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Interview with Tommi Nyman,
CEO of Steady Energy

Tommi Nyman is a prominent leader in deep technology, with a distinguished career spanning over two decades in nuclear energy and particle physics. He currently serves as the CEO of Steady Energy, one of the hottest nuclear tech start-ups, where he drives innovation in the industry. Previously, Tommi was the Vice President of Nuclear Energy Research at VTT Technical Research Centre of Finland, where he led a research organization that serves the global nuclear industry.

Among his notable achievements, Tommi played a key role in the new-build nuclear project Olkiluoto 3 at Teollisuuden Voima Oyj in Finland, which is recognized for having the largest climate impact in the country. He also contributed to particle physics experiments at CERN in Geneva that led to a Nobel Prize in Physics, highlighting his deep scientific expertise and innovative spirit. Tommi's unique blend of technical knowledge, strategic leadership, and proven success in high-impact projects makes him a highly respected voice in the deep tech community.

Steady Energy develops a small reactor module LDR-50 for district heating applications. What are the main characteristics of the design?

The LDR-50 is a simplified light water (PWR) reactor with a thermal output of 50 MW. The design allows for multiple units to be housed within a single facility, which will be constructed underground.

Since the reactor is intended to produce low-temperature heat (below 150 °C), it operates at very low temperatures and pressures. The pressure within the reactor pressure vessel is under 10 bars, which is about 15 times lower than that of conventional PWRs designed for electricity production.

The LDR reactor module features two nested pressure vessels. Cooling is achieved through natural circulation, eliminating the need for pumps inside the pressure vessel. Heated water rises to the heat exchangers at the top of the reactor pressure vessel, where it is cooled and then flows back to the bottom, thus restarting the cycle.

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The company Steady Energy is very young. Is there already design work which you can build upon?

The design's origins trace back to early 2020, when a group of researchers at VTT, the Technical Research Centre of Finland, first devised it. Currently, around 25 people are employed by Steady Energy, but nearly 200 experts from various organizations, including VTT, Tractebel, and Sweco, are collaborating on the plant and reactor design.

The reactor is a small SMR module design. Will the nuclear heat supply system be factory built and be easily transportable?

Natural circulation within the reactor pressure vessel results in a vessel height of approximately 10 meters, despite the fuel itself occupying only 1 meter. While the system, due to height, as a whole is not easily transportable, the plant features very few components, making on-site assembly a relatively quick process compared to larger power plants.

To be efficient, district heating systems mostly are centered around the heat source in a hub and spoke manner. This will mean the heating reactor will be in the middle of population centers. What are the safety features of the LDR-50?

The facilities will be constructed in air-tight caverns underground. In the Nordic context, there will be up to 15 meters of bedrock between the facility‘s ceiling and the ground above. If bedrock is not available, a “dig-and-cover” approach will be used instead.

Building a facility underground eliminates the need for airplane crash-proof domes and makes the facilities difficult to penetrate.

There are several reasons for choosing the underground option, with safety being a primary concern. Building a facility underground eliminates the need for airplane crash-proof domes and makes the facilities difficult to penetrate.

The LDR-50 is also designed to ensure that, even if the ultimate heat sink (the district heating network) is unavailable, the decay heat is passively removed from the reactor to the pool in which it is situated.

Do you fear there might be reservations about a close-by nuclear reactor and if, what could be done to overcome them?

We must be prepared for people‘s reservations, and the best way to address these concerns is by communicating any potential project plans openly and transparently. This approach ensures that people do not feel that decisions are being made behind closed doors.

Additionally, the underground solution will help alleviate potential fears. The Finnish safety regulator (STUK) recently revised the requirements regarding the proximity of nuclear plants to population centers. If we can demonstrate that we can achieve the same safety levels as a larger plant located 20 km away, there will be no regulatory issues with building within city limits. The preferred option is always to build on existing industrial sites.

How large is the green house gas mitigation potential of nuclear district heating in Finland and in other potential markets in Europe where there are important district heating systems?

The immediate market potential for Steady Energy’s district heating reactors is up to 300 units, covering markets in Finland, Sweden, the Baltics, Poland, and Czechia. The broader European market could potentially double this number. Currently, nearly 60 % of district heat is produced using fossil fuels, so the greenhouse gas (GHG) mitigation potential is immense, amounting to millions of tons of CO_2.

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Moreover, it‘s not just about reducing GHG emissions but also minimizing material impact. The fuel required by an LDR-50 reactor over its 60-year lifetime would fit into two parking spaces. To produce the same amount of energy (20 TWh), you would need about 12 million barrels of oil or 10 million cubic meters of wood. These benefits will multiply as we aim to build dozens or even hundreds of these reactors.

Will nuclear district heating be cost competitive with current alternatives such as fossil fueled district heating, fossil fueled boilers, geothermal heating and electrical heat pumps both for individual buildings and as large centralized heat pumps?

Our conservative estimate is that heat produced with an LDR-50 will cost less than €40/MWh, including both capital and operating costs. At this level, nuclear heat is cost-competitive with any alternatives. Additionally, nuclear heat alleviates pressure on the wider energy system‘s electrification efforts, as less electricity is needed for heating. This provides more flexibility as industrial sectors and transportation become electrified. We view heat pumps and electric boilers as complementary solutions for district heating systems, working alongside nuclear heat to help decarbonize them.

To produce the same amount of energy (20 TWh), you would need about 12 million barrels of oil or 10 million cubic meters of wood.

Could there be additional applications for the LDR-50, such as cooling for large building complexes, cool storage facilities or large industrial sites?

The same technology can be applied to process industries where there is a constant need for large quantities of low-temperature heat. The LDR-50 could be utilized in medical, food and beverage, and textile industries.

Additionally, the LDR-50 could be employed in desalination plants in areas lacking fresh water, replacing fossil fuel-based systems. Furthermore, the heat energy from the LDR-50 could be used with absorption chillers for cooling, supplying chilled water to district cooling networks.

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Nicolas Wendler has been Head of Press and Politics at KernD since August 2013 (Nuclear Technology Germany e. V. / German Atomic Forum e. V.) and started his career in March 2010 as Policy officer. Previously he was an international consultant for the international relations of the Young Union (Junge Union) of Germany among other topics of energy, climate and economic policy for the organization. Since January 2022 he is also the editor in chief at atw. Wendler studied in Munich and Bordeaux political science and economics and (North) American cultural history.