ECTOGRID INCREASES ENERGY EFFICIENCY REUSING EXCESS HEAT IN COMBINATION WITH HEAT PUMPS

Summary of the project

In today's cities, lots of energy goes to waste. The amount of energy is enough to cover heating and cooling demands for hole cities if it's taken care of. Ectogrid is an ongoing project in Sweden which makes it possible to connect different buildings with different energy demands to use each other's residual energy. Existing energy is then used maximally before new energy is added. Ectogrid uses all available energy flows and makes it possible to decrease both pollution and the energy consumption in a city. By connecting both cooling and heating in the same grid, the energy price decreases compared to traditional solutions on the market.

The energy systems today are designed to do only one thing at a time. But it's possible to create a more energy efficient system. Ectogrid makes it's possible to connect thermal energy flows and let buildings benefit from each other. This by utilizing that a building with a need for heating can deliver a cooled energy flow and vice versa.

Ectogrid combines the characteristics from heat pumps and cooling machines with characteristics from energy distribution grids such as electrical, thermal and gas. The revolutionary is not the components but the way they are put together. The combination makes the performance of each system increase. The system enables the heat pumps and cooling machines to operate within a more favorable temperature range. Compared to large scale production units the energy distribution becomes more efficient and energy losses decrease. Only one thermal grid is needed as it serves several purposes, such as distribution of heating and cooling, storage and flexibility.

The principle of the system is that Ectogrid connects the city with a flexible grid that distributes thermal energy flows between neighbors. The buildings make

"THE ENERGY SOLUTION FOR FUTURE SUSTAINABLE CITIES IS FLEXIBLE, ENABLES RENEWABLE ENERGY AND REDUCES THE USE OF COMBUSTION AND FOSSIL FUELS."

energy deposits or withdrawals from the grid which create energy balance between the buildings different demands. Each building connects to the system through a heat pump and a cooling machine. The water that runs between the buildings keeps a temperature between 5-40°C which makes is possible to use uninsulated pipes and utilize stored energy in the ground. As the system operates with the same temperature as the surrounding earth, the energy losses will be small or even zero. Each heat pump uses the heat it needs, and the cooled water in the grid continues to the next building. Energy only needs to be added to the system when the demand is high. The system uses renewable energy sources such as ground source heat pumps and biogas boilers for additional energy.

Buildings needs for heating and cooling do not always fit together. Therefore, an accumulator tank is used to store heat for later use and to handle daytime fluctuations. The system works like a thermal battery. It can adapt the temperature depending on the demand for cooling and heating. It can also prioritize different demands, if for example an electric car needs to be charged or if there is a surplus of energy, the system temperature change.

The Ectogrid solution can be built in all different sizes, as a neighborhood solution, for a district or for an entire city. It can also be combined with an existing energy system such as district heating and cooling or gas grids. These combined systems are called ectogrid hybrids as they enable local balancing of heating and cooling supported by adding energy from an existing energy system.

Ectogrid has an integrated smart cloud system which optimizes the energy flow and storage. The smart system collects information by using algorithms and data about typical demands over time of users, dates, seasons, weather, local energy production and energy trading prices.

Worlds first ectogrid is built at Medicon Village in Lund, Sweden. This is a life science-park with 120 different organizations dedicated to improving people's health and lives. Medicon Village will be 140 000 m2 when it's finished 2020. The research and innovation center will have 15 commercial and residential buildings connected to the ectogrid. The current energy consumption is approximately 10 GWh heating and 4 GWh cooling. According to calculations, when the project is finished, ectogrid will use only 3 GWh of supplied energy and balance the remaining 11 GWh.

Expected results

- Balancing all thermal energy flows in a building cluster
- Heating and cooling needs are matched against each other with a high efficiency
- Optimizing energy flow and storage using ectocloud
- Minimizing pollution and combustion using renewable energy

FACTS ABOUT THIS PROJECT

Building type: Commercial and residential

Heated floor area [m²]: 140 000 m²

Heat source: excess heat, heat pumps

Location: Lund, Sweden

Time frame: 2017-2020

Project organisation: Eon

Project partners:

• Swedish Energy Agency

• RISE Research Institutes of Sweden

Link to web page or report:
http://ectogrid.com/

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