Status Report – SEALER-UK (LeadCold)
Sweden/UK DATE (2019/12/11)

This reactor design is a new concept with a projected earliest commercial deployment time of 2030.

INTRODUCTION

Indicate which booklet(s): [ ] Large WCR [X] SMR [X] FR

SEALER-UK is a 55 MWe lead-cooled reactor using 12 percent enriched uranium nitride fuel. The purpose of the design is to produce base-load power on the UK grid. The reactor is designed to permit automated manufacture in a factory, with an intended lead-time from order to operation of 24 months. In a reference configuration of four units, a SEALER-UK power plant may produce 220 MW of electricity at an estimated cost of £50/MWh. A single fuel load will last 22.5 full power years, corresponding to 25 calendar years of operation.
The integrity of steel surfaces exposed to liquid lead is ensured by use of alumina forming steels developed by LeadCold Engineers, containing 3-6 wt% aluminium. These steels are applied either as weld overlay, as a surface alloy, or as bulk material, depending on the radiation damage dose tolerance and mechanical strength required for a particular component.
Passive safety of the reactor is ensured by removal of decay heat from the core by natural convection of the lead coolant. Transport of the decay heat from the primary system is accomplished by dip-coolers, or ultimately by radiation from the primary vessel to a reservoir of water surrounding the guard vessel. In the event of a core disruptive accident, volatile fission products are retained in the lead coolant and no evacuation of persons residing at the site boundary will be required.

Development Milestones

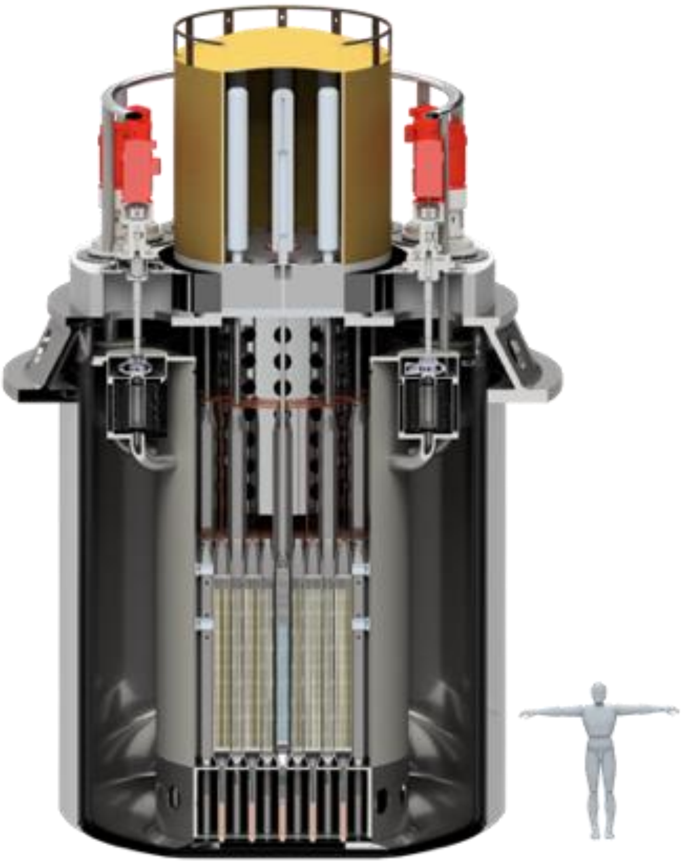
2019	Concept design completed
2020	Engineering design complete
2021	Start of licensing procedure for demonstration unit
2024	Start of construction of demonstration unit
2026	Demonstration unit in operation
2027	Start construction of reactor factory
2030	Commercial operation of first multi-unit site

Design organization or vendor company (**e-mail contact**): LeadCold (info@leadcold.com)

Links to designer/vendor homepage: www.leadcold.com

Detailed Design Description: N/A

Most Recent Licensing Application Support Document: N/A



CAD representation of SEALER-UK

Table 1: ARIS Category Fields (see also Spreadsheet "Categories") for Booklet

ARIS Category	Input	Select from
Current/Intended Purpose	Commercial - Electric	Commercial – Electric/Non-electric, Prototype/FOAK, Demonstration, Experimental
Main Intended Application (once commercial)	Baseload	Baseload, Dispatchable, Off-grid/Remote, Mobile/Propulsion, Non-electric (specify)
Reference Location	Below-Ground	On Coast, Inland, Below-Ground, Floating-Fixed, Marine-Mobile, Submerged-Fixed (Other-specify)
Reference Site Design (reactor units per site)	Multiple Unit (4 units)	Single Unit, Dual Unit, Multiple Unit (# units)
Reactor Core Size (1 core)	Small (140 MWth)	Small (<1000 MWth), Medium (1000-3000 MWth), Large (>3000 MWth)
Reactor Type	LFR	PWR, BWR, HWR, SCWR, GCR, GFR, SFR, LFR, MSR, ADS
Core Coolant	Pb	H_2O, D_2O, He, CO_2, Na, Pb, PbBi, Molten Salts, (Other-specify)
Neutron Moderator	None	H_2O, D_2O, Graphite, None, (Other-specify)
NSSS Layout	Pool-type	Loop-type (# loops), Direct-cycle, Semi-integral, Integral, Pool-type
Primary Circulation	Forced (10 pumps)	Forced (# pumps), Natural
Thermodynamic Cycle	Rankine	Rankine, Brayton, Combined-Cycle (direct/indirect)
Secondary Side Fluid	H_2O	H_2O, He, CO_2, Na, Pb, PbBi, Molten Salts, (Other-specify)
Fuel Form	Fuel Bundle	Fuel Assembly/Bundle, Coated Sphere, Plate, Prismatic, Contained Liquid, Liquid Fuel/Coolant
Fuel Lattice Shape	Hexagonal	Square, Hexagonal, Triangular, Cylindrical, Spherical, Other, n/a
Rods/Pins per Fuel Assembly/Bundle	271	#, n/a
Fuel Material Type	Nitride	Oxide, Nitride, Carbide, Metal, Molten Salt, (Other-specify)
Design Status	Conceptual	Conceptual, Detailed, Final (with secure suppliers)
Licensing Status	N/A	DCR, GDR, PSAR, FSAR, Design Licensed (in Country), Under Construction (# units), In Operation (# units)

Table 2: ARIS Parameter Fields (see also Spreadsheet "Data") for Booklet

ARIS Parameter	Value	Units or Examples
Plant Infrastructure		
Design Life	25	years
Lifetime Capacity Factor	96%	%, defined as Lifetime MWe-yrs delivered / (MWe capacity * Design Life), incl. outages
Major Planned Outages	14 days every 12 months (prev. maint)	# days every # months (specify purpose, including refuelling)
Operation / Maintenance Human Resources	60 staff in operation per unit	# Staff in Operation / Maintenance Crew during Normal Operation
Reference Site Design	4 units	n Units/Modules
Capacity to Electric Grid	4 x 55 MWe	MWe (net to grid)
Non-electric Capacity	N/A	e.g. MWth heat at x ºC, m3/day desalinated water, kg/day hydrogen, etc.
In-House Plant Consumption	2-3 MWe	MWe
Plant Footprint	80 x 60 m^2	m^2 (rectangular building envelope)
Site Footprint	150 x 200 m^2	m^2 (fenced area)
Emergency Planning Zone	1 km	km (radius)
Releases during Normal Operation	N/A	TBq/yr (Noble Gases / Tritium Gas / Liquids)
Load Following Range and Speed	N/A	x – 100%, % per minute
Seismic Design (SSE)	N/A	g (Safe-Shutdown Earthquake)
NSSS Operating Pressure (primary/secondary)	0.1 MPa/16.5 MPa	MPa(abs), i.e. MPa(g)+0.1, at core/secondary outlets
Primary Coolant Inventory (incl. pressurizer)	700 000	kg
Nominal Coolant Flow Rate (primary/secondary)	7400 kg/s / 76 kg/s	kg/s
Core Inlet / Outlet Coolant Temperature	420ºC /550ºC	ºC / ºC
Available Temperature as Process Heat Source		ºC
NSSS Largest Component	Guard Vessel	e.g. RPV (empty), SG, Core Module (empty/fuelled), etc.
- dimensions	6.0 m / 4.8 m / 50000 kg	m (length) / m (diameter) / kg (transport weight)
Reactor Vessel Material	SS316L with weld overlay	e.g. SS304, SS316, SA508, 800H, Hastelloy N
Steam Generator Design	Spiral tube stack	e.g. Vertical/Horizontal, U-Tube/ Straight/Helical, cross/counter flow

ARIS Parameter	Value	Units or Examples
Secondary Coolant Inventory		kg
Pressurizer Design		e.g. separate vessel, integral, steam or gas pressurized, etc.
Pressurizer Volume	/	m^3 / m^3 (total / liquid)
Containment Type and Total Volume	/	Dry (single/double), Dry/Wet Well, Inerted, etc. / m^3
Spent Fuel Pool Capacity and Total Volume	N/A	years of full-power operation / m^3
	Fuel/Core	
Single Core Thermal Power	140 MWth	MWth
Refuelling Cycle	None	months or “continuous”
Fuel Material	UN	e.g. UO_2, MOX, UF_4, UCO
Enrichment (avg./max.)	11.8%/11.8%	%
Average Neutron Energy		eV
Fuel Cladding Material	15-15Ti	e.g. Zr-4, SS, TRISO, E-110, none
Number of Fuel “Units”	85 SA	specify as Assembly, Bundle, Plate, Sphere, or n/a
Weight of one Fuel Unit	220 kg	kg
Total Fissile Loading (initial)	2300 kg U-235 (nitride)	kg fissile material (specify isotopic and chemical composition)
% of fuel outside core during normal operation	N/A	applicable to online refuelling and molten salt reactors
Fraction of fresh-fuel fissile material used up at discharge	6%	%
Core Discharge Burnup	60 MWd/kg U	MWd/kgHM (heavy metal, eg U, Pu, Th)
Pin Burnup (max.)	120 MWd/kg U	MWd/kgHM
Breeding Ratio	1.0	Fraction of fissile material bred in-situ over one fuel cycle or at equilibrium core
Reprocessing	None	e.g. None, Batch, Continuous (FP polishing/actinide removal), etc.
Main Reactivity Control	Rods	e.g. Rods, Boron Solution, Fuel Load, Temperature, Flow Rate, Reflectors
Solid Burnable Absorber	N/A	e.g. Gd_2O_3,
Core Volume (active)	4.0 m^3	m^3 (used to calculate power density)
Fast Neutron Flux at Core Pressure Boundary	N/A	N/m^2-s
Max. Fast Neutron Flux	4.5×10^{14} $n/m^2/s$	N/m^2-s

ARIS Parameter	**Value**	**Units or Examples**
Safety Systems		
Number of Safety Trains	Active / Passive	% capacity of each train to fulfil safety function
- reactor shutdown	0/1	-/100%
- core injection	1/0	100%/
- decay heat removal	1/1	100%/100%
- containment isolation and cooling	N/A	/
- emergency AC supply (e.g. diesels)	None	/
DC Power Capacity (e.g. batteries)	72 h	hours
Events in which ***Immediate Operator Action*** is required	None	e.g. any internal/external initiating events, none
Limiting (shortest) ***Subsequent Operator Action*** Time	Indefinite	hours (that are assumed when following EOPs)
Severe Accident Core Provisions	Pb coolant	e.g. no core melt, IVMR, Core Catcher, Core Dump Tank, MCCI
Core Damage Frequency (CDF)	N/A	x / reactor-year (based on reference site and location)
Severe Accident Containment Provisions	Pb coolant filter	e.g. H_2 ignitors, PARs, filtered venting, etc.
Large Release Frequency (LRF)	N/A	x / reactor-year (based on reference site and location)
Overall Build Project Costs Estimate or Range (excluding Licensing, based on the Reference Design Site and Location)		
Construction Time (nth of a kind)	24 months	months from first concrete to criticality
Design, Project Mgmt. and Procurement Effort		person-years (PY) [DP&P]
Construction and Commissioning Effort		PY [C&C]
Material and Equipment Overnight Capital Cost		Million US$(2015) [M&E], if built in USA
Cost Breakdown	%[C&C] / %[M&E]	
- Site Development before first concrete	/	(e.g. 25 / 10) (30 / 40) (20 / 25) (20 / 10) (5 / 15) (-----------) (to add up to 100 / 100)
- Nuclear Island (NSSS)	/	
- Conventional Island (Turbine and Cooling)	/	
- Balance of Plant (BOP)	/	
- Commissioning and First Fuel Loading	/	
Factory / On-Site split in [C&C] effort	/	% / % of total [C&C] effort in PY (e.g. 60 / 40)

1. Plant Layout, Site Environment and Grid Integration

SUMMARY FOR BOOKLET

In the 4x55MWe SEALER-UK plant, all reactor units are located underground and two units share a common control room. The foot-print of the site is 150 x 200 m, and that of each reactor building 25 x 25 m.

1.1. Site Requirements during Construction

Figure 1.1 shows the layout of a 4x55MWe SEALER-UK plant, with its reactor units located under ground and where two units share a control room. The foot-print of the site is 150 x 200 m, and that of each reactor building 25 x 25 m.

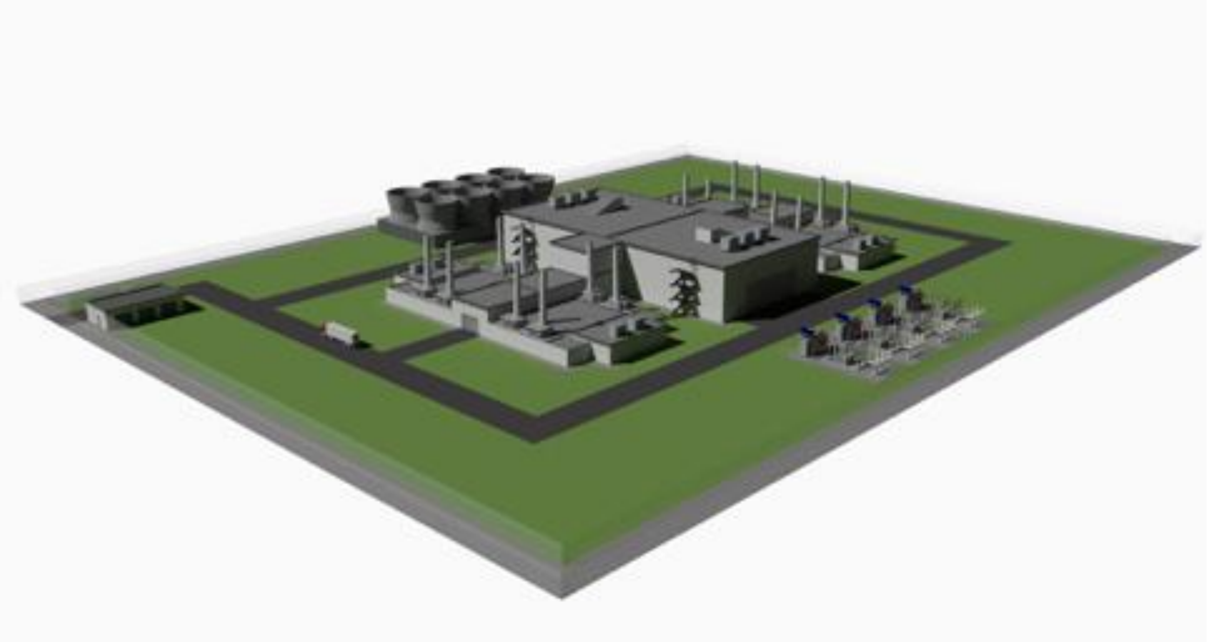


Figure 1.1: Conceptual layout of a 4x55 MWe SEALER-UK plant with its reactor units located underground.

1.2. Site Considerations during Operation

- Not provided

1.3. Grid Integration

- Not provided

2. *Technical NSSS/Power Conversion System Design*

SUMMARY FOR BOOKLET

2.1. Primary Circuit

Figure 2.1 shows a CAD representation of the primary system of SEALER-UK, including the location of fuel assemblies, pumps and steam generators.

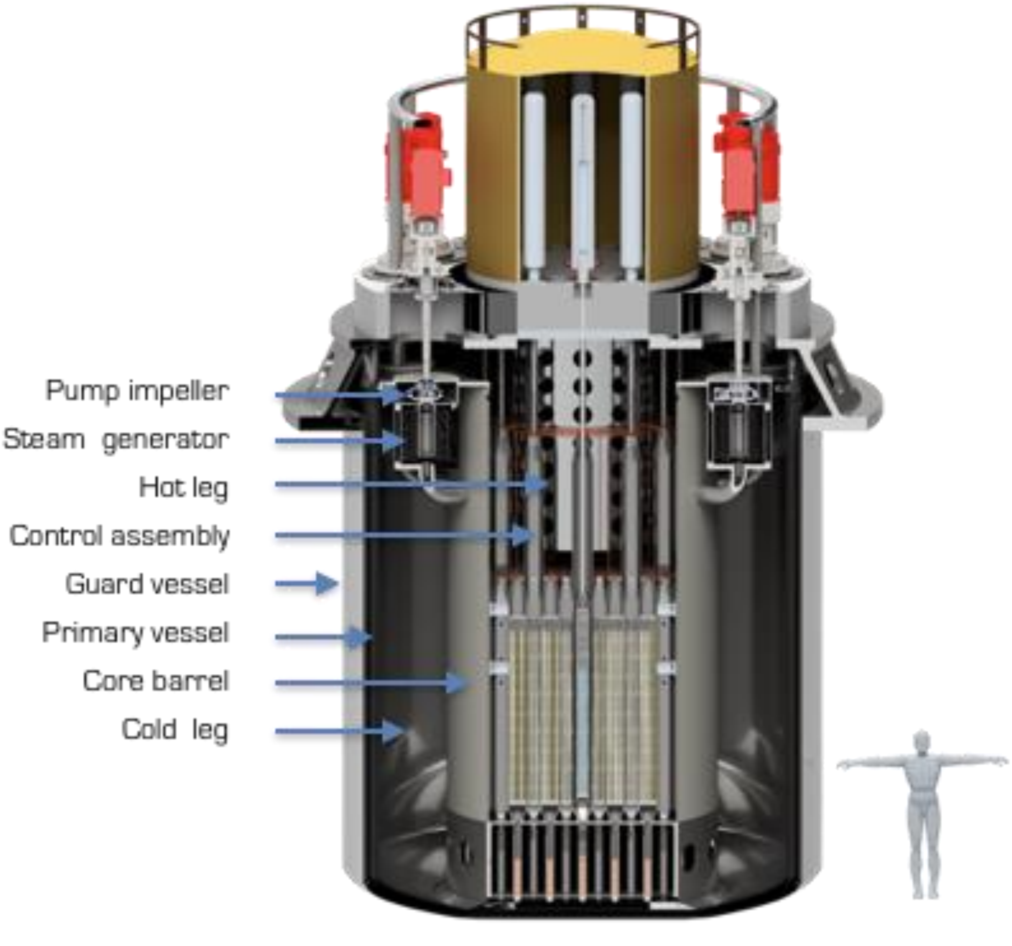


Figure 2.1: CAD representation of the primary system of SEALER-UK

Figure 2.2 shows the principles for decay heat removal by means of dip-coolers and a guard vessel immersed into an emergency cooling water pool.

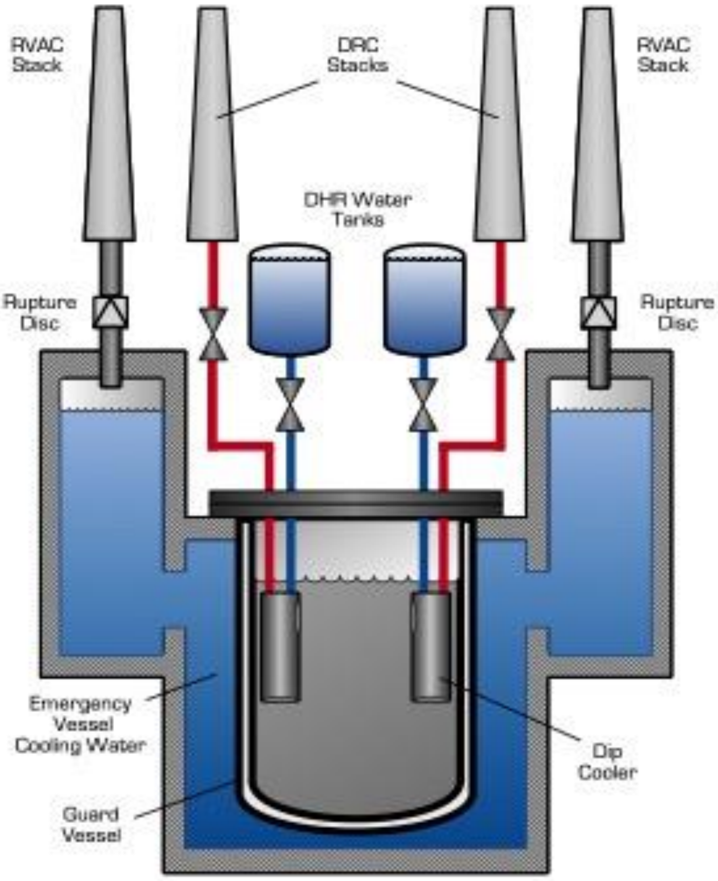


Figure 2.2: General layout of the Decay Heat Removal systems of SEALER-UK.

2.2. Reactor Core and Fuel

The reactor core consists of 85 fuel assemblies, six control assemblies, six shut-down assemblies and 72 reflector assemblies. A core map is displayed in Figure 2.3.

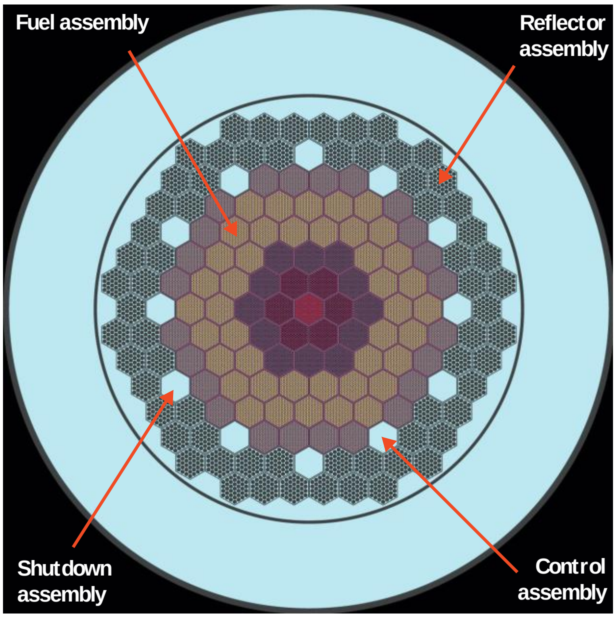


Figure 2.3: Core map for SEALER-UK.

Dimensioning and characteristics of fuel rods and fuel assemblies is provided in the table below.

Item	**Value**
Fuel pellet composition	UN
^{235}U enrichment	11.8%
^{15}N enrichment	99.5%
Pellet porosity	10.0%
Pellet density	12.9 g/cm^3
Pellet diameter	8.12 mm
Fuel column active height	1305 mm
Lower SS316 end cap height	25 mm
Lower B_4C shield height	100 mm
Lower ZrN reflector height	100 mm
Upper ZrN reflector height	10 mm
Upper gas plenum height	500 mm
Upper SS316 end cap height	20 mm
Fuel cladding material	15-15Ti
Fuel cladding surface alloy	Fe-10Cr-6Al-RE
Fuel cladding inner/outer diameter	8.56/9.60 mm
Fuel rod pitch	11.3 mm
Hex-can material	Fe-10Cr-4Al-RE
Hex-can inner/outer flat-to-flat	188.5/194.5 mm
Hex-can pitch	198.5 mm

The fuel burn-up is limited by the peak damage dose (160 dpa) to the fuel cladding. This results in a peak peak/average burn/up of 110/60 GWd/ton respectively.

12% enriched UF_6 may be provided by TENEX or possibly in the future by URENCO. LeadCold intends to set up a factory for synthesis of UN powder using ammonolysis of UF_6. High density uranium nitride fuel pellets will be manufactured using spark plasma sintering.

2.3.Fuel Handling

No fuel handling is foreseen during the operational life of the plant.

2.4.Reactor Protection

The reactivity swing of the SEALER-UK core is estimated at 540 pcm during 22.5 full power years (60 GWd/t average burn-up), where peak reactivity occurs at middle-of-life. This value includes reactivity decrements due to axial swelling of the fuel. The reactivity swing is compensated for by insertion and consequent withdrawal of six natural B4C control-rod assemblies.

Passive reactor shut-down is achieved by insertion of six shut-down assemblies containing CerMet composite W-(W,Re)10B2 pellets, having a density higher than lead. The reactivity worth of these assemblies exceed 1000 pcm.

The fission gas plenum of the control rods is dimensioned so that the fuel rod cladding shall not undergo creep rupture failure during any transient where the cladding temperature remains below 973 K, taking into account full fission gas release into the plenum.

Volatile fission products are retained in the coolant by formation of lead iodide and Pb-Cs Zintl compounds. The retention factor is calculated to be in excess of 99.99% at a primary system coolant temperature of 973 K.

2.5. Secondary Side

A simplified description of the secondary side is provided in Figure 2.4. The super-heated steam from the steam generators is expanded through the turbine, producing mechanical energy, which is converted to electrical energy by a generator. The generator is connected to the utility grid via a step-up transformer. Turbine exhaust is condensed in the condenser, and the waste heat is rejected to the environment by the condenser cooling system. Several turbine extractions are used for feedwater pre-heating to optimise the efficiency of the cycle. Further efficiency improvements can be obtained by considering turbines supporting re-heat. In such approach, the temperature of the exhaust steam from the high pressure sections of the turbine is increased by re-heating, before the steam is supplied to the low pressure sections.

The condensate is pumped from the condenser through the purification system and the low pressure pre-heaters to the feed-water tank. The low pressure pre-heaters utilise extraction steam from the turbine. The feed-water tank acts as the on-line feed-water storage, pre-heater and deaerator. The feed-water tank is heated by extraction steam from the turbine and the drains from the high pressure pre-heaters. High pressure feed-water pumps take the feed-water from the feed-water tank and supply it back to the steam generators through a combination of high pressure pre-heaters. The high pressure pre-heaters utilise extraction steam from the turbine, except for the last pre-heater which utilises live steam from the steam line. Live steam is required to provide the desired feed-water temperature control.

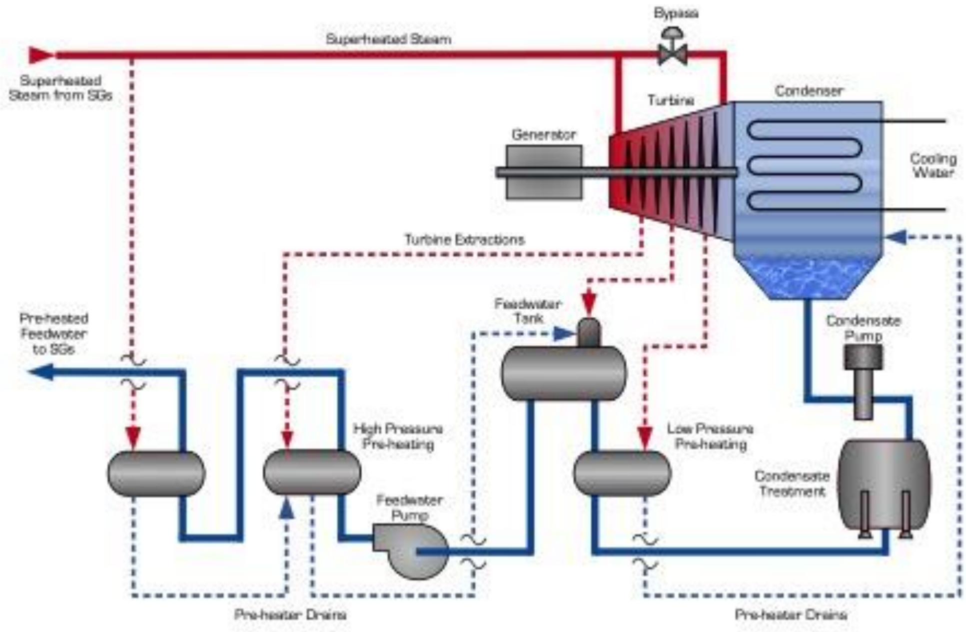


Figure 2.4: Drawing of power conversion system

The main parameters of the power conversion system are summarized in the table below together with the assumptions applied in the calculations.

Item	**Value**
Steam generator power	14 MW
No of steam generators	10
Steam pressure at steam generator outlet	15 MPa
Steam temperature at steam generator outlet	530 C
Feed water temperature at steam generator inlet	335 C
Total steam mass flow rate	76 kg/s
Condenser temperature	30 C
Feed water tank pressure	8 bar
Turbine thermal power	60 MW
Generator output	58 MW
Cycle conversion efficiency	> 40%

3. Technology Maturity/Readiness

SUMMARY FOR BOOKLET

In 2019, the SEALER-UK design is at TRL 3-4.

Component testing and qualification has to be done for pumps and steam generators. Irradiation tests of alumina forming steels and spark plasma sintered UN fuel is to be conducted. An integral test of an electrically heated scale model is foreseen, bringing the design to TRL 7.

3.1. Deployed Reactors

- N/A

3.2. Reactors under Licensing Review

- N/A

3.3. Reactors in the Design Stage

- In 2019, the SEALER-UK design is at TRL 3-4.
- Component testing and qualification has to be done for pumps and steam generators. Irradiation tests of alumina forming steels and spark plasma sintered UN fuel is to be conducted. An integral test of an electrically heated scale model is foreseen, bringing the design to TRL 7.
- The design is simplified by eliminating fuel reloading equipment, spent fuel storage pools, and emergency diesel power generators, as well as avoiding safety classification of the secondary system. A unique feature is the use of alumina forming steels for corrosion and erosion protection.
- The design and construction of the SEALER-UK reactor will comply with the ISO-19443 nuclear standard.
- Preventive maintenance is foreseen to include an annual replacement of pump/steam generator packages
- Main completed and remaining R&D and licensing stages and their duration
- The design authority of SEALER-UK is LeadCold. Supporting R&D has been carried out by KTH, NRG, CRA, SUPSI, Manchester University, McMaster University and engineering studies were conducted by Safetech, Inprotec, Promation Nuclear and TSP Engineering.
- The SEALER-UK reactor could be licensed for construction and operation in the UK within four years after submission of a license application.

4. Safety Concept

SUMMARY FOR BOOKLET

SEALER-UK is designed to manage beyond design basis accidents (initiated by simultaneous failure of two reliable safety systems) with consequences that are less than for conventional design basis accidents. Hence, BDBA events are treated as DBAs in the safety analysis of LeadCold.

Defence in-depth is provided by a series of barriers to release of fission products, which include the uranium nitride fuel pellet, ensuring a low temperature and minimal release of volatiles during transients, the fuel cladding, being protected from corrosion attack by an alumina forming alloy, the lead coolant, providing chemical retention capability up to high temperatures, the primary vessel operating under low pressure conditions and finally a steel confinement.

The safety classified systems operate by means of passive mechanisms, such as insertion by gravity of shut-down rod elements containing high density tungsten composites, insertion by gravity of water into dip-coolers providing natural convection of the primary lead coolant, and radiation of decay heat from the primary vessel to a guard vessel immersed into an emergency cooling water pool. The design intent is to achieve indefinite grace time for operator intervention, with the exception of battery power for post accident radiological monitoring.

In the case of postulated fuel cladding damage, the lead coolant inventory is calculated to retain a least 99.99% of the iodine realeased from fuel pellets, which is sufficient to ensure meeting the radiation protection goals of the design.

Aircraft impact is mitigated by underground location of the plant.

4.1. Safety Philosophy and Implementation

- SEALER-UK is designed to manage beyond design basis accidents (initiated by simultaneous failure of two reliable safety systems) with consequences that are less than for conventional design basis accidents. Hence, BDBA events are treated as DBAs in the safety analysis of LeadCold.
- Defence in-depth is provided by a series of barriers to release of fission products, which include the uranium nitride fuel pellet, ensuring a low temperature and minimal release of volatiles during transients, the fuel cladding, being protected from corrosion attack by an alumina forming alloy, the lead coolant, providing chemical retention capability up to high temperatures, the primary vessel operating under low pressure conditions and finally a steel confinement.
- The safety classified systems operate by means of passive mechanisms, such as insertion by gravity of shut-down rod elements containing high density tungsten composites, insertion by gravity of water into dip-coolers providing natural convection of the primary lead coolant, and radiation of decay heat from the primary vessel to a guard vessel immersed into an emergency cooling water pool. The design intent is to achieve indefinite grace time for operator intervention, with the exception of battery power for post accident radiological monitoring.

- Radiation damage is mitigated by keeping operational temperatures above 420 degrees C, thus avoiding liquid metal embrittlement, and the peak damage dose to the fuel cladding below permissible limits.
- The radiation protection goal is to limit the dose to persons residing outside of the site boundary to a level ensuring that no relocation nor evacuation will be necessary.

4.2. Transient/Accident Behaviour

- SEALER-UK is designed to manage beyond design basis accidents (initiated by simultaneous failure of two reliable safety systems) with consequences that are less than for conventional design basis accidents. Hence, BDBA events are treated as DBAs in the safety analysis of LeadCold. Hence, unprotected loss of flow (ULOF), un-protected loss of heat sink (ULOHS), un-protected transient over-power (UTOP), station blackout (SBO) and un-protected blockage (UBA) are considered as limiting cases for DBA analysis. Loss of coolant is considered to be excluded by design.
- The safety systems that are designed to manage the above set of limiting transients are dip-coolers, activated by opening of a valve to a water tank located above the primary system, and an emergency cooling water pool, into which the guard vessel is immersed. Heat transfer to the guard vessel from the primary vessel is actuated in a completely passive manner when the temperature of the primary system increases above the operational regime.
- The behaviour under ULOF, ULOHS and UTOP accidents has been assessed using SAS4A-SASSYS-1 and LeadCold’s in-house code BELLA. Preliminary findings indicate that margins to failure of cladding and vessel barrirers are maintained during the entire course of the transient.
- In the case of postulated fuel cladding damage, the lead coolant inventory is calculated to retain a least 99.99% of the iodine realeased from fuel pellets, which is sufficient to ensure meeting the radiation protection goals of the design.
- Aircraft impact is mitigated by underground location of the plant. Analysis of seismic, fire and flooding events remain to be conducted, which is also the case for a probabilistic safety analysis.

5. *Fuel and Fuel Cycle*

SUMMARY FOR BOOKLET (optional)

SEALER-UK operates on a once-through fuel cycle. The spent fuel will be left in the primary reactor vessel, which once the lead coolant is frozen, will serve as a final disposal package.

5.1. Fuel Cycle Options

- SEALER-UK operates on a once-through fuel cycle. The spent fuel will be left in the primary reactor vessel, which once the lead coolant is frozen, will serve as a final disposal package.

- In case a recycling option for used uranium nitride fuel will become available *and* cost competitive with respect to enrichment of natural uranium, the spent fuel of SEALER-UK may be reprocessed and enriched uranium, plutonium and possibly minor actinides may be recovered and refabricated into nuclear fuel for future SEALER plants that are designed to operate on such fuel.

5.2. Resource Use Optimization

- Not provided

5.3. Unique Fuel/Fuel Cycle Design Features (if any)

6. Safeguards and Physical Security

SUMMARY FOR BOOKLET (optional)

The SEALER-UK reactor units are located underground, mitigating the impact of airplane crashes and delaying access to vital areas. The core barrel will be sealed, considerably delaying any access to the fuel assemblies.

6.1. Safeguards

- The inventory of the fuel inside the sealed core barrel may be assessed using measurements of reactivity and neutron activity of irradiated fuel.

6.2. Security

- The SEALER-UK reactor units are located underground, mitigating the impact of airplane crashes and delaying access to vital areas. The core barrel will be sealed, considerably delaying any access to the fuel assemblies.

6.3. Unique Safeguards and/or Security Features (if any)

7. *Project Delivery and Economics*

SUMMARY FOR BOOKLET (optional)

The overnight capital cost of a 4x55 MWe SEALER-UK plant is estimated at GBP 400 million.
This figure is based on the assumption that the primary system is manufactured in a factory where automated procedures are applied. The time from ordering of the plant to operation is planned to be 24 months. The lifetime LCOE for a 4x55 MWe SEALER-UK plant is estimated at GBP 50/MWh, assuming an interest rate of 6%.

7.1. Project Preparation and Negotiation

Not provided

7.2. Construction and Commissioning

- The overnight capital cost of a 4x55 MWe SEALER-UK plant is estimated at GBP 400 million.
- This figure is based on the assumption that the primary system is manufactured in a factory where automated procedures are applied. The time from ordering of the plant to operation is planned to be 24 months.
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7.3. Operation and Maintenance

- The lifetime LCOE for a 4x55 MWe SEALER-UK plant is estimated at GBP 50/MWh, assuming an interest rate of 6%.
- This rate assumes a design life of 25 years, and a capacity factor of 90%. The former is limited by radiation damage dose to the fuel cladding (there is no fuel reload foreseen during the life of the reactor. The latter is arrived at by allocation of an annual maintenance and quality inspection period of 35 days.
- The O&M cost is estimated to be GBP 17/MWh, including fees for spent fuel, waste management and decommissioning.
- An equivalent fuel cost of GBP 12/MWh is estimated. The single fuel load is paid for up-front and may alternatively be included in the capital cost of the plant at an expense of GBP 170 million for a 4x55 MWe plant.
- No storage costs for fuel during operation are foreseen, as all fuel is located in the primary vessel.
- Plant decommissioning costs are included in the spent fuel and decommissioning fee, which is part of the O&M cost of GBP 17/MWh.