Helsinki Energy Challenge

Answers to the clarifying questions sent to the organizer by 29 May

Helsinki

Why does the contest clearly advert a one million prize for the winner whereas the competition program states in section 3.6 that the jury may decide to divide the prize money between more than one winner?

The goal is to find one winning solution and the prize for the winning team is one million euros. However, the jury will evaluate the solutions against the same evaluation criteria and should it happen that the jury would decide that more than one team deserves a prize, they have the right to decide to divide the prize money between more than one winner. Both the jury and the organizer have a right to share recognition awards or other additional prizes. As stated in the competition program section 3.9., the jury also reserves the right not to choose a winner. However, the aim is to find one winner.

Are software solutions eligible for the Energy Challenge?

We welcome different types of solutions to the Helsinki Energy Challenge, so also software solutions are eligble. We are looking for solutions that will significantly affect the cessation of coal use by 2029 and speed up the City of Helsinki's journey to becoming carbon-neutral by 2035. All proposed solutions will be evaluated against the same evaluation criteria, presented in the Competition program, section 3.5.

It would be nice to know more about planned Evaluation Criterias: Are all the criterias equally important? Or are some of the criterias worth more "points" than others? Mimimum or maximum cost impact / climate impact?

All proposed solutions will be evaluated according to the same criteria and, due to the nature of the contest, they do not have any specific weight or order of importance. Regarding the cost and climate impact: we have not set mini-mum or maximum cost/ climate impact. As described in the section 3.5 of the Competition program, in the case of climate impact: the bigger the impact on the emissions reduction, the higher the score. Regarding the cost impact - we are looking for solutions that can be implemented and used at a feasible cost to the city and end-users; participants are required to present the total cost of their solutions. In the Applications, the estimation the proposed solution's climate impact as well as cost impact is enough.

The evaluation criteria says “The solution utilises as little biomass and other natural resources as possible”, and we have interpreted this as biomass as a form of raw material (e.g. wood pellets or similar) simply replacing the old coal power plants, that on a short-term basis would cause an increase in GHG emissions. If the material used for the solution however purely consists of biomass waste (e.g. from industry or households), would this still be considered as “biomass” in regards to the evaluation or as “waste”?

We do not want to replace the coal-fired heat production with biomass-fired production, regardless the source or type of biomass. However, as the challenge questions describes - we are looking for answer to the question: How can we decarbonise the heating of Helsinki with minimal use of biomass. The competition criteria includes assessment of the natural resources needed as well as the impact on emissions, where also (biomass) waste as a feedstock, if proposed in the competition entry, is taken into account. The evaluation depends on the potential other use of this waste stream and the emissions related to utilising the waste stream.

The challenge solution should take into account the already planned actions of Helen. On some topics such as heat recovery in datacenter and in industrial sites some sites are mentioned on the challenge documents, Helen webpages or in press releases but are there other sites planned on these topics?

There are plans where there is an investment decision made already as well as plans that are still in a planning phase (no investment decision yet). Those investment decisions that have already been made, should be taken into account – such as the decision on the construction of a new bioenergy heating plant in Vuosaari,as a replacement for part of the production capacity of Hanasaari coal-fired plant. However, those replacement plans, that are only indicative and there is no investment decision yet, can also be treated by

the Challenge participants as indicative plans only, thus, plans that may not materialize as such. So the challenge participants can either consider them as plans that will materialize or propose something else. The challenge participants can of course use other publicly made material as their background information when preparing their proposal, but most important is to take into account the background material published on the challenge website: https://energychallenge.hel.fi/heating-helsinki-today

Is it theoretically possible that a winner is chosen but another teams project is executed?

This is a design contest. The implementation of the winning plan and the solutions included in it, is a possible continuation but yet a separate process from this challenge competition. The continuation will be decided upon after the challenge competition process is completed, depending on the winning plan and the type of solution(s) it consists of. It might be even that some potential winner is not in a position of or interested in the implementation of the solutions. The City of Helsinki has the right to use the winning plans and the ideas in them in its own operations to the extent necessary and, if necessary, to modify those plans with the assistance of a third party, if no agreement can be reached with the winner on possible further development work. However, by default the further discussions will take place with the winner. The right to use the plans only concerns the winning plans, not the other plans.

Do You have a data of the distribution of consumption of the heat because 7,300 GWh for a city of 630.000 people seems a lot. Do you have figures how much is for heating the living space, how much is for offices, how much for shopping centers and retail and how much is for the industry? If you have also rough figures of the square meters of each of the four sectors it would be great in order to understand the energy consumption per m2.

The district heating demand in Helsinki by user group (residential, industry, others) is presented in the Background report (https://www.hel.fi/static/kanslia/energy-challenge/heating-system-in-helsinki.pdf) Figure 8. In the first phase of the competition, this level of information should be enough to develop the initial approach.

Have any of your teams considered tidal buoyancy energy storage? With Finland having an average cycle of 98 feet, a floating platform weighing many tons could be lifted and held till energy is needed. It is a resource that is available.

We do not yet know the content of the Helsinki Energy Challenge team's proposals (all proposals will be opened only after the application period has ended), thus, will not and cannot comment on the content of the teams' proposals. As a general note, the impact of the tide in the Baltic Sea is small, only a dozen centimeters.

Is the Map of the Helsinki district heating network (Document: Background material - Heating system in Helsinki, Figure 16, page 19) available in a better resolution?

That particular picture we do not have in better quality. However, a better quality and more up to date map of Helsinki district heating network has been published on the website, here:
https://energychallenge.hel.fi/heating-helsinki-today

I was in the Live-Broadcast on May, 4. There and in your documents you said that there is already a plan to replace the capacity of CHP Hanasaari, so our system should not include a replacement capacity for this one. But of the Salmasaari CHP. In the documents provided, the heat production from coal is mentioned with about 3850 GWh and the electricity is 2100 GWh - but this is valid for both CHP plants. So our question is, what is the annual energy (heat as well as electricity) that is generated in the Salmisaari CHP, which should be replaced by our system.

There indeed is an indicative replacement plan already to replace the Hanasaari coal-fired plant, thus, therefore with this Challenge competition we are especially looking for solutions that helps us to get rid of also the

Salmisaari coal-fired plant. (Regarding the replacement plant of Hanasaari: those investment decisions that have already been made, should be taken into account; however, those replacement plans, that are only indicative and there is no investment decision yet, can also be treated by the Challenge participants as indicative plans only).

There is more information about the Salmisaari CHP plant and heat only boiler in Salmisaari available in the Background report, chapter 3.3.
(available for download: https://www.hel.fi/static/kanslia/energy-challenge/heating-system-in-helsinki.pdf).
The annual heat production with the plant varies from year to year, and there will be changes to the use of that plant in the future as well, as there are already decided investments to heat generation capacity in Helsinki district heating network area. The competitors are encouraged to assess how their solution would fit as part of Helsinki's other production portfolio, and how much of the coal use the proposed solution can replace. It is good to note that the proposed solution's capacity/ potential to contribute to the cessation of coal-fired heat production in Helsinki is one of the evaluation criteria but not the only one (we haven't set any minimum criteria for the capacity); all evaluation criteria are presented in section 3.5. of the Competition program (available for download: https://www.hel.fi/static/kanslia/energy-challenge/helsinki-energy-challenge-competition-program-updated-31032020.pdf)

Will you please indicate, for Hanasaari and Samisaari PP, the following:
(1) We understand that the electric capacities are 220 respectively 160 MWe, but, we wish to know what is the maximum electric capacity which can be used as of today ?
(2) The same applies to Heat capacities (currently, the nominal are 430 respectively 300 MWt), so what could be the max. capacities which could be taken over by the existing connection points with the DH network?
(3) For the same plants, what are the free space available for new constructions ? (including, perhaps, coal storages)

More information about the Hanasaari and Salmisaari CHP plants can be found in the Background report, chapter 3.3. (1) The electricity generation of CHP plants varies signicantly during the year. There is not requirement to replace that electricity generation capacity; (2) Heat production capacities utilised also vary greatly during the year. At the first stage of the competition, there is no requirement to assess the capacities of connection points in more detail. (3) Concerning the land use by the plants, there are already plans by the city to use the Hanasaari site for other purposes. In the current plans, the Salmisaari area will remain as an energy production area also when there is no coal-fired production anymore. The participants are requested to present the resources needed for their solution, including land use. At the first stage of the competition (so in the application phase) the description of the possible land area need is adequate information. If the challenge participants wish to do so, they may search information on the possible land areas from open source information provided in the Helsinki Map Service (https://kartta.hel.fi/?setlanguage=en; look to the Layer level of: "Real Estates and Unseparated Parcels and Buildings" – layer for "Available Plots"). However, the applicants should note that the maps may not necessarily be completely up to date

What are the average fuel costs (natural gas and coal) in order to evaluate the energy concepts economically and enable a cost-benefit calculation of the status quo?

The historical fuel costs, as well as taxes etc are described in the Background report, chapter 4.1. The cost of using coal depends on the purchase cost of coal for Helen Ltd. (which is confidential information). However, it can be estimated based on the average fuel cost figures presented in the background report Figure 22 (chapter 4.1.).
In addition, the revenues from electricity production with coal in CHP plants (electricity prices presented in Figure 23), CO2 emission allowance costs (Figure 24) and fuel taxes in heat production should be taken into account when assessing the cost of coal use.

Regarding a zoning plan, is there a limit on the amount of available area that can be used for renewable energy sources in the city or its surroundings?

Zoning planning and relevant legislation is described in Chapter 5.4 in the Background report. As the land use and availability is very much dependent on the renewable energy source, information on generally available land area can not be provided. At the first stage of the competition (so the application phase), the participants are asked to estimate the feasibility of their proposal and describe the possible land area needed. Implementation feasibility is one of the evaluation criteria.

Are there still capacities of waste water utilisation for heat pumps? If heat pumps (air or ground source based) are to be included for further consideration, should the electrical consumption be self-produced or what would be the estimated electricity costs for these systems?

The current and planned use of heat pumps by Helen is described in the Background report. There is no study available on the further potential of waste water utilisation for heat pumps in Helsinki. If heat pumps are used, electricity for the heat pumps can be purchased from outside. Historial electricity market price is described in the Background report, figure 23. In addition, electricity taxes and distribution cost will be paid for the electricity used for heat pumps. Participants should assess themselves the total cost of electricity or any other resource for their solution, using current price information or give their own, well grounded estimates.

What are the energy proceeds of the electricity supplied by the CHP and CCGT plants?

The proceeds from electricity generation by the plants can be estimated based on electricity market prices. Historical prices can be found in the Background report, and hourly prices from electricity exchange webpage https://www.nordpoolgroup.com/Market-data1/#/nordic/table. The electricity production by the plants varies from year to year and largely within a year. The participants are not required to assess the impact of their solution on the electricity production in Helen's plants.

What is the yearly generated electricity and amount of energy contained in the fuel for the calibration and modeling of the CHP and CCGT plants?

The amount of electricity and heat generation by the plants varies from year to year, and will change in coming years due to the decided changes of capacities and investments. In the first phase of competition, a high level estimate based on the plant capacities can be provided.

How efficient are the CHP, CCGT and GSHP plants?

There is more information about the CHP and CCGT plants in the Bakckground report. The efficieny of CHP and CCGT plants can be around 90% or even higher
(please see https://www.helen.fi/en/company/energy/energy-production/power-plants). There are no GSHP producing district heating in Helsinki currently. If the proposed solution includes GSHPs, the participant can present own assumptions.

What are the current plans for an expansion of the district heating network? Could you give us an estimate for the next 10, 20 and 30 years?

There are no plans for expansion of the district heating network currently. The share of district heating of the total heat consumption in Helsinki has been stable at around 92% during past decade. The expansion, as well as replacing district heating with other heating methods, can be part of the solution proposed by a competition participant.

What is the degree of heat loss within the district heating network?

Heat losses in the DH system were 7,3% in 2013 (source in Finnish
https://www.helen.fi/helen-oy/vastuullisuus/ajankohtaista/blogi/2014/negawatit-ovat-tarkea-osa-hiilineutraalia-tulevaisuutta).

Are there any districts in Helsinki that are not connected to the heat network of the city? Any branch of the heat network that is currently underperforming and would better be isolated with a smaller but dedicated network? If yes, is it possible to have figures related to this question?

There are some areas which are not connected to DH network, typically these are areas of low heat demand density, for example areas with mainly single family houses. Underperforming areas have not been analysed

and identified. It is good to note, that the customers are free to disconnect from district heating, and freely choose their heating method.

Is it possible to have more information about the type of buildings that are city-owned (housing, schools, ...)? Is it possible to know the fiber optic coverage of the city and in those city-owned buildings?

The City of Helsinki owns approximatley 10% of all buildings in Helsinki. All types of buildings are included in this (apartment buildings and other dwelling houses, office buildings, public serving buildings, industrial buildings, storage buildings, etc.). The fiber optic coverage information of all the city-owned buildings is not available.

Should the competition proposal take into account the electricity generation lost in connection with the closure of existing cogeneration (CHP) plants?

In Helsinki Energy Challenge, we are in search for sustainable heating solutions, to replace the coal used in the heat generation. The proposed solutions do not need to replace the electricity that is currently produced in the coal-fired CHP plants locally. However, the Challenge team can (but not mandatory) in its competition entry also describe the proposed solution's impact on electricity production or demand, in case the solution has an impact on them.

Can the competition proposal be based on improving the energy efficiency of the existing building stock?

If the Challenge participant is proposing energy effiecieny solution as part of the competition entry, it should be such that the City of Helsinki or its energy utility can either implement centrally or have control over implementation othwerwise. This is to ensure large scale impact. Improving the energy efficiency of individual buildings is often based on the decisions of the owners and is therefore associated with an uncertainty independent of the city; therefore, this kind of solutions are excluded from the Helsinki Energy Challenge, unless the competition entry also includes an element for "central implementation" as described. The City of Helsinki's has set a goal to reduce the total heat consumption by 20% and the district heating consumption by 30% (during 2015–2035), by improving energy efficiency of buildings and actions towards these goals are already taking place.

Helsinki