

YGN Technical Tour of Finland 2009

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This year 14 delegates from the UK took part in the YGN Technical tour to Finland between the 7th and 12th of June. We chose to return to Finland again after the excellent feedback received following the 2005 YGN tour.



The event was organised by Alan Ruiz of Halcrow Group Ltd and Tommi Henttonen of Fortum Nuclear Services Ltd (Finland). The aim of the tour was to provide an insight into the Finnish Nuclear industry and provide delegates the opportunity to network with like minded young professionals throughout Europe.

Day 1 kicked off with a coach journey 3 hours north of Helsinki to Olkiluoto which is operated by Teollisuuden Voima Oyj (TVO). TVO is a private limited company founded in 1969 by 16 industrial and power companies to produce electricity for its shareholders at cost price. Today TVO has over 100 shareholders who have purchased a percentage of the organisation which gives them use of a predetermined quantity of electricity (dependant on the shares held).

TVO operates two Swedish designed boiling water reactors (Olkiluoto 1 and 2) on behalf of its shareholders and does not make any profit, as any profit is again invested in new plant such as the new Olkiluoto 3 Evolutionary Power Reactor (EPR) being constructed currently by Areva in a ca £3bn turn-key contract.

The Olkiluoto 1 and 2 reactors have been running for ca30 years with capacity factors consistently in the region of 97%. Each reactor has a net output of 860 MW, and together they produce around 16% of Finland's energy requirements. With the Olkiluoto 3 EPR due to connect to the grid in 2012, the Olkiluoto plant will contribute 32% of Finland's energy needs.

Waste heat from the reactors is used to heat soil and the air in the most northerly vineyard in the world where TVO make there own 'TVO' branded wine; and the heat is piped to a large warehouse building where the company breed crawfish to sell at cost to local farmers and fishermen who sell it on at profit. This is all very far removed from the UK system of generation where profit is king!



The group were welcomed by TVO President Mr Jarmo Tanhua who highlighted the challenges being faced by the Finnish nuclear industry and how these were similar to the challenged experienced in the UK. Jarmo emphasised the importance of encouraging young people into the industry, developing professional networks which cross international borders and talked of the nuclear renaissance in Finland.

Jarmo Tanhua (pictured) "It is a bright time for Finland and a bright time for nuclear"

The welcome presentations at Olkiluoto continued with a discussion on the various projects across the site to increase the output from the reactors and a presentation on reactor safety by Mr Juha Poikolainen, Head of Reactor Safety.

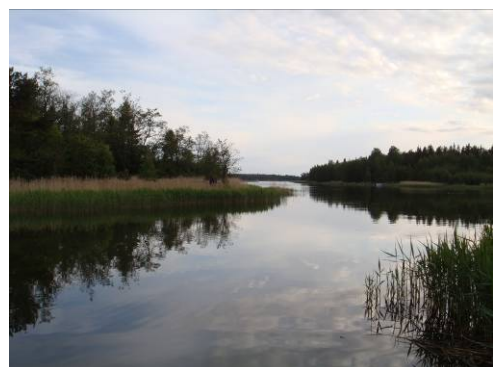
The visit included guided tours of the Olkiluoto 1 turbine hall where delegates could see, hear and feel the 860MW turbine supply electricity to TVO's shareholders, and a tour of the reactor charge face, giving all the opportunity to see firsthand the fuel storage ponds and reactor pressure vessel. A tour of the spent fuel storage ponds followed where everyone could get up close and personal with the fuel assemblies in their matrices, below several metres of crystal clear pond water – something most of the group were experiencing for the first time!



The group were then let loose at the excellent visitors centre during the Monday afternoon. The interactive displays described the "Uranium Cycle" showing how it is mined, used in a reactor and then the final disposal facility being constructed at Onkalo. The centre included a cloud chamber where background radiation could be seen in front of your own eyes and a genuine copper fuel disposal flask. A genuine reactor pressure vessel bolt capable of withstanding 732 tons and approx 5ft long was also on display (pictured). The group all agreed that it was the best visitor centre that they had visited. The visitor centre is visited by approx 20,000 visitors per year, including tourists, school children and now the UK YGN!



Hospitality was provided on Monday evening by TVO with the exclusive use of their Raumolina Social Club which included a meal and some refreshments with the YGN working at Olkiluoto. The evening included the traditional Finnish sauna (one of only ca 2m in Finland!) and plunging into the ice cold Baltic Sea! Fun was had by all, well mostly!

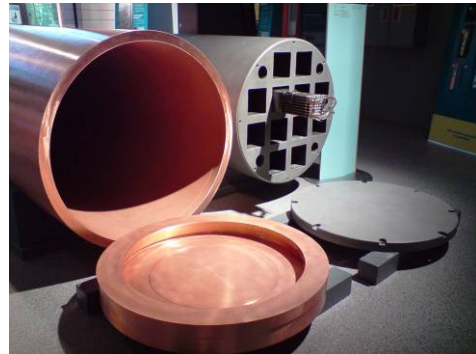




The tour continued on the Tuesday morning with a series of presentations by Posiva at their offices at Vuojoki Mansion. Posiva is owned 60% by TVO and 40% by Fortum, Finland's other main nuclear operator and is responsible for Finland's deep geological disposal facility at Onkalo. The presentations were by Ms Vesa Ruuska of Posiva who discussed the licensing process for the deep geological repository, Mr Jani Helin, a geologist specialising in deep geological

disposal, presented on the rock characteristics and finally Ms Hanna Kajader presented on the infrastructure required in Olkiluoto to support the Olkiluoto 3 project and the deep geological repository construction at Onkalo. A brief visit to the Onkalo repository then followed.

The Finnish government requires that all nuclear waste generated in Finland must be handled and stored in Finland. It also requires that high active wastes and spent fuel be disposed of adjacent to an existing nuclear site, hence the location at Olkiluoto. The current plan is for spent fuel sub assemblies to be placed into a steel matrix (12 per matrix) and these are then placed into a copper flask weighing 7 tonnes. The current best estimate is that 2,900 of these flasks, each weighing 15 tonnes once full of fuel, will be sent to Onkalo and cemented into vertical storage positions surrounded by bentonite clay.



The Onkalo repository will be capable of taking all fuel and high active wastes from all existing nuclear reactors in Finland and the new EPR being built at Olkiluoto. In addition, provision has been made to expand the store for any potential new reactors such as the application for Olkiluoto 4 by TVO, Loviisa 3 by Fortum and the new build application by Fennovoima.

Geological feasibility studies were undertaken during the 70s and the Olkiluoto location chosen in 2001. To date the access tunnel has been partially complete with an underground rock lab being built to establish the fitness for purpose of the site for long term geological disposal. Depending on the findings of that investigation the decision will be made by the Finnish government to either progress with the Onkalo repository or investigate alternative locations. All being well, construction of the final repository is scheduled to begin in 2012 with operation in 2018.

Tuesday morning also included a tour of the TVO operated LLW and ILW underground storage facility which is situated approx 75m underground, extending some 60m further in 2 large cylindrical vaults.



The last stop on the Olkiluoto tour was to a viewing platform overlooking the site of the Olkiluoto 3 EPR construction site. Olkiluoto 3 is widely recognised by our hosts as the future of Finnish nuclear power, and perhaps the UK?

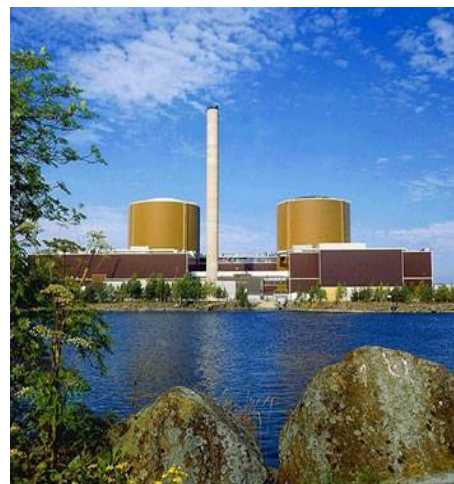


Wednesday started with the annual Finnish YGN seminar that had been organised at the office of Fortum Nuclear Services in Helsinki. The event included presentations from the UK Tour attendees including the UK's new build programme and BE merger with EdF delivered by Katy Jones and Gareth Thomas of BE/EdF, a discussion of the purpose of the Dalton institute by Warren Jones and a presentation by Stephen Le Clere on the decommissioning challenge faced at

Sellafield. The Finns presented on regulatory process for new build, highlighted the large number of research projects being undertaken on the OL 3 project and on their ambitions for new build beyond OL 3. The presentations will be made available late in 2009 on the Finnish YGN website –

<http://www.ats-fns.fi/info/arkisto.html>

Thursday morning was spent visiting the operating VVER stations at Loviisa (a 1h drive from Helsinki) which are operated by Fortum. The VVER design is similar to the PWR but a Russian design. The tour included a number of presentations giving a brief overview of the design followed by a tour of the containment building. Entry procedures were extremely strict with our hosts insisting that clean socks and coveralls were worn whilst inside the station!



Before lunch the group were taken to the Fortum operated LLW and ILW disposal facility – some 150m below ground. After lunch the group headed back to the offices of Fortum Nuclear Services in Helsinki where they listened to a number of talks from leading nuclear specialists and the president of nuclear generation support for Fortum. The presentations focussed on the decommissioning

strategy for Loviisa and the site assessment for the proposed construction of a third nuclear plant at Loviisa.

Thursday evening was a great opportunity for the group to meet with the staff from Fennovoima, a new company formed recently to build a new nuclear reactor in Finland. The organisation, like TVO is non-profit making and is owned by ca 65 shareholders (EoN Nordic hold 33%) in a similar way to the shareholders in TVO. In relation to new build in Finland, there are currently 3 applications lodged with the Finnish Government. One by TVO who wish to build another reactor at Olkiluoto (OL4), Fortum Nuclear Services who wish to build a new reactor at Loviisa in the East of Finland (This proposal includes an option for a ca 70km underground stream pipe to heat homes in Helsinki) and Fennovoima who wish to build at one of 4 sites across the country. A decision in Principle is expected in 2010 from the Finnish government.

The tour was concluded on Friday morning with a series of presentations by the Finnish regulator, STUK. These included NPP Licensing in Finland - Feasibility Studies and Preliminary Safety Assessment for Decision in Principle by Janne Nevalainen, Challenges in the Olkiluoto 3 Project by Kirsi Alm-Lytz and a general presentation on the Finnish regulatory system. The visit also included a tour of the emergency response centre at STUK's offices.

In a country where every second street light has been turned off to save on electricity and ultimately cost, there is a lot of national debate on the reasons for the delays to Olkiluoto 3. STUK and the Finnish utilities believe that the rest of the world should be made aware of the problems that they have faced in the construction of the EPR at Olkiluoto, so that lessons can be learned for future new build projects. Unsurprisingly, STUK (and TVO during our visit earlier that week) maintain that the construction license for OL3 was granted based on a scheme design, and that the detailed design of systems associated with EC&I and other complex safety systems was delayed in being submitted for regulatory approval. Further delays were also incurred during construction with quality issues surrounding the concrete foundations etc. STUK was keen to highlight the importance of collaborative working between utilities, regulators and manufacturers for future new build. These presentations can be viewed on the YGN website under the "Documents" tab.

Overall the visit was a great success for all involved and the YGN. An excellent mix of technical presentation, site tours and socialising was achieved thanks to the organisation and hospitality offered by the Finnish YGN. In particular thanks must go to Fortum, TVO, Fennovoima and STUK for their assistance in organising the 2009 YGN Technical Tour.

Further info can be found online:

http://www.nuclearinst-ygn.com/pic/main.php?q2_itemId=29 – Event Photos
www.tvo.fi/www/page/etusivu_en
www.fortum.com
www.stuk.fi
www.posiva.fi/en
www.fennovoima.fi/en