to enforce the regulations.

Meanwhile Sustainable Energy Ireland implemented both a Dwelling Energy Assessment Procedure (DEAP), which is the Irish official procedure for calculating and assessing the energy performance of dwellings [8], and a Greener Homes Scheme, with Residential Renewable Energy Grants [9] of €250/m^2 (to max. of 6m^2) for flat plate solar collectors (sizing of the hot water cylinder: At 60°C use a minimum of 70 litres per m^2), and of €300/m^2 (to max. of 6m2) for evacuated tube solar collectors (sizing of the hot water cylinder: At 60°C use a minimum of 50 litres per m^2), if the collector is included on the Registered Product List, with a SEI Product ID (which means a certified product under the European quality standards), and if the solar system is installed by an installer included in the Registered Installer List, with a SEI Installer ID (which means a qualified and certified installer, with an accredited training course, and recognized experience in installing solar thermal systems). All completed installations may be the subject of verification and/or technical inspections.

- Italy:

  - at local level:

In 2003, the small (less than 15,000 inhabitants) Municipality of Carugate adopted a new building regulation which promotes energy efficiency in general [10].

In particular, following the model of Barcelona "Solar Ordinance", the use of solar thermal systems to produce at least 50% of the DHW demand was introduced as a mandatory measure.

Meanhile, other municipalities introduced some modifications in the city building code, as the case of Roma [11], dealing with energy and water saving measures, as well as renewable energies.

- at regional level:

The Law no. 15/2004 of the Regione di Lazio [12] foresees the mandatory use of solar thermal energy and the rational use of water in buildings. Its scope includes both new and under refurbishment buildings.

The law itself does not go into details regarding specific measures to be applied, leaving to the Municipalities the duty to apply the law in details.

- at national level:

The Law no. 192 (August, 19th 2005) [13], modified and integrated through Law no. 311 (December, 29th 2006) [14], is the implementation, at national level for Italy, of the EC Directive 2002/91/CE, about energy efficiency in buildings.

This law foresees minimum requirements for energy efficiency and the use of renewables in new and refurbished buildings.

- Portugal:

The Portuguese Government established as mandatory for all buildings comprised by Thermal Performance Building Regulation (RCCTE) (Decreto-Lei n.80/2006, [15]), which improves the already existing regulation, almost duplicating the thermal performance request in the new and renovated buildings, and imposing the usage of solar thermal collectors for hot water production if there is favourable conditions for exposure (if the roof or cover runs between SE and SW without significant obstructions) in a base of 1m2 per person (the total can be reduced up to 50% if space is necessary for other important usages of the building).

The annual energy production of the solar system must be calculated with a programme developed by INETI (SOLTERM programme)

For performance calculation of such systems, the collector certification according to the European Standards is needed.

The installers of these systems must also be certified installers.

The solar system must have a six year guarantee of maintenance.

This regulation is a part of the new Portuguese regulations for buildings arising from EU Directive 2002/91/CE. The others parts are

the Building Certification National System on Energy and Interior Air Quality (SCE) (Decreto-Lei n.º 78/2006, [16], 2006-04-04), and the Air Conditioning Energy Systems Regulation (RSECE) (Decreto-Lei n.º 79/2006, [17]).

It is deductible to the collect 30% of the acquisition value of new equipments for thermal energy production (VAT = 12%), with a limit of €777 (Lei n.º 67-A/2007, State Budget 2008, DR 251 SÉRIE I, 2007-12-31, pg. 9178-(13), IRS Code, Art. 85, n.º 2)

- Spain:

  - at local level:

The Barcelona Solar Thermal Ordinance (municipal legislation) approved in July 1999 and entered into effect in August 2000 was updated in 2006 [18]. Its main promoter was the Sustainable City Council. The purpose of this ordinance is to regulate the incorporation of solar thermal energy and its use for the production of sanitary hot water in the city's buildings. The Solar Ordinance affects new, restored and fully refurbished buildings and those seeking to implement a change of use. This regulation applies to buildings intended for residential, health-care, sports, commercial and industrial use and, generally, any activity involving the existence of canteens, kitchens, laundries or other circumstances that lead to a large consumption of hot water, regardless of whether they are public or privately owned.

The Pamplona Solar Ordinance (municipal legislation) entered into force in May 2004 [19]. The purpose of this ordinance is to regulate the incorporation solar thermal energy for the production of sanitary hot water and indoor swimming pool water heating in new and existing buildings subject to major renovations within the Pamplona city. The promoter is the Pamplona City Council. The main objective is to diminish the CO2 emissions and therefore, improve the quality life of Pamplona's citizens.

Notes:

1. We present in this study only two ordinances. One, the Barcelona Ordinance, it was the first in Spain, and there is an evaluation report about their application [20]. Another, the Pamplona Ordinance, it is a representative of one of some eighty ordinances covering all Spain (see more cases in [21]).

2. It must be registered the important role played by IDEA – Institute para la Diversificatión y Ahorro de la Energia, with their proposal of Municipal Ordinance Model of Solar Collection for

Thermal Applications [22], a general proposal presented in 2002, to be developed and implemented in function of the characteristics factors of each one of the municipalities.

3. Berlin was the only city working to adopt a Solar Ordinance in 1996 in Europe. Barcelona city followed this initiative.

- at regional level, in Catalunya:

The Decree of Eco-efficiency (regional legislation [23]) aims to regulate the criteria for the sustainability of buildings in Catalonia promote social consciousness in the way to conceive, design, build and use buildings in a sustainable way. Four action fields have been established within the decree: water, energy (including solar thermal), materials, construction methods and waste.

- at national level:

The existing building code “Código Técnico de la Edificación” (CTE) entered into force in 2006 [24]. Among the basic quality requirements for buildings, the CTE contains the DB-HE chapter which aims, among others, at the efficiency of thermal installations (HE2 = RITE [25]) and the application of solar thermal systems for hot water preparation for domestic purposes and indoor swimming pools (HE4) in buildings. It is applicable for all new buildings and integral renovation projects (>1000m^2) when the hot water demand is higher than 50 l/day at a reference temperature of 60 ºC.

The HE2 and HE4 sub-chapters contain relevant information regarding the implementation of solar thermal installations: the first one defines all procedures in order to ensure the efficiency of thermal installations (including solar thermal) and the later one, enforces the application of solar thermal systems to partially cover the hot tap water demand. On the second one, it is stated that for all new buildings and renovations a minimum solar fraction from 30 to 70% is required (depending on climate zone, hot tap water demand and energy source for back-up heating). The values established by the CTE are minimum values to cover the basic demand. It is a national STO. The promoter of this legislation is the Spanish government.

Note: As said in CTE, Section HE 4, Clause 2- Characterization and quantification of the requirements, the solar contributions established in the CTE have a character of minimums, which can be voluntary increased by the promoter or as a consequence of requirements defined by an administrative authority. So, if a municipal ordinance is less restrictive it is necessary to accomplish the requirements of the

CTE. Otherwise, if the requirements of the municipal ordinance are more restrictive than those of the CTE, it is necessary to accomplish the requirements of the municipal ordinance. If there is no municipal ordinance, it is necessary to accomplish the requirements of the CTE.

3. Horizontal evaluation of international STO cases

3.1. Success factors and performance indicators for STOs

The outcomes of the horizontal analysis (11 case studies collected) regarding success factors and performance indicators are quite clear and almost unanimous, meaning that a good STO could be developed following these guidelines.

Below, the main success factors (and therefore barriers) for developing and implementing a STO are listed and commented.

3.1.1. Success Factors. The road towards effective STOs

BIRTH: CAREFUL INITIAL ASSESSMENT

Strong and constant commitment by the promoters and the local politicians is needed.

Besides that, the Administration, supported by technical experts, should carry out a **careful initial assessment** of the local situation, including several factors:

- which is the composition of the building stock, in terms of typology of use, size, public/private, ownership, new/refurbished, etc.?
- is the heat consumption (in particular, the domestic hot water demand) in the area relevant?
- basing on the above information, do you estimate a large impact of the STO?
- are there enough technology suppliers available in the area?
- are there enough certified products in the market (e.g. solar collectors) and/or test institutes ready for delivering certifications in reasonable terms?
- does your Administration (Municipality, Province, Region, etc.) have the right competencies to assure that the STOs will be legally valid and operating?

- will the STO be immediately operating, with no needs for waiting application rules or being implemented in other local tools (e.g. the building code)?
- are there other ordinances already operating? If this is the case, is the new STO consistent with the previous regulations?
- is the internal staff of your Administration enough to manage the STO?
- are there any subsidies available for solar thermal?
- is a certification scheme for planners and/or installers of solar thermal operating in your Administration/Country?

BIRTH: COOPERATION AMONG ACTORS

A key factor for developing an effective STO is to promote networking and cooperation among the main actors:

- involve main stakeholders, before the STO be developed, by means of hearings (building companies, consumer association, NGOs, etc.);
- promote cooperation between actors (e.g. building companies and solar thermal industry or other RES-heat technologies providers) through platforms, workshops, etc.;
- for Municipalities and Provinces: involve more high level Administrations (e.g. Regions) for promotion, advertisement, development of common tools, replication;
- for Regions:
  a) communication, pushing and checking towards Municipalities to have the STO applied;
  b) foresee compensation measures and/or fees for Municipalities which apply/do not apply the STO;
  c) central training of Municipality personnel and development of calculation tools;
  d) centralise other flanking measures (e.g. information campaign).

Regarding the roles foreseen for the different actors:

- they should be very clear and separate;
- an exhaustive and constant monitoring of the whole process is needed, in order to improve the STO through feedback signals;
- managing and monitoring of the STO should be carried out by an external body (e.g. Energy Agency).

BIRTH: LET EVERYBODY KNOW WHY

Communicating the STO is a key issue for its success: if you are able to inform people why you are doing that, they will understand and agree and **they will end with considering this STO as their law**.

Try to address each one of the actors with the most appropriate message:

- architects: “solar could be beautiful” or “solar is for sure beautiful, when you use it properly”;
- final users:
  a) “solar homes are the best where to live, for economics, environment and comfort”;
  b) “if you like and want solar, the right moment when to install it is when the building is under construction or refurbishment”;
- building companies, designers:
  a) “surplus cost is low”; provide them with simple (and correct!) figures;
  b) “at the same time solar homes have clear added values and they could give you competitiveness”;
  c) “you have the legal responsibility to comply with the law”;
  d) “there are checks and corresponding fees and both of them are actually and effectively working”;
- Municipality staff: “our solar obligation is easy to apply”;
- all the actors:
  a) “our STO is easy to apply”;
  b) “our STO has a wide impact on reducing energy consumption and emissions in our City/Province/Region/Country”; show that you have a business plan, with clear targets and figures (emission savings, clean energy production, etc.) ;
  c) “the building we build now will require energy for the next 50 years, so why should we rely on fossil fuels and not on clean renewable energy for the next 50 years?”;
  d) “this law gives you the “guaranteed right” of using clean, renewable and no-cost energy”.

DEVELOPMENT: KEEP IT SIMPLE

Complexity of the law act as a universal barrier. Therefore, the following is needed:

- the regulation should be simple and clear, since therefore:
  a) it would be easier to be applied (meaning also low costs for managing the STO);
  b) it would be easier to convince stakeholders;
- to have clear and straight-forward timing and deadlines (starting date for

the implementation, deadlines for complying and reporting, dates for checks, etc.).

DEVELOPMENT: WHICH BUILDINGS?

In order to have a high impact, the scope of the STO should **include a remarkable share of the building stock**. Therefore:

- include not only residential buildings, but also tertiary activities which consume hot water (elderly homes, hospitals, jails, sport centres and gyms, etc.);
- include as many refurbishment activities as possible, for instance, foresee the obligation for any refurbishment which concerns heat supply plants.

DEVELOPMENT: NOT TOO MANY EXEMPTIONS

Exemptions to the accomplishment of the law should be **not too many and not ambiguous**:

- in particular, clear rules should be established for historical and protected buildings/areas; it would be advisable not to have a 100% exemption, but rules for architecturally integrating technologies in order to lower their visual impact;
- do not ask that the solar collectors should not be seen from street level;
- do not ask for internal boiler only;
- industrial buildings could be exempted;
- buildings with small consumption of hot water could be exempted;
- seasonal buildings (when the consumption is mainly in cold seasons!) could be exempted.

DEVELOPMENT: WHICH TECHNOLOGIES?

Several technologies could be considered when implementing a renewable heat ordinance, which is not “solar only”. The recommendations are:

- allow different technologies for complying with the obligation;
- set priorities, according to technical and economical feasibility;
- include only “actually renewable” heat technologies: no fossil CHP, no heat pumps.

DEVELOPMENT: QUANTITATIVE OBLIGATION AND CALCULATION METHOD

For setting the **quantitative obligation**, the following remarks should be taken into account:

- set a quantitative obligation for covering by renewables a minimum share of the hot water or total heat consumption of the building;
- do not mix obligations on heat and electricity;
- the quantitative obligation chosen should be reasonably reachable, e.g. in terms of available roof area or in terms of demand fraction to be covered.

A **calculation method** should be provided, with the following approach:

- set a simple and clear method;
- use, as much as possible, figures which Municipalities are used to (e.g. link the mandatory m2 of solar collectors to m2 of living area or to the number of building occupants);
- develop calculation sheets and provide both designers/building companies and personnel of the Municipalities with them, also training them for a correct use of the tools.

DEVELOPMENT: QUALITY REQUIREMENTS

Quality is a key issue in a STO, since:

- mandatory solar thermal could mean lower quality solar thermal;
- some Countries already experienced relevant mistrusts towards solar thermal in the recent past (e.g. Italy, Portugal);
- on the other hand...ask for the same quality requirements as for other domestic appliances and not much stricter ones!

Do not include too many technical requirements, since:

- it is not possible to check all of them;
- it does not necessarily assure quality;
- it prevents technological innovation and development from being applied.

Quality rules should be:

- clear;
- applicable (e.g. if product certification is required, a reasonable amount of certified products should already be available on the market; if it is not the case, allow a time delay for complying with the certification

requirements included in the STO);

- comprehensive (include requirements on design and planning, products, installation, operation and maintenance);
- for products: referring to European standards is advisable (e.g. Solar Keymark);
- for installation: you could ask for one or more requirements (e.g. certified installers, maintenance contract, etc.);
- for operation and maintenance: you could ask for one or more requirements (e.g. Guaranteed Solar Results scheme, system monitoring, random checks, maintenance contract, etc.).

IMPLEMENTATION: CHECKS AND FEES

A good STO should include both checks and fees.

Recommendations for implementing checks:

- the complete approach includes 3 checks: design phase, after installation, during operation;
- checks in the design phase:
  a) checks work well if calculation methods are simple and the personnel in charge of the checks is properly trained;
  b) include specific STO checks in the ordinary building check, so no surplus costs for the work of checking should be borne;
- checks after installation: the check could consist either of a in-situ inspection or a verification of the certification of the installer;
- check during operation: the most effective solution is to foresee random checks and then “advertise” widely when someone not complying with the law is caught and therefore has to pay the corresponding fee.

Recommendations for setting fees:

- they are needed to make people understand that this law shall be taken seriously;
- they should be high enough to “scare” building developers;
- they should be higher than the additional cost coming from complying with the STO (e.g. the cost of including a solar thermal plant in the building).

IMPLEMENTATION: FLANKING MEASURES

In general:

- flanking measures should be considered as part of the STO, since, without them, even the "perfect STO" could be ineffective;
- they should be planned, worked out and implemented before and during the STO;
- need for targeted actions, addressing the main actors involved.

A list of suggested flanking measures is:

- training for Municipality personnel (more than just a flanking measure, it plays a crucial role!);
- training for installers;
- specific training on large scale solar thermal plants for designers;
- giving the good example: develop pilot plants in your own public buildings;
- information workshops for "external" actors, e.g. building companies, banks, etc.;
- comprehensive web site where designers, building companies, installers can find reference documents, guidelines, etc.; a good reference is the "gestor integral" web platform developed by Barcelona Municipality;
- information campaign addressing final users;
- careful and targeted communication actions (see section **"BIRTH: LET EVERYBODY KNOW WHY"**).

3.1.2. Performance indicators

This chapter shows the **quantitative results of the comparative analysis of the 11 STO collected**.

The most relevant performance indicators to be included in the monitoring plan of a STO are listed. Further indicators, depending on local parameters, could be added. **The function of the indicators should be always to assess the impact of the STO** on the energy supply, the solar thermal market and the customer behaviour.

Following difficulties have been faced in carrying out this task:

- since STO is a relatively new mechanism, several of the analysed ordinances are quite recent and therefore no or only a few quantifiable results are available;
- most of the analysed STOs do not foresee a monitoring of their effects, which is a really negative issue, because it is not possible to compare results with the targets set in the preparation phase;
- this is the reason why the inclusion of a clear monitoring plan has been

reported, in the previous section, as a key success factor.

Is It Working Well?

Buildings:

- number of buildings addressed by the STO (also in terms of m2 of living area and of people addressed by the STO);
- share of buildings addressed on the total building stock;
- if the ordinance is not "solar only": share of buildings (new/refurbished) which chose solar thermal to comply with the law;
- real figures for surplus cost in new/refurbished buildings (check that this value is reasonable);
- how many buildings applied successfully for being exempted?
- number of cases where the minimum obligation foreseen has been definitely overcome (e.g. buildings which chose a 50% share of solar thermal on hot water demand, when the STO requirement is 30%).

Checks:

- how many people in the Administration have been trained to perform checks?
- share of negative checks in the design phase;
- number of random checks in the installation or operation phase and share of negative situations;
- number of sanctioned situations and rate of accomplishment (payment of the fees).

Others:

- how many "external actors" (e.g. building companies, banks, etc.) have been involved in information workshops?
- how many people have been involved in information campaigns addressing final users?
- how many Municipalities replicated a similar ordinance?
- are final users happy with the law? A questionnaire could be developed and spread.

Impact On The Development Of The Solar Thermal Sector

- installed solar thermal plants thanks to the STO (m2, kWth);

- m^2 of solar thermal installed in public buildings;
- growth of the local and/or national ST market thanks to the implementation of the STO (compare the new growth rate with the rates before the STO was operating);
- number of new companies manufacturing solar collectors and/or plants in your Administration/Country;
- number of new certificates issued for solar collectors in the local/ national market;
- number of people trained on solar thermal (designer, installers, etc.);
- effects on non-obliged segments of the solar thermal market, for instance buildings not included in the scope of the STO (e.g. industrial).

IMPACTS ON THE LOCAL ENERGY SUPPLY

- heat produced by the installed solar thermal systems, quantified through the energy savings (final or primary) and/or the share on the total heat demand or the hot water consumption; the figures could be measured (when metering systems are installed in the plants) or estimated from the m2 installed;
- CO_2 emissions avoided (calculated from the above parameters).

IMPACTS OF EXISTING STOS: SOME EXAMPLES

- Real figures for surplus cost in new/refurbished buildings:
  a) Spain: 0.45-0.59% increase per m² built;
  b) Catalunya: 0,32-0,41% per m² built;
  c) Barcelona: 0.29-0.38% per m² built;
  d) Pamplona: 0.53-0.68% per m² built;
  e) Baden-Wuttenberg: 20 to 34 € per m^2 living area (<1% of the building cost).

- Installed solar thermal plants thanks to the STO:
  a) Spain: 4,900,000 m^2 installed by 2010 (estimated);
  b) Barcelona: from 1999 to 2007, the total installed solar thermal surface goes from 1,350 m^2 to 51,436 m^2 (real);
  c) Ireland: 22,165 m^2 of solar thermal will be installed in the Counties involved (estimated).

- Number of people trained on solar thermal (designer, installers, etc.):
  a) Portugal: 1,000 certified installers and dozens of already planned courses.

- Heat produced by the installed solar thermal systems:
  a) Ireland: primary energy saving of about 270,000 MWh/year (estimated);
  b) Spain: 1,536,500 kWh/year (estimated);
  c) Catalunya: 84,000 kWh/year (estimated);
  d) Barcelona: 32,076 MWh/year (summary 2002-2006, estimated).
- CO_2 emissions avoided:
  a) Ireland: 27,000 t/year (estimated);
  b) Barcelona: 5.640 t/year (summary 2002-2006, estimated).

4. Needs for successful STO implementation

4.1. Needs of Communities

In order to develop useful tools for introducing STOs, the needs of communities have been investigated by asking directly the communities participating in the ProSTO project and by systematizing the contributions of European experts invited to the project's workshop and of the STO questionnaires.
Comparing those outcomes, it is quite clear that communities which are on their way to introduce a STO mainly focus on the first phase of the whole process: as a matter of facts, they stress the importance of the initial assessment and the flanking measures.

Following table is meant as a deeper analysis of these two particular success factors.

BIRTH

- A clear definition and quantification of the results which can be reached by introducing a STO is crucial for convincing decision makers of local authorities and other involved stakeholders. Following figures can be estimated:
  a) environmental impact;
  b) job creation al local/national level;
  c) annual turnover due to solar thermal market increase;
  d) positive side effects on the voluntary market;
  e) reduction of dependency from fossil fuels;
  f) costs occurring for the STO implementation.
- In some countries, especially if a national STO already exists, local authorities' power can be restricted.
  On the other hand local authorities can introduce stricter rules, thus increasing their level of commitment.

In the design phase, it should therefore be made clear which issues the local administration can decide about and in how far the requirements should be stricter than the national ones. Specific information about such decisional issues in past experiences should be therefore made available.

- In those countries/regions where STOs already exist at national/regional level, a local pilot STO must be innovative compared to the national/ regional one, e.g. by introducing stricter requirements. At the same time, it must be well justified: citizens must be informed about the STO being one of the best options in sustainable development and energy savings. Existing experiences in how to properly communicate such messages would be very helpful.
- A basic pre-condition for introducing a STO is the existence of a local solar thermal market to assure enough product availability.
- ESCOS: where companies providing district heating exist, according to the STO details the ordinance might be fulfilled with DH.

DEVELOPMENT

- Definition of technical criteria:
  a) how to deal with buildings which have no specific use;
  b) how to deal with areas undergoing landscape protection;
  c) how to deal with system integration in the buildings;
  d) how to deal with special technologies (e.g. solar cooling).
- Municipalities technicians must feel their role in the STO implementation: they should not just assure that projects respect the rules, they should also be in charge of identifying interventions opportunities (e.g. recognize "false" exemptions). This can be reached through a good training and through the know-how about existing experiences.
- Quality assurance:
  a) how to rule the maintenance of the solar thermal systems;
  b) provide a list of components which can be chosen for the realisation of the solar systems.

IMPLEMENTATION: FLANKING MEASURES

- Local authorities should give good examples: demonstration plants on public buildings are a basic and powerful flanking measure when introducing a STO.
- Legal support.

- Awareness raising campaign towards end users and technicians. It is crucial to properly communicate the benefits of a STO.
- Financing Conditions are essential: favouring agreements with financing institutions in order to avoid initial installations costs must be promoted. Know-how about existing experiences is helpful.
- Training of professionals:
  a) architects: increase the level of awareness and potential to develop innovative products and integration solutions (e.g. design and architecture contests are a good vehicle for introducing the technology and promote user/technology relations.
  b) engineers: training about the solar thermal technology and about the STO requirements and calculation methodology shall be provided. A tool for supporting them in the design phase is very helpful.
  c) installers: training about suitable and non suitable materials to use, training about specific technological requirements of the solar thermal technology.
- Training of municipality personnel: technical, administrative and legal staff (e.g. standard method for calculating solar fraction, DHW demand, exemptions).
- A tool for self evaluation by building owners/constructors would help a lot in convincing the target to follow the STO. It should enable these target actors to easily evaluate the costs and savings occurring through the installation of the solar thermal system.

4.2. STO Process Model

A process model - this sounds like theory! However, it is worth to derive from the existing STOs a kind of generalised procedure for implementing a STO in a community. It is rather helpful to understand beforehand abourt the phases of the process, the stakeholders to be involved and their roles, in order to implement the ordinance in a successful way. It is worth to understand, that the development of a STO is a 90% political and only 10% technical issue. However, the technical specifications need to be of good quality either in order to avoid overregulation and burocracy.

This paper sketches a picture of a STO development as participated process involving local stakehoders, market actors and citizens. For sure this model needs to be adapted to the very individual boundary conditions of the community in question.

4.2.1. Parties involved in a STO process

Ideally the following parties should be involved in the process of developing and implementing a STO:

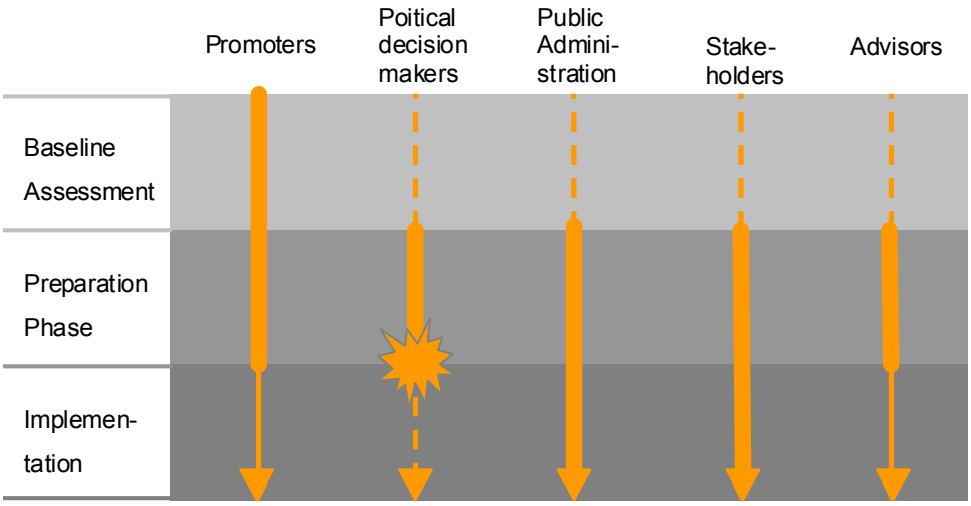
- **Promoter**: a person, an organisation or a group taking the initiative and the role of the leading force for bringing forward the STO. Ideally such a group should already at an early stage include representatives of the following parties.
- **Political decision makers** need to be involved for adjusting the STO with the political goals and for ensuring the enacting of the STO.
- The **public administration** is the party responsible for developing and executing the STO and thus the main player in the process. Ideally all sectors of the administration concerned by the STO should participate in the process (e.g. building, environment, energy sectors).
- **Stakeholders** representing the housing and the HVAC sector but also citizens. Stakeholders need to be consulted in order to reach broad acceptance for the STO.
- **Advisors** are experts for consulting on juridical, economical, technical and social issues related to the STO.

4.2.2. Phases of a STO process

The process of developing and implementing a STO can be structured in three phases:

- a **baseline assessment** is carried out by a limited promoter group in order to assess the framework for developing a STO on the territory in question.
- In the **STO preparation** phase the process becomes 'public' foreseeing consultations with political decision makers, stakeholders and expert advisors in order to reach a broad support for the STO to be implemented.
- The **implementation phase** starts with the enacting of the STO. Measures shall ensure a good efficiency of the STO.

Obviously these phases will differ for the variety of individual STOs, leading also to a mixing or overlapping of activities.



STO process versus process phases and stakeholder groups

PHASE 1: BASELINE ASSESSMENT

Objectives

- Understanding the regulatory, political, economical, societal framework for a STO;
- developing a suitable approach/proposal for starting public consultation with all parties concerned.

Process

- Analysis of the regulatory, political, economical, societal framework;
- analysis of internal and external factors, risks and opportunities;
- stakeholder analysis;
- lessons learned from external best practices.

Roles and Tasks

Promoter	Political decision makers	Public administration	Stakeholders	Advisors
Initiative, leading force assessment developing a suitable approach	an early involvement of these parties is most desirable			

PHASE 2: STO PREPARATION

Objectives

- Drafting of a STO regulation ready for enacting;
- achieving broad support and acceptance for the STO implementation. Both political and from the stakeholders concerned.

Process

- Commencement of them process by the competent public administration;
- iterative process of public consultation with policy makers, stakeholders and advisors;
- drafting of the STO with all elements required;
- planning of the implementation phase (e.g. flanking measures, monitoring);
- setting-up of suitable structures.

Roles and Tasks

Promoter	Political decision makers	Public administration	Stakeholders	Advisors
leading force close cooperation with politicians and administration	ideally also leading force	**absorption of the process** **coordination**		
participate in consultation process	participate in consultation process ensure political support	**coordinate public consultations** **coordinate drafting**	participate in consultation process	participate in consultation process advice and support to drafting
work sharing		**planning of implementation, setting-up of structures**	work sharing	advice and support

PHASE 3: IMPLEMENTATION

Objectives

- High efficiency and impact of the STO at low cost;
- good acceptance;
- multiplication effects, additional benefits.

Process

- Enacting of the STO;
- flanking measures;
- monitoring of the STO.

Roles and Tasks

Promoter	**Political decision makers**	**Public administration**	**Stakeholders**	**Advisors**
leading force close cooperation with politicians and administration	ideally also leading force	**ideally also leading force coordination of measures**	support to STO	
	political support	**enacting of the STO**	support	
work sharing	political support	**coordination of flanking measures and monitoring**	work sharing	advice and support

Appendix - Recommendations for STO tools

The present document is the starting point for the development of tools for introducing STOs at local level.
Success factors and barriers analysed in chapter 3 were considered. Besides, inputs by participating communities (chapter 4) were analysed. This process enabled to identify well targeted tools.

The various tools range from text proposals for the ordinance over background reports and best practice examples to software tools for mapping the potential of solar thermal in your community. New tools are develop and already available instruments are collected and made available.

According to the needs of the communities involved in the project, the STO tools have been divided according to a simple structure:

1. Context
   Communities need first of all background information about in order to learn more about the objectives, the impact, the efficiency and the effort of STOs. For this reason it is recommended to make existing experiences available. Once the background information is available, communication tools are required in order to effectively disseminate the choice of introducing a STO. In particular hints for good reasons for introducing a STO are useful. Following tools will therefore be produced within the project:
   - **Brochure for promoting STOs**
   - **Guideline** for supporting local communities while introducing STOs;
   - **Process model** showing the different phases of the introduction and the involved actors.

2. Baseline Assessment
   Before introducing a STO it is crucial to realise a detailed analysis of the local situation and of the local boundary conditions. This means investigating the actual conditions at different levels, assessing the potential impact of the STO and evaluating its feasibility. Following tools are necessary:
   - **Base line assessment**: templates (such as check lists) to be used as starting point and adapted to the local needs could be a useful tool for accompanying local communities in the assessment phase.
     Besides, examples of complete assessments carried out previously by other communities would help in collecting the

required information.

- **Potential of a STO**: assessing the impact of a STO is crucial in order to convince decision makers and other involved actors that such legal provisions have a positive effects and create a win-win situation for the whole community.
  A methodology for assessing the potential impact will therefore be suggested.

3. Ordinance components
   Once the decision of introducing a STO has been taken, communities face the problem of creating the contents of the law. A lot of mistakes have been made in the past and can now be avoided by learing from existing experiences. Analysis and comparison of past experiences, which is described in chapters two and three of this document, clearly showed that criteria and procedures should be made available to local communities.

   - **Scope:** a clear definition of the scope of the STO is fundamental. This mainly means to decide which buildings will be affected by the STO and which exemptions should be considered. Besides, technologies accepted for meeting the requirements must be exactly defined.
   - **Calculation procedures** must be clearly defined and well targeted. Since this is a technical issue, communities need support in this phase. Looking at existing examples will help newcomers a lot.
   - **Quality requirements:** the effect of STOs on product quality must be controlled. For this reason a set of minimum quality requirement will help communities a lot. This, again, is a mainly technical issue, which needs specific knowledge that public administrations are not supposed to have.
   - **Architectural integration** and protected buildings are further technical hot topics in the implementation of a STO. Different approaches have been adopted in the past and should be made available.
   - **Administration and procedures** are probably the most time consuming phase of a STO, since they affect the whole implementation phase. Check lists, as well as existing experiences, will be very useful for newcomers.
   - **Training of community staff:** community technicians are key actors in the implementation phase. They must be trained in order to assure an effective implementation. For this purpose, however, a specific training approach is needed, which strongly differs from those usually adopted in the training of professionals.

4. Flanking Measures

Support measures revealed to be crucial for boosting the impact of a STO. A comprehensive set of such measures should be therefore introduced in order to accompany the whole process. Following measures are considered:

- **Local initiatives and campaigns** aim at reaching the final users, which, in many cases, are not even aware of the existence of the STO and must therefore be informed.
- **Demand side measures** should involve building companies and other key actors as much as possible. Since it is often very difficult to involve these actors, previous experiences and specific documents (e.g. up-to-date state-of-the-art) are very useful.
- **Supply side measures** aim at involving professionals and system providers mainly. Specific training schemes already exist all over Europe and should therefore be collected and made available. Partnerships among professionals are also an effective way of supporting STOs and have already been experimented in several cases.
- **Incentive** programs exist all over Europe, a national, as well as at local level. Giving a comprehensive overview on existing experiences is therefore not possible. Nevertheless, a general description of existing incentive schemes could be a useful tool for local communities willing to introduce financial incentives for supporting the STO.
- **Local best practice plants** are a good way of increasing confidence in new technologies. Several experiences show that it is often difficult for a local administration to install systems which run efficiently and show good architectural integration. Experienced approaches can help a community choosing the proper system and the following the whole process.

5. Monitoring

Tools of the Monitoring section are useful for tracking the achievements obtained with the STO.

- **Monitoring** of the market helps evaluating the real impact of the STO.
- **Evaluation** of the impact of the STO
- **Supervision** is on of the hottest topics to address, since checks are expensive. What is more, defining fees and penalties is very difficult and can make the difference between a a good and a bad STO.