

KUDANKULAM NUCLEAR REACTOR'S APRIL FALL – BEGINNING OF THE END?

VT Padmanabhan, Joseph Makkolil

The first reactor at the Kudankulam Nuclear Power Plant (KKNPP), 98 km North-East of Thiruvananthapuram and off Bay of Bengal in Tamil Nadu state of India ([8°10'08"N 77°42'45"E](#)) which started commercial operation on 31st December 2014 appears to be in serious trouble due to problems in its steam generator. The reactor, supplied by Atomstroyexport (ASE) of Russia, was grid-connected on 22 Oct 2013. During its 586 'online' days till 31 May 2015, the reactor was not available for 226 days. There were 13 forced shut downs (known as trip or SCRAM in nuclear engineering) which claimed 90 days, two maintenance shutdowns lasting for 64 days, and an outage of 72 days for replacement of the turbine. Incidentally, an association of nuclear vendors in Europe -the European Utility Requirement (EUR) Forum – has certified this reactor as Generation-3.

During 130 days of its 'commercial operation' (from 31st Dec 2014 to 10th May 2015), the reactor tripped twice . The first one known as the 'Pongal trip' as it happened on the Tamil harvest festival day on 14th January 2015, kept the reactor off-grid for four days. The second trip happened at 6.30 PM on 9th May, two days before the Russian national holiday known as the 'Victory day' (11th May). The reactor was revived three days later at 4.47 AM on 14th May 2015.

The 'Victory Day' trip was the culmination of a turbulent process inside the reactor that started on 20th April 2015. Since the revival after the trip, the reactor output has dropped to about 50% and has been stable for 19 days till the 1st of June 2015.

The name-plate capacity of KK reactors is 1000 MW(e). As the campus consumes about 70 MW, the maximum deliverable power is 930 MW. From 31st Dec 14 to 19 April 15, (except during the the Pongal trip), the reactor showed asymptotic performance, feeding the grid with an average 930 MW. NPCIL management was even planning to invite VIPs from Russia and India to 'dedicate the reactor to the nation'.

However, since 20th April 2015, the reactor has been showing clear signs of trouble and the output was falling systematically and dropped to around 798 MW(e) on 8th May 2015. Figure 1 captures this transition.

On 9th May, the reactor tripped and remained off-grid till 14th May 15. The reason reported by the the Southern Regional Load Despatch Centre (SRLDC) was 'transient in steam generator level control'. The daily output on 14 May, the day of revival was 272 MW, which increased to 498 and 516 MW on 15th and 16th May 15. During 17 to 28 May, the output was slightly above 525 MW and during the next four days, it registered a slight decline. (Please see figure 2)

The Media Musings

By and large, the reporting by the national media on the events in KKNPP has been by and large objective and patriotic. Though SRLDC website has been uploading the output and outage data of KKNPP daily at 6 AM since 22 Oct 2013, the reporters generally prefer the station director and the informed sources inside KKNPP and their readers have been fortunate enough get the news right from the 'horses' mouth'. Another advantage is the diversity of the stories, evident from the reporting of the same event by different newspapers.

About the latest, 10th May 15 trip, The Times of India reported: “At Kudankulam, sea water is used to cool and condense the steam-water mixture that generates power - and is several steps removed from the nuclear reactor. Officials say they suspect a hardware problem, likely a malfunctioning of

a seawater inlet filter, and hope to rectify it quickly. "Due to the flow problem the reactor had to be shut down. Technically it is called a hot shutdown and we are confident of resuming generation by Wednesday," site director R S Sundar told TOI." The TOI despatch was reproduced by the blog www.wn.com. (<http://timesofindia.indiatimes.com/city/chennai/Kudankulam-trips-power-cuts-may-hit-TN/articleshow/47227151.cms>)

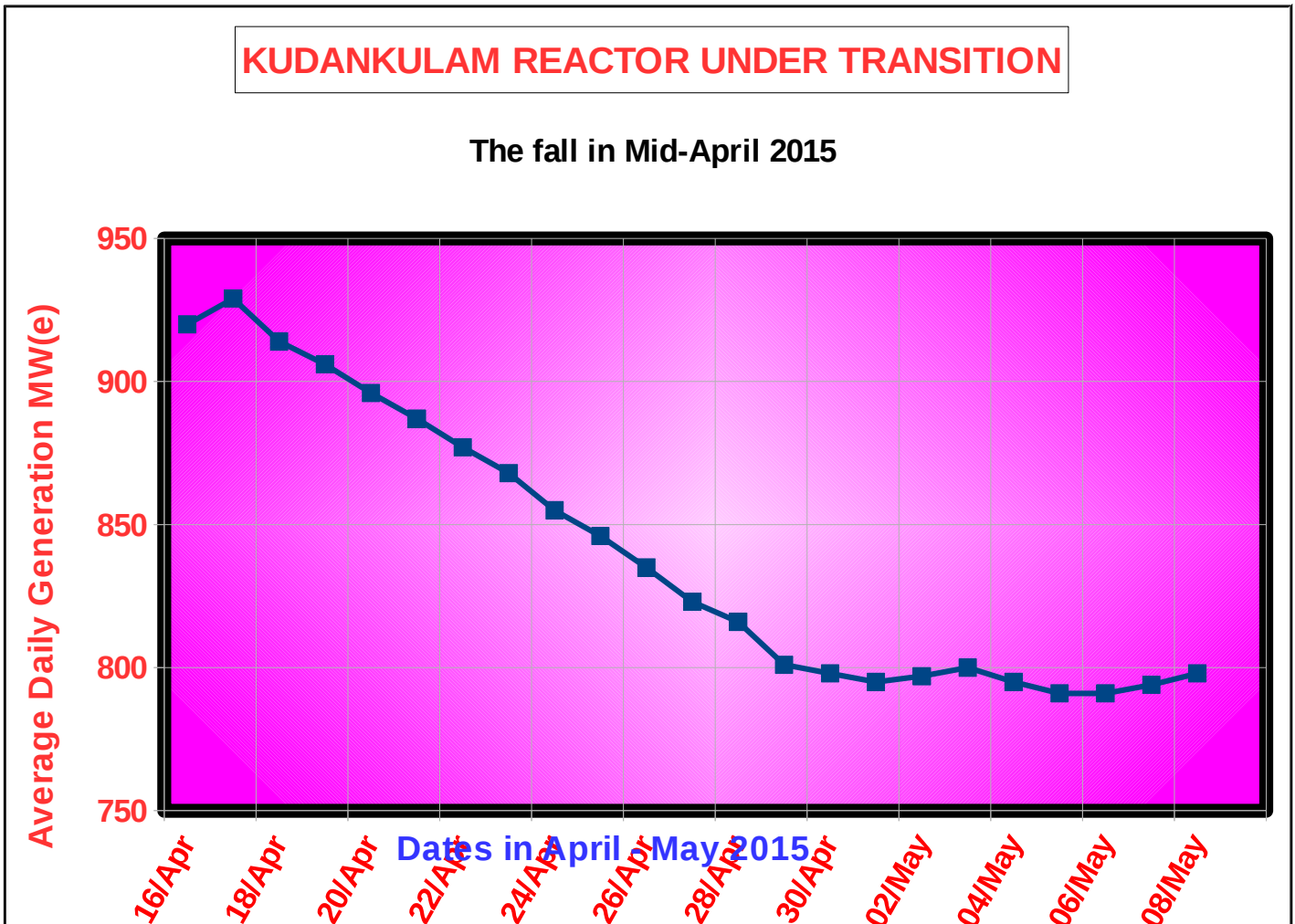


Figure- 1: The reactor under transition

The Hindu printed a different story: “Sources in the KKNPP said the technical problem identified in the hot water release section led to the tripping of the reactor, which was also one of the redundant safety systems incorporated in the reactor and its ancillary units. Though it was initially thought that problem could be sorted within a few hours, the need to externally stop a few more associated units and allow them to cool down prevented engineers from resuming power generation immediately.” (<http://www.thehindu.com/news/national/tamil-nadu/kudankulam-unit-1-trips-again/article7191686.ece>)

The Indo-Asian News Service (IANS) sourced the news to the Southern Regional Load Despatch Centre ("Reactor tripped due to transient in-steam generator level control".) Those without access to sources inside KKNPP, like NDTV, ABPLive etc used the IANS despatch.

Both the reports based on 'inside sources' mention seawater and hot water. KKNPP officials have reason to be shy of the equipment known as the 'steam generator', which was supplied by a Russian company called Zio Podolsk, whose procurement director was arrested in February 2012 for purchasing cheap steel in Ukraine and then passing it off as more expensive grade”

The Beginning of the End?

Is this the beginning of the end of the steam generator? According to a report in the Times of India, “the the Station Director of KKNPP, announced on 21 May 2015 that the the first unit producing 600MW, will undergo annual maintenance for 45- 60 days starting from the first week of June 15”. The systematic decline of the power level during 40 continuous days with a forced shut-down in between and the plan to place the reactor, which has not even worked for one full year, on a long-term maintenance outage lasting for about two months are clear signs of a deep-rooted problem.

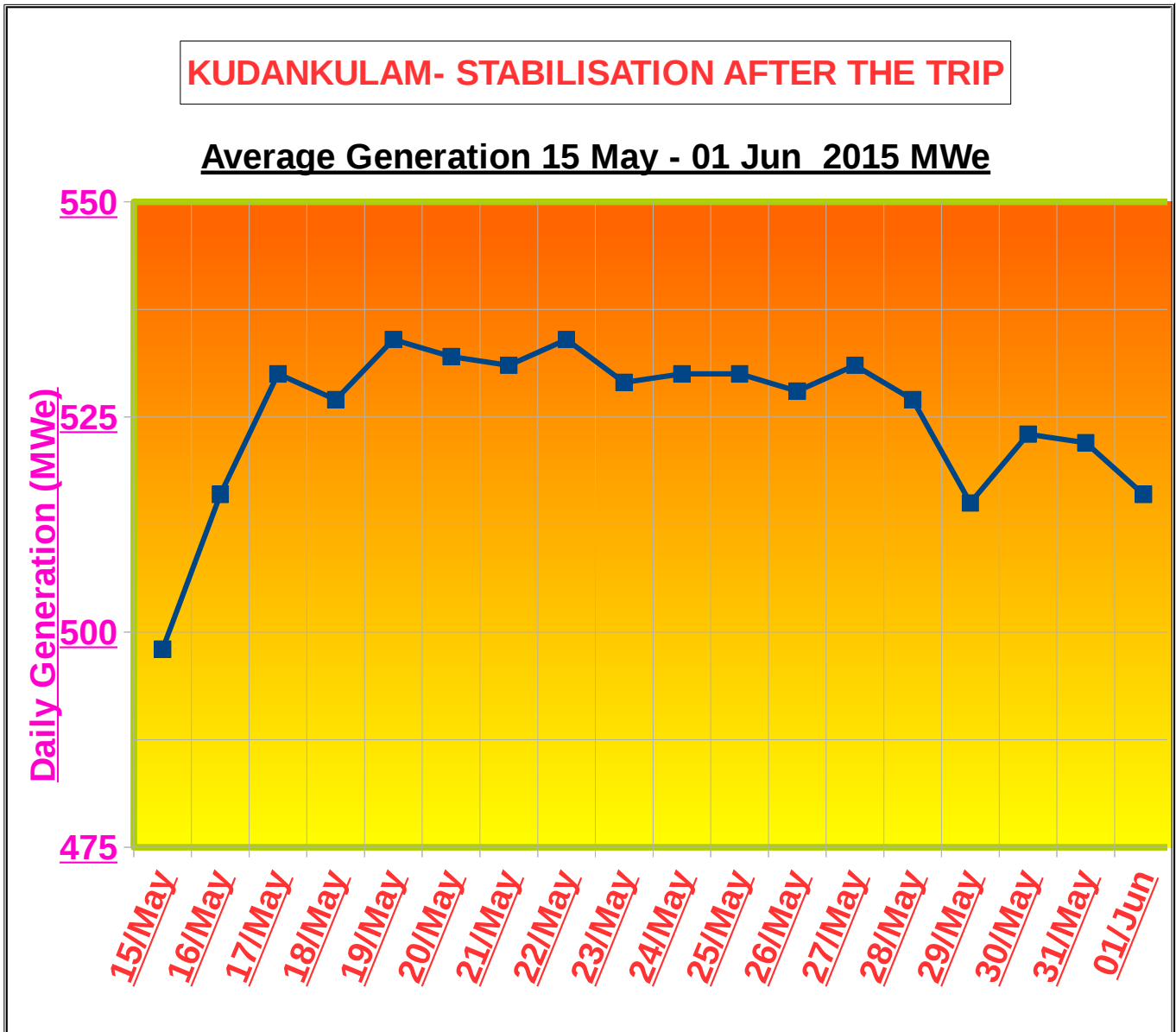


Figure- 2 : Stabilization after decline

VT Padmanabhan is an independent analyst working on radiation and health, nuclear safety, radioactive waste management and food safety. vtpadman@gmail.com

Dr Joseph Makkolil is a nano-scientist in Inter-University Centre for Nanomaterials and Devices, IUCND) CUSAT, Cochin