**According to the International Renewable Energy Agency or IRENA, electricity in buildings for keeping the lights on and running appliances and electronic gadgets accounts for only just over half of total energy consumption. Most of the rest of the energy consumed is for space and water heating. The vast majority of that heat energy is currently generated by burning gas or oil or biomass like wood pellets, accounting for two-point four billion tonnes of direct CO2 emissions and another one-point-seven billion tonnes of indirect CO2 emissions just in twenty-twenty-two alone**

**So, it was something of a pleasant surprise for me when a couple of bits of very encouraging news landed on my desk this week from our friends up in the land of snow and ice that is Scandinavia.**

**Hello, and welcome to Just Have a Think,**

**Regular viewers may remember a couple of years back we took a look at a pilot project being developed by a Finnish company called Polar Night Energy. It was essentially a thermal energy storage cylinder filled with nothing more exotic than common sand that could work as a closed air loop heat exchanger for a local district heating system. Air is heated up externally to about six hundred degrees Celsius by an electrical resistance heater and fed through a system of pipes that circulate through the sand in a very specific configuration. That gets the centre of the sand extremely hot indeed while keeping the outer sections much cooler. Once the sand is at full temperature it can store that heat for several weeks or even months with very minimal thermal losses. Then, when the district heating system calls for heat, it’s a simple matter of running ambient air through those same pipes to force the hot air out of the other end. The unit we looked at back then in the Finnish town of Kankaanpää was a relatively small-scale demonstrator capable of discharging heating power of a hundred kilowatts constantly for eighty hours, which translates to eight megawatt-hours of energy.**

**The plan was for Polar Night Energy to produce gigawatt-hour energy systems with about fifteen megawatts of discharge power, which is a very good fit for the majority of district heating networks and also for all sorts of different industries that require process heat or high-pressure steam for their operations.**

**The company’s co-founder, Markku Ylönen, explained to me at the time that a system that size would cost around six to eight million Euros to supply and install, which brings us nicely to the first piece of encouraging news, because Polar Night Energy has just announced that they have successfully secured seven-point-six million Euros in seed funding to scale up the company and advance their capability to convert stored heat back to electricity**

**The company’s press release said…**

 **“This significant investment will play a crucial role in realizing Polar Night Energy's vision of decarbonizing energy production and establishing itself as the leading global provider of large-scale thermal energy storage solutions.”**

**The investment round was led by a South African businessman called Jonathan Oppenheimer, and co-led by Finnish investment companies Stephen Industries, and Holdix and Turret, plus a Swedish family-owned investment company called PC Rettig.**

**Polar Night Energy also announced a new industrial-scale sand battery project with a Finnish district heating company called Loviisan Lämpö, as well as a partnership with a Nordic energy company and independent power producer called Ilmatar, who plan to use a large-scale versions of the sand battery to store surplus wind and solar energy from their own installations.**

**And it’s all going on in Finland right now, because literally in the same week that Mikku emailed me the Polar Night announcement, another news report arrived in my inbox from the city of Vantaa, near Helsinki. This one is the brainchild of a Finnish energy supplier called Vantaan Energia.**

**The plan here is to construct a massive underground seasonal thermal energy storage chamber that can store enough hot water to meet the heating needs of the city for up to a year.**

**Vantaan Energia's CEO, Jukka Toivonen said**

**"The world is undergoing a huge energy transition,". "Wind and solar power have become vital technologies in the transition from fossil fuels to clean energy. The biggest challenge of the energy transition so far has been the inability to store these intermittent forms of energy for later use.”**

**The three huge underground caverns will be built into the city's bedrock about a hundred metres underground. Each of the three compartments will be three hundred metres long, twenty metres wide and forty metres high, giving a total volume of one-point-one million cubic metres. The plan is to use excess renewable energy from local wind and solar to run two 60-megawatt electric boilers that will heat up water, and then pump it into the space at a pressure that will allow temperatures to get as high as a hundred and forty degrees Celsius, which is two hundred- and eighty-four-degrees Fahrenheit for those of you still using the wrong calibration system. The operators will also siphon off a bunch of waste heat from local industrial facilities which would otherwise just float off into the atmosphere, and the inputs are all carefully coordinated by a smart control system. Pressure is maintained by the structure of the caverns, which means the water doesn’t boil over and disappear as steam. It stays liquid and can be stored for months with minimal heat loss. Then when the good burgers of Vantaa start to feel the first ravages of the unforgiving Finnish winter, the hot water will be pumped into homes and businesses via an existing district heating network.**

**The facility will have a maximum thermal capacity of ninety gigawatt hours. Which really is an awful lot of energy. In fact, the operators say it’s basically enough to fully meet the year-round domestic heating needs of the city via it’s six-hundred-kilometre heating network, which pumps hot water through a closed two-pipe system and up into heat exchangers in each building. The householders can then draw the hot water off into their own heating system and the cold water that comes out at the other end is then sent back into the city’s circulation pipes to be recycled back into the storage caverns.**

**The people of Finland are apparently very fond of District Heating technology. In twenty-twenty-three, the country generated thirty-seven-point-three terawatt hours of energy this way, more than half of which came from renewables, and about fourteen percent from waste industrial heat.**

**This new storage cavern is expected to come into service by twenty-twenty-eight with a projected build cost of two-hundred-million Euros. Exact numbers aren’t available for things like levelised cost of energy and round-trip efficiency and all that sort of stuff, but Vantaan Energia reckon they’ve crunched the numbers and they’re confident that the project is, in their words, ‘cost effective’. Let’s hope they’re right because the Finnish Ministry of Economic Affairs and Employment has chucked nineteen million Euros of taxpayers’ money into the project, and I suspect they will be watching closely to ensure their money has been well spent.**

**Now you might be thinking well we Brits don’t want any of that district heating nonsense, do we? We want our own heating systems in our own castles, I mean houses, that no-one can fiddle with except us! But times are a changing aren’t they folks, and communal and cooperative models of energy generation and storage are growing rapidly all over the world, including here in Britain. As a good example, Vattenfall now operates the Bristol Heat Network over in the west of England. It’s part of a wider energy transition initiative called Bristol City Leap, which aims to deliver seven-hundred and fifty-million pounds-worth of decarbonisation projects to the region, creating a thousand well-paid new jobs in the process. Over the next five years, Vattenfall expects to invest four-hundred-and-seventy-five million pounds to grow the Bristol Heat Network into a system that will provide enough heat to supply the equivalent of twelve thousand homes.**

**So, there we are then folks, just a few more examples of how scientists and engineers are quietly getting on with the task of building out low or zero carbon energy technologies while the rest of us continue to bicker about the why’s and wherefores of the so-called Green Agenda!**

**And of course, if you still feel like doing a bit more bickering, or if you’ve actually got some positive news about similar initiatives in your part of the world then, as always, the place to leave your thoughts is in the comments section below, and I will look forward to reading some of your feedback a bit later on.**

**That’s it for this week though. A huge thank you, as always, to the channel’s Patreon supporters who enable me to keep the content completely independent and keep ads and sponsorship messages out of your way. If you’d like to get involved in that, and get exclusive early access to all my videos, then you can do that by visiting patreon.dot.com forward slash just have a think.**

**And if enjoyed this week’s topic and you’d like to get notified when new videos come out each week, then make sure you select the completely free option of clicking on that subscribe button and switching on all notifications, which you can do down there somewhere or by clicking on that icon there.**

**As always though, thanks very much for watching! Have a great week, and remember to just have a think.**

**See you next week.**