Best Practice description

REScoop: Südtiroler Energy Verband (SEV)

Country: Italy

Name of Measure: Return Flow Temperature Optimization

Third party involved: SYNECO ltd

Description of measure

SEV uses the measure of return flow temperature optimization to optimize their district heating system and save energy. This is a tariff incentive for consumers to give financial incentives in order to encourage consumers to use energy outside the peaks. District heating plants work most efficiently if run at a constant baseline. Biomass plants take a couple of days to work within their design boundaries. Outside these boundaries they quickly become inefficient, that means they do not use the whole amount of energy that resides within the woodchips. The efficiency factor can easily drop from 85% to 40%. To avoid this, a biomass district heating plant should have a well-balanced demand situation. However, demand of consumers varies a lot throughout the day and throughout the year.

One crucial factor for energy efficiency for a district heating plant is the return flow temperature. High return flow temperatures are an indicator for not optimal configured secondary circuits on the client side. Therefore, incentives for the final customer may be a chance to foster energy efficiency in a very transparent way.

Lower return flow temperatures have the following effects for the district heating plant:

- A reduction of the return flow temperature by 10 K reduces the demand for pumping by 20-30% (cutting the flow rate by half reduces energy demand by factor 8);
- Lower return flow increases the efficiency factor for flue gas condensation;
- Demand shifting (start heating earlier / later) is very effective for peak shaving;

Description of actions

In order to give consumers an incentive to use their heat on different times in order to create a better baseline SEV proposed a new tariff model. For transparency and exact calculations of a new tariff model the cooperative first needed to collect data from each costumer. The following data is needed:

Parameter	Unit	Data granularity
Flow temperature	°C	Continuous
Return flow temperature	°C	Continuous
Consumption	kWh	Hourly
Capacity / Load	kW	Hourly

With this data SEV creates a new tariff model. This model is as follow:

$$Tariff\ NEW = Base\ Tariff + T_{Building} + T_{ReturnFlow} + T_{EfficiencyBonus}$$

- **Base Tariff:** All Customers pay a certain base tariff to cover expenses for piping, heat exchanger and other fixed costs;

- **Building Component:** Depending in which house the customer lives, there is a certain component to take also the basic structure of the building into account. It is easier to save energy with a brand new building than with a 50 year old house;
- **Return Flow:** The most important part;
  a temperature level below 40°C is considered as very efficient,
  levels from 40°C to 50°C efficient and
  temperatures above 50°C are penalized as not efficient;
- **Efficiency Bonus:** The efficiency bonus is granted if the customer is shifting peaks as well; the efficiency bonus is a simple correctional factor. If the customer can reduce its standard deviation an additional bonus of 5% is granted. If the deviation is high a penalty of 5% is applied to the whole tariff.

Customers then get a proposition for new a tariff that gives them an incentive to change their energy use. In order to convince customers to move from the basic tariff system to the new system the basic tariff system is increased a bit to create a better incentive to move. Then the new tariff system is promoted through information nights, leaflets and online communication.

Cost of implementation:

The cost of implementation depends highly on the size and complexity of the district heating system. First a technical analysis needs to be done in order to find out how to optimise the energy use in the system. Then the new tariff system needs to be implemented in the organisation. Finally the new tariff system needs to be communicated to members in order to convince them to take on the new tariff system (which is optional).

On average it is estimated that an implementation costs around €20.000 euro's. €10.000 for the technical analysis in order to know how to establish a better equilibrium of energy production and energy use. And €10.000 for the marketing and communication to customers. Depending on the size of the district heating system, this investment has a return within a year thanks to energy saving in the system.

Criteria	Dr. Watt	Score	Explanation of Score
Effectiveness: The effectiveness of energy saving measures exists of different parts			
	Impact: Is there a clear impact on the energy savings of households where the measures were targeted or implemented. The researchers aim to find meaningful correlations between the measures and the variables that determine energy saving in households.		Not available yet
	Goal efficiency: This criterion looks at the reach in relation to impact. How easy is it to reach a large group of consumers and have an impact on energy saving in that group. Or the other way around, when the measure was implemented in a small group did it had a substantial impact to justify this reach.	+	Once implemented the new tariff is proposed to all consumers of the district heating system.
	Time Efficiency: This criterion looks at how much time does it takes to implement the measure and the duration between implementation and first results. An example of a best practice would be a short time span (months rather than years) between the implementation of a measure and the first measurable results.	++	Implementation of the measure will take around half a year, but results can be measured within the next half-year.
Pre-investments and share of costs: Who bears the pre-investments of implementing the measures and who benefits? How long does it take to cover the pre-investments?		+++	The investments are done by the district heating company to implement the new tariffs. Members can benefit from the new tariffs and the district company from the energy savings in the system. In cooperative district heating companies this reflects in the overall price again.
Implementation: This criterion looks at the complexity of implementing the measure. This includes the above criteria of cost, but also administrative burdens, training of employees or volunteers and integration into existing systems.		-	
	Administrative burdens: Here we will look at the administrative burden that is created with the implementation of the measures, and if it is possible to reduce them with automatization, for example with a basic administrative system. This criterion will always be applied in relation to the impact and reach.	-	The new tariff structure integration in the organisation should not be taken lightly. Once it is implemented administration will function as regular.
	Training of employees or volunteers: Here we will look at how much time it costs to train volunteers or employees that help with implementing the measures. Also, the level of education is considered.	-	It requires specific technical knowledge to implement the new tariff structure.
	Integration into existing systems: Here we will look at the ease by which the implementation of a measure can be transferred to another cooperative somewhere else. When adoption of a measure implies the adoption of a complex support system, this Is likely to form a barrier for transfer of this practice to other cooperatives.	++	Integrating a new tariff structure is difficult. However with the right support it is possible. The financial returns are worth it.

Market up take: This criterion evaluates the possibility of replication with workable alterations in different cooperatives.			
	Regulatory context: Important here is to look whether the measures can only be used when certain regulatory measures are in placed or that they can be implemented in any regulatory context.	-/+	Whether it is possible to implement it is dependent on tariff regulations on a national level.
	Organisational context: Another important aspect is to analyse whether the measures are linked to any specific organisational structures of the cooperative. For example, when a measure only works when the cooperative is the owner of the electrical grid it will get a low score on the market up take criteria.	++	No organisational limitations. This tariff structure is independent from what legal structure the company is.
Ethical performance: This criterion looks at whether there are ethical procedures in place concerning control of end-user, transparency and data management.	Degree of control by end-user: In what terms can end users exercise control of the measures or organisation that implement the measures.	++	This depends on the legal structure. The company owns the data. When the company is a cooperative owned by the consumers they could exercise control.
	Transparency: Is it clear how governance structures or cash flows are organised	+++	Cash flows and governance structures are clearly explained in the communication about the new tariff structure.
	Data management: How is data of the tools managed. Is there for example a privacy policy in place?	+	Managed according to national privacy regulations.

Expert involved: Christopher Larch

Christoph Larch is partner of SYNECO ltd, an engineering and consultancy company focusing on energy efficiency and renewable energy. He is specializing in the public service sector with over 15 years' experience.

After finishing his studies of business economics in Innsbruck, Florence and London he worked for several utilities and professional service firms before starting his own business in 2000. Larch is author of various papers in digitalization, machine learning and big data.

In his professional focus now he is supporting multi-utilities through the digital transformation. The key issues are developing new business models, delivering digital securely and the move towards the 'internet of things' which is a remarkable playground for utilities.

Christoph can help district heating cooperatives to implement other tariff models in order to make their system more efficient and save money and energy.