Strategy	Description	Thermal Peak Shaving	Thermal Energy Saving Potential	Electric Peak Shaving	Electric energy saving potential	Celsius Demo	Applicability	Cost Effectiveness
Demand side heat storage in the buildings' thermal mass	This technique exploits the thermal capacity of massive buildings to deliver heat to the building in moments when the overall heat demand is low. This strategy is best effective (with minimal negative effect for the internal comfort) when implemented on buildings with high thermal mass enclosed in a thick external thermal coating (in order to achieve very high time constants), and with radiant emission systems having a large exchange surface between the space heating thermal vector (heating water circuit) and the building's mass.	Very high	High (high time constant means high capacity and high insulation)	High if heat is produced through electric systems	Fair in case of electric resistance, high in case of heat pump	GO1 (theoretically possible within London demos), CO1	High on new buildings specifically designed, fair on existing buildings with radiant heating	Very high
Demand side heat storage though heat tanks	This technique consists in storing heat at the user's side through any heat storage system. Technologically, such a storage system is very often an insulated water vessel. This technique allows receiving heat at a constant rate using it discontinuously. Thus, peaks are shaved at the demand side, allowing a smoother heat production	Very high	Low (indirectly savings are obtained by the smoother demand)	High if heat is produced through electric systems	Fair in case of electric resistance, high in case of heat pump and DHW electric production	RO1 (the heat hub is a large heat storage at the side of the demand), CO1 (at building scale)	High potential for displacing peak boilers in the user areas	Low to very high (high effectiveness for RO1 replicas and for DHW electric heaters)

	and flow rate on the DH main lines. If heat is provided by electric heat pumps or electric heaters, this can enable electric peak shaving and shifting. In general, this allows being able to supply a thermal power higher than the maximum output of the thermal generator.							
Supply side heat storage through heat tanks	This technique consists in storing heat at the production side through any heat storage system. Technologically, such storage system is very often an insulated water vessel. This technique allows to receive heat at a constant rate using it discontinuously. Thus, peaks are shaved at the demand side, allowing a smoother heat production and flow rate on the DH main lines. Heat storage is particularly important in small DH systems. Within a network like the Goteborg one, with 1200 km extension, such capacity is already provided by the water volume stored in the network piping itself.	Very high	Low (indirectly savings are obtained by the smoother demand)	High if heat/cold is produced through heat pumps	Theoretically high, still not applied	LO2	High where needed (small and medium DH/DC systems)	High
Smart heat pricing	As for electricity grids, also in DH it is possible to think to a different pricing as a function of real heat cost and	Medium	Medium (pricing always promotes saving)	No	No	GO29e partially promotes saving	Tariff has to be consumption dependent and heat meters must be equipped with clock	High

	availability. The consequence of this should be a shift in heat demand from peak hours, featuring higher pricing, to lower demand hours, thanks to behaviour change in users or demand-side storage development. Such a strategy can be effective in shaving daily peaks related to social causes, but not at yearly level. It is effective, therefore, in situations with high demand variations, with a real, large, measurable cost for daily peaks. This is not the case of Gothenburg, where daily peaks are largely shaved by the size of the network, but it is something important in situations with small DH systems, with small piping capacity and large statistical variations.					through pricing		
Sale of thermal comfort, not of energy	The sale of internal comfort, rather than of kilowatt hours of heat, is the base concept of climate agreements in Gothenburg. This type of contract allows a company to invest in the improvement of the thermal plant and of the building envelope of the customer rather than in selling heat, when these	Medium	Very high	No	No	GO29e	Nearly everywhere	High

	improvements are economically/environmentally more convenient than selling extra heat (or peak heat).							
Promotion of energy efficiency in buildings renovation	Promotion of buildings insulation is a primary policy for reducing energy demand in the EU. In particular, external insulation coating of buildings allows not only the reduction of energy demand but also a large increase of thermal capacity of the building. This implies a larger thermal inertia, useful for shaving demand due to external temperature changes but also – as in case of GO1 to partly compensate fluctuations in energy demand of other buildings connected to the network.	Very high	Very high	High if heat is produced through electric systems	Fair in case of electric resistance, high in case of heat pump and DHW electric production	GO1, GO29e	Applicable everywhere on new buildings and in renovation of the existing ones	Medium
Promoting DH/DC development	The increase of the number of users, as well as the types of services, of DH allows the reduction of statistical fluctuations in energy demand, and the broadening of daily use patterns. This causes a broadening of peaks and, in general, a relative reduction between minimum and maximum demand.	High	Medium	No	No	GOe	Gothenburg is already covering large part of the city. High potential in London and Rotterdam	Low (DH development is always expensive)
Promotion of absorption systems for cooling	In case of large availability of waste heat and in presence of	Low	High	High	High	GO14e	A high temperature network operating	Low (adsorption

	networks operating all year long at high temperature (above 90 °C at least) adsorption cooling is a cost-effective, environmentally friendly technology for producing chill. Considering that summertime peak electric demand is largely driven, in southern Europe especially, by cooling, the advantage in the development of these systems is also in terms of shaving electric energy demand peaks.						also in summer is needed	cooling is also expensive)
Development of seasonal storage	There are several possibilities being investigated for achieving seasonal storage. The only available possibilities on large scale are however limited to geological heat storage, where heat is stored by large masses of underground water or by geological layers. This technique finds its best conditions where it is possible to play with large amounts of energy with a good balance between heat demand and cold demand, with an average temperature between the two similar to the yearly temperatures. In many cases, thermal losses by conduction towards other	High	High (especially when fed by waste heat)	High	Medium	No	Proper geological conditions are needed	Medium (in some conditions this technique can be particularly convenient)

	geological layers and towards the surface may be a problem in terms of convenience of storage but also an environmental problem.							