

ThorCon USA
partnered with
Argonne National Laboratory

RFA-18-15820, Electroanalytical Sensors for Liquid Fueled Fluoride Molten Salt Reactor

YEAR AWARDED: 2018

TOTAL PROJECT VALUE: \$500k (DOE Funds Awarded: \$400k; Awardee Cost Share: \$100K)

STATUS: Completed

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DESCRIPTION: ThorCon is developing a thermal neutron spectrum thorium/uranium molten salt fueled reactor known as the ThorConIsle power plant. The design is based on the Molten Salt Reactor Experiment at Oak Ridge National Laboratory in the 1960s. The fuel is in liquid form and onsite fuel processing is limited to adding makeup fuel and beryllium to maintain redox balance in the fuel salt. Shipyard manufacturing is used to build a complete 500 MWe power plant and then tow it to a site where it is ballasted to the sea bottom. In order to provide the full range of sensing requirements for the ThorConIsle power plant, two sensors were needed. The first sensor was needed to perform high concentration measurements of uranium trifluoride and uranium tetrafluoride. The second sensor was needed for low concentration measurements of the fission and corrosion products. Working under a GAIN voucher, ThorCon requested Argonne National Laboratory to assist in the development of multi-function sensors for redox control and nuclear material accounting in the fuel salt. These activities were to support successful deployment of the 500MWe ThorConIsle demonstration power plant.

BENEFIT: Maintaining proper redox condition is crucial to minimizing corrosion. Sensors to measure the current redox condition are required to maintain the proper redox condition. Because the fuel is in liquid form, if the reactor overheats for whatever reason the ThorConIsle will shut itself down and passively shed the decay heat.

IMPACT: ThorCon International and Indonesia have identified a remote site for the demonstration power plant and are currently conducting a site survey. The pre-fission test facility and the demonstration plant will develop the data necessary to support a license application for deployment of ThorCon power plants in the US and elsewhere.

NEXT STEPS: ThorCon reports much of the design phase has been completed, computationally modelled, expressed in 2D drawings and 3D CAD models, and shared with potential suppliers. The company plans to build a pre-fission test facility (PTF) at full scale. The fuel salt will not contain enriched uranium and will not sustain a chain reaction to generate power. The components will be brought up to operating temperatures using electric heating. The absence of radioactivity allows intrusive instrumentation, direct observation, and internal access to components.

