Joosten, Sandy

From: Ting Chu <yawind2011@yahoo.com>
Sent: Tuesday, April 15, 2014 6:40 PM
To: CHAIRMAN Resource
Subject: Self Powered Heat Exchanger System for Safer and Cheaper Nuclear Reactor Operation

Dear Chairman Madam Macfarlane,

Subject: Self Powered Heat Exchanger System for Safer and Cheaper Nuclear Reactor Operation

The damages caused by the Fukushima Reactor Accident are immense and long lasting. This accident has resulted in an Order to further strengthen beyond-design-basis mitigation plans. The objective of the order is to further reduce the chance of run away heat build up that leads to accident. One approach is to add more standby non-operational equipments which work for a limited duration, require periodic refueling, and / or availability of external power. With non-operational equipments, periodical tests are needed. However, periodic tests still leave uncertainty of whether the standby equipments will work when emergency occurs since the latest test, and also the handicap of inability to turn on the standby equipments due to access interference. Non-operational equipments also incur pure expenses.

In contrast to adding standby non-operational equipment, the other approach is to implement self powered operational equipments that can achieve the objectives of the standby equipments after main turbine shutdown by being able to operate without external power for sustained period as long as elevated heat sources exist. By incorporating a patent pending and copyrighted Multi-function Transmission (MFT), a Self Powered Heat Exchanger (SPHE) can replace each existing external powered coolant circulation pump. The MFT can blend multiple disparate powers converted from heat with multiple SPHE, and differentially redistribute with customized torque changes to multiple hydraulic circulation motors. A MFT can easily be configured to produce more than forty thousand (40,000) torque / speed ratios with overdrive of 0.025 to amplification of 40.0 so wide range of high and low heat can be converted into usable hydraulic energies. Under computer control, a single MFT can directly differentiate about ten combined power sources and loads so all heat sources in a nuclear reactor can be managed. Each heat source can be converted into mechanical energy with known external heat engine principles including high and low temperature steam, Stirling, or elevated pressure hot air. Next, the MFT differentially blends the converted mechanical energies with appropriate individual torque ratio modifications so as to drive hydraulic coolant circulation pumps and regulate temperature. So, removing heat with SPHE eliminates, or at least reduces, consumption of electricity that can be marketed for additional revenue. The amount of unproductive capital tied up in standby equipment is also reduced. Reliability is further increased with extra source of on-site AC electricity independent of main generator because a SPHE can be sized to generate sufficient onsite AC electricity for plant operations so crucial electrical equipments can continue to function after both main reactor shutdown and cutoff of grid AC power. With SPHE being in the operation loop, there is no delay in maintaining adequate cooling after main generator shutdown. There is also full time monitoring so any SPHE failure will be detected and alerted in fractions of a second rather than delayed until discovered in a forthcoming standby equipment test some days or months later. Non-productive standby equipment test hours and expenses are eliminated or reduced. The MFT has the capability and flexibility to connect and operate extra SPHE so the load of a failed SPHE can be instantly assumed by remaining operating SPHE, and the failed SPHE can be hot swapped out for one or more functioning SPHE of sufficient but not exactly matching capacity so downtime can be eliminated.

I hope I have sufficiently shown that SPHE system has superior technical and safety merits to justify funding request from the Commission for prototyping. If additional information is needed, I can provide more SPHE details. If the Commission needs information of MFT, I can show how MFT can meet the control functions of SPHE with two computer simulations using commonly known applications. A first computer simulation shows ability to meet stringent differential constraints with a MFT differentiating a six wheels vehicle executing friction constrained pivot turns which are tighter and more complex than possible with existing indirect control differential popularized with 4x4 vehicles. A second computer simulation shows the ability to simultaneously control different rpms some that varies, and one that stays fixed with a ship having multiple engines simultaneously driving multiple propellers, thrusters, electric generator and hydraulic tool so that the generator deviates less than 0.2 rpm from 3,600 rpm while propellers, thrusters and hydraulic tool repeatedly change speeds. The operation principles of both simulations apply to how SPHE functions.

I look forward to hear from the Commission. I believe the proposed SPHE has the rare combinations of enhancing safety, reducing operation cost, and enhancing revenue. The SPHE can also co-operate with traditional standby equipment so installation of SPHE can be incrementally introduced safely.

Sincerely,

Chu, Ting