



# ENERGY EFFICIENT HEATING IN ARCTIC AREAS



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In remote regions far from the electric grid, the challenge of efficient use of the local resources and opportunities is obvious. If no local resources are near, the aim is to minimize the import of Arctic Grade Oil for the diesel motor power generator and the heating of buildings in the most cost effective way. If some local resources could be viable, it is a challenge how to utilize them.

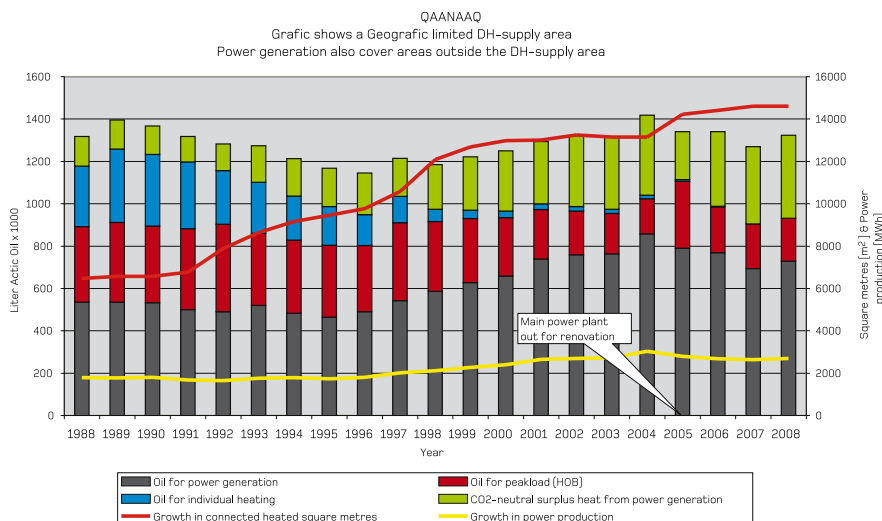
The Arctic settlement of QAANAAQ, close to the North Pole, can show remarkable high energy efficiency, which should be a landmark for any other local and isolated community. The district heating infrastructure which is the key to this high efficiency is owned by Nukissiorfiit, Greenland's national power company, and Ramboll has provided the consultancy services.

The overall efficiency of the imported light oil for the electricity and the heating is around 85%, as a fully developed district heating network distributes all the waste heat from the diesel motors. In fact this surplus energy, which else would be wasted, covers now around 70% of the total heat production. In case there had been individual oil boilers instead of district heating, the total efficiency would have been only 55% (40% for the electricity and 80% for small boilers).

Today the oil consumption for power production and heating purposes in areas supplied with district heating has been reduced by nearly 30% compared to 20 years ago. CO2 emissions have been reduced correspondingly. Looking at oil consumption for heating purpose alone - the reduction has been 70%.

It is remarkable that an efficiency of 85% is possible without a thermal storage, which could be installed if necessary.

Moreover, if the network is supplemented by a thermal storage it would be ready for efficient integration of renewable energy like wind. The wind energy would supplement the diesel generator and surplus wind energy would be absorbed by an electric boiler, stored in the tank and used for heating in accordance





with the demand. Additionally, the district heating system opens for utilization of local waste or biomass - if any, or hydrogen generated using one of the significant potentials for hydro power Greenland holds in other parts of the country.

An important precondition for this success is that the heating density is sufficient and that the costs of the district heating pipes are modest, as they are placed in ducts above ground together with other infrastructure - a symbiosis.

In a warmer climate this solution is even more feasible. Only the district heating has to be supplemented by a district heating cooling.

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