1) Activities – Moltex development status 2018

2) Moltex’ approach to Fuel Cycle, and the road to Thorium

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Thorium World
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Moltex’s Technology Portfolio

Stable Salt Reactor Platform
– rapid-deployment, GW scale power plants

SSR-W
Fast spectrum Wasteburner fuelled by Pu from spent fuel

SSR-U
Low Enriched Uranium Burner (~5%)

SSR-Th
Thorium Breeder

GridReserve®
Low Cost Thermal Energy Storage

WATSS - WAste To Stable Salt
Conversion of spent oxide fuel to SSR chloride fuel
Company Background

- Founded in 2014;
- Inventor is Dr Ian Scott, former chief Scientist of Unilever
- UK origins with international presence
- Strategy to remain small reactor designer and license IP through strategic partnerships
- Privately funded until 2018
- Mission to enable low cost clean energy as a practical economic solution
Activities – UK AMR Feasibility Study

• UK policy is now to support Advanced Modular Reactors (non water cooled) at an early stage

• Moltex selected as 1 of 8 vendors to carry about a feasibility study on the technology (1 of 2 at utility scale)

• 2 or 3 are expected to receive £10m for R&D in 2019. Total of £56m to be invested in AMRs

• Aim is to progress towards GDA slot with ONR and UK FOAK SSR.
Vendor Design Review is an opportunity to get early regulatory feedback on the design.

Currently part way through Phase 1 of 2 Phases having commenced in December 2017.

Review covers 19 topic areas.

10 vendors taking part; 5 in progress.
Activities – New Brunswick SSR-W300 FOAK

• On 13th July, Memorandum of Understanding announced with New Brunswick Power and NB Government to build, own and operate a SSR-W300

• NB providing initial funding of CAD$5m towards development matched by Moltex

• Moltex Energy’s North American headquarters is currently being established in Saint John, NB

• NB Power is a small utility with a 600MW CANDU-6 with a history of driving innovation – 1st CANDU refurb
Molten chloride salt fuel confined to conventional fuel assemblies – no pumped circulation as in all other Molten Salt Reactors

Simple continuous refuelling enabled by low pressures and rectangular core

Primary coolant is NaF-KF-ZrF$_4$ in tank with integral primary heat exchangers, 525-630°C

Core modules contain all reactor core components inc pumps and heat exchangers – multiple modules in single tank allow simple upscaling

• SSR-W300 NaCl-AnCl$_3$ fuelled
• WATSS (Waste to Stable Salt) conversion process recovers An/Ln from spent oxide fuel liabilities
• SSR-W1000 is identical design with more modules in a longer tank – quick deployment strategy for commercial growth.
Fuel Cycle and Deployment Roadmap

- SSR-W300 – MOU for Canadian FOAK at Point LePreau
- Quick to market (use of current materials and lowest technology hurdles – concept design complete)
- Commercial advantage – reducing current wastestream liabilities for operators
- Limited W markets (established nuclear countries with significant-enough stockpiles)
SSR-U

• SSR-U is a 5% LEU-fuelled reactor which can adopt current water reactor fuel cycle infrastructure.

• Design heavily-related to SSR-W, providing a common development platform.
Fuel Cycle and Deployment Roadmap

- SSR-U deployment next priority
- LEU Fuel cycle that is deployable & safeguardable – works with current commercial enrichment infrastructure and non-proliferation approach (not HALEU)
- Emerging nuclear markets with viable U235 economy reached, where indigenous supply or supply agreement is practical
SSR-Th

- SSR-Th is an incremental development step of SSR-U. A thorium-based coolant supplants the zirconium-based coolant, using thorium redox couple.
- A bismuth extraction column extracts Pa/U into a U238 diluent.
- The ~5% U233 alloy is processed back into stable salt fuel.
Fuel Cycle and Deployment Roadmap

- SSR-Th simple iteration of SSR-U baseline design
- Third to market – extends SSR to regions where access to enriched U fuels is commercial obstacle
- Bred U233 extracted into U238 diluent, close analogue to a 5% LEU 235 fuel.
- All-New Nuclear Markets, even lower cost point evolution.
Fuel Cycle and Deployment Roadmap

Deployment Roadmap

SSR-W launches the Stable Salt Platform...

SSR-U is our global workhorse...

...SSR-Th transitions the fleet away from U enrichment dependency.

* illustrative only
Further technical information at www.moltexenergy.com

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