Quantitative Obligation and Calculation Procedures

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Description:	A STO is the provision that solar thermal (or other renewables) should cover at least a minimum share of the hot water or total heat consumption of a building. This document discusses various approaches of the qualitative and quantitative definition of the obligation foreseen and describes related calculation procedures.
Link/Download:	www.solarordinances.eu

Introduction

The 'heart' of a STO is the provision that solar thermal (or other renewables) should cover at least a minimum share of the hot water or total heat consumption of the building.
STOs shall therefore include:

- the qualitative and quantitative definition of the obligation foreseen;
- the description of the calculation procedure;
- the check of the correctness of the calculation done.

This document analyses the first two issues, while checks are dealt with in Tools 3.5 and 5.3.

General criteria for developing these issues are:

- both the quantitative obligation and the calculation method should be defined soon, together with the issuing of the STO; otherwise, there will be a 'limbo' period, when the obligation cannot be really operating, since clear and official rules are missing;
- the quantitative obligation should:
    - be clear (not ambiguos);
    - not mix different kind of energy (for instance, keep obligation on heat and electricity separately and possibly also fix different obligations for domestic hot water and space heating);
    - be reasonable and reachable (for instance, do not ask for a solar contribution of 80% in a northern Europe country);
    - depend on specific parameters, such as: the total hot water (or heat) demand of the building, the availability of solar resource and of roof area, the energy

source replaced by solar (for instance, in Spain a higher share of solar is requested if the building is using electricity for producing hot water);

- the calculation method should:
  - be simple (understandable, not time-consuming and easy to apply also by non-experts);
  - be correct (for instance, it should take into account the difference between the yield of several solar collector technologies);
  - refer, when possible, to existing standards or figures designers are familiar with (e.g. link the minimum m^2 of solar required to the m^2 floor area of the building), since:
    - they are official and universally accepted;
    - designers know these standards very well;
    - they allow a first verification of the fulfilment of the obligation at the planning stage, when measurements are not yet possible;
  - if necessary, include a simplified tool (e.g. an excel file), which should be distributed to all stakeholders (designers, building companies and personnel of the Municipalities); furthermore, these actors must be trained to use the tool correctly;
- if the STO is issued by a more general administration body (e.g. Nation, Region), the Municipalities, at local level, could ask for stricter requirements, when they have favourable specific conditions (for instance better climate).

- In the following description of the different possible approaches can be either used for a 'solar only' obligation or the specific solar thermal part of a renewable heat obligation.

Approach 1: % basis

	% basis
Approach *(describe)*	This approach foresees to cover a minimum share <u>of the domestic hot water demand by solar thermal</u>. This minimum share could indicatively range from 40 % to 80 %. This minimum share could have different values, also within the same STO, depending on several parameters (e.g. the building use, the hot water demand, the availability of solar resource and of roof area, the energy source replaced by solar).
Model text module *(if useful / available)*	In all buildings included in the scope of this law, the use of solar thermal is mandatory, for covering at least X % of the domestic hot water demand of the building, as an average on an annual basis. *Specifications on the mandatory values and calculation methods to be used should then follow in the law text.*
Elements to be foreseen in the STO	In case this approach is chosen, the STO should clearly include: - the definition of the value (or of the values) of the minimum share; - a standardised calculation method (or even already fixed values for different building types or uses) for defining the domestic hot water demand of the building; - a standardised calculation method for defining the heat produced by the solar thermal plant; the calculation methodology should be based on the European standard EN15316-4-3 of 2007: 'Heating systems in buildings - Method for calculation of system energy requirements and

	system efficiencies - Heat generation systems, thermal solar systems.' It is suggested to provide a simplified and standard calculation tool (e.g. an excel sheet).
Exceptions *(if applicable)*	
Examples of STOs, which used this approach	- Spain ("Codigo Técnico de la Edificaciòn') - Italy (still waiting for full operation) - City of Rome (Italy) - City of Carugate (Province of Milano, Italy)
Analysis	
Strengths	- correctness and precision: giving different values for the obliged share, taking into account different parameters (building size, climate, etc.) and requiring a specific calculation allow to meet precisely the requirements; for instance, the efficiency of the solar collector could be included in the calculation; - from the point of view of communication, it is easy to understand how much solar really contributes to the hot water demand and therefore to the energy savings in buildings.
Weaknesses	- calculations should be first performed and then checked; this means that both designers and Municipality staff (or other actors in charge of the checks) should be adequately trained. - the approach is practically applicable only to solar domestic hot water systems. It is not applicable for systems for combined domestic hot water preparation and space heating.
Opportunities	
Threats	- simplified tools and standard calculation methods should be provided and their correct use should be carefully checked; otherwise, any applicant could do his/her own 'tricks' for not fulfilling the obligation; - the above tools should be for free, cleary visible on web sites and easily downloadable; - do not allow exemptions or lowering of the minimum share based on too generic 'technical impossibility' to install the solar thermal plants.

Approach 2: m^2 solar thermal / m^2 floor area or m^2 solar thermal / occupant

m^2 solar thermal / m^2 floor area or m^2 solar thermal / occupant	
Approach *(describe)*	This approach links the minimum area of solar thermal collector to be installed to figures well known and well standardised in the building sector, e.g. the m^2 of floor area or the number of occupants (theoretical value, foreseen in the specific building legislation). Also, a set of values could be required, taking into account the climate, the solar collector technology (a lower value of m^2/m^2 would be needed for more efficient collectors), etc.
Model text module *(if useful / available)*	In all buildings included in the scope of this law, it is mandatory to install at least X m^2 of solar thermal collectors for each m^2 of floor area (or for each occupant).
Elements to be foreseen in the STO	In case this approach is chosen, the STO should clearly include: - the definition of the value of the minimum solar thermal area required;

	- if not only a single value is provided, but a whole set, specify the parameters which influence these values (e.g. collector technology, climate, etc.); - define what is meant by 'area' of solar collectors ('gross', 'aperture', 'absorber').
Exceptions *(if applicable)*	
Examples of STOs, which used this approach	- Portugal national law: 1 m^2 solar thermal per building occupant; - National German renewable heat law and region renewable heat law of Baden-Württemberg: The laws require 10 % or RES for existing buildings and/or 20 % of RES for new buildings. This is fulfilled when 0.04 m^2 solar thermal per m^2 living area are installed.
Analysis	
Strengths	- this approach is easy both for calculating the amount of solar thermal to be installed and also for checking the fulfilment; - it is applicable for both applications of solar plants, domestic hot water preparation and space heating; - it uses figures which designers and Municipality staff are quite familiar with (floor area, number of occupants and which should be anyway communicated when asking for building permission.
Weaknesses	- not precise and not correct on a technical/scientific basis, since we only talk about m2 of 'solar thermal', without taking into account the efficiency of the collector; defining a set of values depending on the efficiency could avoid this problem; - from the point of view of communication, solar thermal is something which is expressed through m2 and not through the produced heat. Presently the solar thermal markets are changing to the use of kW_{th} instead of m^2 for defining the size and capacity of solar heating systems. Following this development it is should be considered to specify the obligation in kW_{th} collector capacity per m^2 living of per occupant.
Opportunities	
Threats	- define precisely which area of solar thermal we are referring to ('gross', 'aperture', 'absorber'); - do not allow exemptions or lowering of the minimum values based on too generic 'technical impossibility' to install the solar thermal plants.

Conclusions and Recommendations

For both approaches, two issues are crucial:

- the link with quality requirements: if a solar collector has been certified, the efficiency values could be trusted and therefore used in the calculations;
- checks should be constant, precise and adequate (see Tools 3.5 and 5.3).

Imprint

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See www.solarordinances.eu for more information on solar thermal ordinances and the ProSTO project.

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