News in nuclear reactor technology

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Abstract: Advanced nuclear power technologies such as small modular reactors (SMRs) and micro-reactors, a subset of SMRs, have the potential to play a key role in the coming nuclear power expansion. Connect with technical innovators, manufacturers, designers, and government regulators to discuss advancements and gain insights on the latest AMR and SMR projects in the UK and globally. 2024 year's world patents are presented.
Keywords: nuclear technology, small modular reactor, micro-reactor, modern patents

Nuclear energy has arrived at an important milestone. A new global consensus emerged from the 2023 United Nations Climate Change Conference (COP28) in Dubai. In the historic first Global Stocktake under the Paris Agreement approved at COP28, the 198 signatory countries to the UN Framework Convention on Climate Change included nuclear among the technologies whose deployment needed to be accelerated for net zero carbon emissions to be reached. The shift in acceptance of nuclear reflects the realization that rapid, deep decarbonization, especially in hard to abate areas such as industry, will not be possible without a significant increase in nuclear capacity. To that end, more than 20 countries attending COP28 pledged to work towards tripling nuclear power capacity by 2050. Advanced nuclear power technologies such as small modular reactors (SMRs) and microreactors, a subset of SMRs, have the potential to play a key role in the coming nuclear power expansion. The high case scenario of the IAEA's latest projections sees nuclear electrical generating capacity in 2050 being two and a half times greater than today. A quarter of that new capacity is projected to come from SMRs. SMRs have much going for them. They are well positioned to enable the decarbonization of electricity and industries through low carbon heat and hydrogen production. They are also well suited to replace fossil fuel generation in remote communities and industries. Some SMRs are also optimized to work flexibly alongside renewables and energy storage. Given their size and lower upfront costs, SMRs offer a new nuclear power option for countries and industries for which conventional large nuclear power reactors are not suitable. Technology companies are already striking deals with SMR producers as they look for ways to cleanly power their energy-hungry data centres. Developing countries are looking to SMRs as a more affordable option for smaller grids. This popular forum to support the engineering community developing the next generation of reactor technologies in the UK will return in 2025. Attend in 2025 and explore how engineers are tackling essential challenges in nuclear engineering, from criticality safety and data analysis to fault detection, fuel development, and production pathways. Connect with technical innovators, manufacturers, designers, and government regulators to discuss advancements and gain insights on the latest AMR and SMR projects in the UK and globally. Below my readers can wound last 2024 years' patents on nuclear reactor technology.

WO2024258313 (A1) - MULTI-COMPONENT POWER GENERATION ASSEMBLY (EMBODIMENTS)

A multi-component power generation assembly relates to nuclear and renewable energy production and comprises a wind turbine, a machinery compartment, a hollow tubular tower, and a base for said tower. A nuclear plant comprises a reactor assembly with a nuclear reactor and a sealed enclosure for said reactor assembly. The reactor assembly is disposed inside the inner cavity of the tower of the wind power generation assembly. The function of the sealed enclosure of the reactor assembly in terms of protecting operators and the general population against ionizing radiation is performed by a radiation shield in the form of an annular structure surrounding the nuclear reactor from the outside, opposite the reactor core. The functions of the sealed enclosure of the reactor assembly in terms of preventing the spread of radioactive substances beyond the sealed enclosure and also protecting the nuclear reactor against extreme external natural or manmade hazards is performed by the walls of the tower of the wind power generation assembly, together with additional partitions, a sealed air lock chamber, and sealed penetrations in the walls of the tower. The technical result consists in eliminating the need to erect a separate structure, the main purpose of which would be to perform the function of a sealed enclosure for preventing the spread of radioactive substances and protecting the reactor assembly against extreme external hazards.

UA122879 (C2) - DEVICE FOR CONTROLLING AND MEASURING WELDING DEFECTS ON A CYLINDRICAL WALL AND METHOD IMPLEMENTING SAME

The invention relates particularly to a device for controlling and measuring welding defects on a cylindrical wall such as a "vessel bottom penetration" wall of a nuclear reactor, said device comprising a control head (forming a probe which has a proximal end (EP) and a distal end (ED), along the longitudinal axis thereof, and includes a first side a so-called "inner" side, provided with at least one ultrasonic wave translator, characterised in that: said control head comprises a second side , a so-called "outer" side, opposing the first side , which has a curved surface in the form of a cylinder fraction, with a longitudinal axis parallel to the longitudinal axis of the head and an outwardly facing convexity; said wave translator consists of a series of adjacent elements , each element being both an emitter and a receiver, said series having a curved surface in the form of a cylinder fraction in the same direction as said longitudinal axis and an outwardly facing concavity; and the plane containing the two end generatrices of the cylinder fraction of the second side forms a non-null acute angle β with the plane containing the two end generatrices of said cylinder fraction of the wave translator.

US2024418287 (A1) - A Linear Motor For Use In A Molten Salt Nuclear Reactor And A Valve For Use In A Molten Salt Nuclear Reactor

A tubular linear motor, for operating actuating a component in a molten salt loop, preferably a molten salt loop in a nuclear reactor, comprising a stator having a lumen, a tubular translational mover in the lumen, the stator comprising stator windings surrounding the lumen for inducing a magnetic field penetrating the mover, the stator windings each comprising an electrically conductive solid bar, at least a portion of the length thereof being arranged spirally, the spirally arranged portion being arranged between first- and second ferromagnetic rings, the spirally arranged portion of the length of electrically conductive solid bar being positioned between the first- and second ferromagnetic rings, by one or more spacers, preferably ceramic spacers, for electrically insulating the electrically conductive solid bar from the first- and second ferromagnetic rings.

US2024417261 (A1) - SINGLE WALLED CARBON NANOTUBE-BASED SLURRY FOR IMPROVED NUCLEAR FUEL CLADDING COATINGS AND METHOD OF FABRICATION OF SAME

A nuclear fuel element for use in a nuclear reactor may include a plurality of metal fuel sheaths extending along a longitudinal fuel element axis and spaced apart from each other, the plurality of fuel sheaths comprising a first fuel sheath having an inner surface, an opposing outer surface and a hollow interior configured to receive nuclear fuel material. A carbon coating may be on the inner surface of the first fuel sheath. The carbon coating may include more than 99.0% wt of a carbon material including more than 20% wt of carbon nanotubes and less than about 0.01% wt of organic contaminants.

US2024420859 (A1) - Mixed Particle Nuclear Reactions

Methods, systems, and devices for producing hot fluid from a reactor are disclosed. A mix of moderator particles, fuel particles, and reflector particles are configured to produce heat by nuclear reactions.

US2024420856 (A1) - REACTOR CORE SYSTEM

A high-temperature gas-cooled reactor (HTGR) core is disclosed which includes a plurality of nuclear fuel kernels encapsulated by i) solid structures; and ii) porous structures, wherein the solid structures and the porous structures form a heterogeneous tileable repeating assembly including a channel for moving heat out of the HTGR core, wherein a ratio of in-channel porosity to in-channel tortuosity of the assembly is between about 0.2 to about 0.5, wherein the in-channel tortuosity is between about 1.0 and 1.6, and wherein total solid fraction of the assembly is between about 0.6 to about 0.85.

WO2024254954 (A1) - PULSE WATER FLOW ADJUSTING DEVICE WITHOUT ROTATING COMPONENT, AND NUCLEAR POWER PLANT REACTOR COOLING STRUCTURE

Provided in the present invention are a pulse water flow adjusting device without a rotating component, and a nuclear power plant reactor cooling structure. The pulse water flow adjusting device without the rotating component is configured to cool down a wall surface to be cooled, and during cooling, a pulse water flow is sprayed onto the wall surface to be cooled. The water flow adjusting device comprises a water container, a water output flow channel and a device inlet, wherein outside cooling water enters the water container through the device inlet; the water output flow channel has an inverted-U-shaped structure, and is provided with a water outlet and a flow channel inlet; the flow channel inlet is located in the water container; the water outlet penetrates the bottom of the water container, and guides the water flow onto the wall surface to be cooled; and the cross-sectional area of the water container is greater than that of the water output flow channel. Provided in the present invention is a method for reducing temperature by means of pulse water cooling. By using the method, the proportion of the evaporative heat exchange of a water film can be increased, and under the same heat exchange requirement, the required total water film flow is effectively reduced, thereby reducing the volume of a cooling water storage tank.

US2024420858 (A1) - HIGH-PRECISION ANALYSIS METHOD FOR KEY THERMAL SAFETY PHENOMENA IN NUCLEAR REACTOR BASED ON PARTICLE METHOD

A high-precision analysis method for key thermal safety phenomena in a nuclear reactor based on a particle method is provided. Fine complex geometric modeling is implemented based on a multi-resolution particle method. High-order discretization of control equations is implemented using a high-order particle discretization model. Key thermal-hydraulic, mechanical deformation, chemical reaction, and neutron physics phenomena can be analyzed. An implicit and explicit hybrid solving technique and an asynchronous marching algorithm are employed. The method of the present disclosure integrates the multi-resolution particle method, high-order discretization model, advanced solving and marching techniques, and comprehensive physical-mathematical model to achieve a comprehensive, fine, and efficient analysis of key thermal safety phenomena in a nuclear reactor, avoiding mesh distortion in the mesh approach, and significantly improving the precision, stability, calculation efficiency, and robustness of the particle method.

US2024420852 (A1) – POWER GENERATION SYSTEM AND POWER GENERATION METHOD

A power generation system comprises: a muon-catalyzed nuclear fusion device configured to undergo muon-catalyzed nuclear fusion; and a nuclear-reactor power generation device configured such that a nuclear fuel therein is irradiated with neutrons generated as a result of muon-catalyzed nuclear fusion in the muon-catalyzed nuclear fusion device, thereby to carry out power generation, wherein a pressurized-water nuclear reaction vessel in the nuclear-reactor power generation device is arranged so as to surround a nuclear fusion reactor core in which muon-catalyzed nuclear fusion occurs via a structural partition separating the muon-catalyzed nuclear fusion device from the nuclear-reactor power generation device.

US2024420855 (A1) - NUCLEAR REACTOR FOR HEAT AND POWER GENERATION

A nuclear reactor power system includes: a reactor core comprising a plurality of nuclear fuel elements, each nuclear fuel element comprising: a first cooling channel passing through the nuclear fuel element; and a second cooling channel passing through the nuclear fuel element and fluidly isolated from the first cooling channel; a first cooling system configured to transport a first fluid coolant through the reactor core, the first cooling system fluidly connected to the first cooling channel of each nuclear fuel

element; and a second cooling system configured to transport a second fluid coolant through the reactor core, the second cooling system fluidly connected to the second cooling channel of each nuclear fuel element. A direction of first fluid coolant flow through the first cooling channel is the same as a direction of second fluid coolant flow through the second cooling channel.

US2024420857 (A1) - AUTOMATED METHOD FOR DETERMINING CORE-LOADING PATTERNS FOR NUCLEAR REACTOR CORES

A computer-assisted method for determining an optimal core-loading pattern for a nuclear reactor core. Positions of nuclear fuel assemblies are tested to assign optimal positions and to load the reactor. The reactor core includes cells positioned symmetrically to axes of symmetry and a standard assembly for insertion into each cell. Standard assemblies are distributed by the number of previous production cycles. Groups of cell positions symmetric to the axes of symmetry are identified, and symmetric positions are counted. Families of standard assemblies having similar burnups are formed, wherein the standard assemblies correspond to positions in a group. The loading pattern of standard assemblies in initial positions is tested by numerical simulation, then the positions are swapped while maintaining the previously formed families of assemblies. The swapped positions loading pattern is tested by numerical simulation. This is repeated until at least one candidate pattern for loading the reactor is obtained.

FI4187555 (T3) - INSTALLATION FOR PRODUCING ACTIVATED IRRADIATION TARGETS IN AN INSTRUMENTATION TUBE SYSTEM OF A NUCLEAR REACTOR

Decay station comprising a housing comprising a radiation shielding , the housing delimiting a decay conduit intended for containing the irradiation targets in the predetermined linear order, the decay conduit comprising: - a decay conduit inlet, intended to be connected to the structure of the core of the nuclear reactor for receiving the irradiation targets therefrom; - a decay conduit outlet, intended to be connected to an irradiation target discharge system for discharging the irradiation targets from the decay station, the decay station further comprising: - an inlet distributor, located at the decay conduit inlet, and configured for releasing only a predetermined amount of irradiation targets at a time from the decay station towards the structure of the core of the nuclear reactor, the inlet distributor being configured for releasing the irradiation targets closest to the decay conduit inlet, while retaining the remaining irradiation targets in the decay conduit; - an inlet counter, configured for counting the number of irradiation targets entering or exiting the decay conduit through the decay conduit inlet , the inlet counter being located at the decay conduit inlet, and - an outlet radiation detector, configured for measuring the radiation emitted by an irradiation target located at the decay conduit outlet.

US2024412882 (A1) – CERMET FUEL ELEMENT AND FABRICATION AND APPLICATIONS THEREOF, INCLUDING IN THERMAL PROPULSION REACTOR

CERMET fuel element includes a fuel meat of consolidated ceramic fuel particles (preferably refractory-metal coated HALEU fuel kernels) and an array of axially-oriented coolant flow channels. Formation and lateral positions of coolant flow channels in the fuel meat are controlled during manufacturing by spacer structures that include ceramic fuel particles. In one embodiment, a coating on a sacrificial rod (the rod being subsequently removed) forms the coolant channel and the spacer structures are affixed to the coating; in a second embodiment, a metal tube forms the coolant channel and the spacer structures are affixed to the metal tube. The spacer structures laterally position the coolant channels in spaced-apart relation and are consolidated with the ceramic fuel particles to form CERMET fuel meat of a fuel element, which are subsequently incorporated into fuel assemblies that are distributively arranged in a moderator block within a nuclear fission reactor, in particular for propulsion.

WO2024250507 (A1) - ONLINE ACCIDENT DIAGNOSIS METHOD FOR THIRD-GENERATION PASSIVE PRESSURIZED WATER REACTOR NUCLEAR POWER PLANT

The present invention particularly relates to an online accident diagnosis method for a third-generation advanced passive pressurized water reactor nuclear power plant. The method comprises: acquiring standardized operation signals of a third-generation passive pressurized water reactor nuclear power plant; identifying a state interval of the third-generation passive pressurized water reactor nuclear power plant; identifying an accident sign of the third-generation passive pressurized water reactor nuclear power plant; identifying an abnormal system state of the third-generation passive pressurized water reactor nuclear power plant; and according to the accident sign and abnormal system state of the third-generation passive pressurized water reactor nuclear power plant, identifying an accident type of the third-generation passive pressurized water reactor nuclear power plant. The present invention further relates to an online accident diagnosis system for a third-generation advanced passive pressurized water reactor nuclear power plant, and a computer device and a storage medium. The present invention realizes rapid, accurate and comprehensive accident diagnosis of a third-generation advanced passive pressurized water reactor nuclear power plant on the basis of a small number of operation signals of the third-generation advanced passive pressurized water reactor nuclear power plant.

US2024413729 (A1) - METHOD OF CONSTRUCTING A NUCLEAR REACTOR HAVING REACTOR CORE AND CONTROL ELEMENTS SUPPORTED BY REACTOR VESSEL HEAD

A nuclear reactor is designed to couple the load path of the control elements with the reactor core, thus reducing the opportunity for differential movement between the control elements and the reactor core. A cartridge core barrel can be fabricated in a manufacturing facility to include the reactor core, control element supports, and control element drive system. The cartridge core barrel can be mounted to a reactor vessel head, and any movement, such as through seismic forces, transmits an equal direction and magnitude to the control elements and the reactor core, thus inhibiting the opportunity for differential movement.

UA128936 (C2) - METHOD OF MEASURING A POSITION AND A POSITION MEASURING DEVICE

In the method of measurement of the absolute position of the linear-motion element being monitored by measuring voltage on the secondary coils, at least three voltage states are created on each of the secondary coils in dependence on the specific position of the linear-motion element, while forming a unique combination of the voltage states of all the secondary coils for every measured position of the linear-motion element, which allows for reducing the number of the secondary coils needed to determine the linear-motion clement position. The device for implementing the method of measurement of the absolute position of the linear-motion element, especially the nuclear reactor control rod, consists of a position sensor and a coding element set in parallel or coaxially to it, and of magnetic parts and non-magnetic parts. The position sensor includes a power-supplied primary winding and a multi-tap secondary winding magnetically-coupled with it to read the induced voltage corresponding to the certain position of the linear-motion element. The primary winding is wound to form a group of sections of the primary winding mutually electromagnetically - separated from each other, and a multi-tap secondary winding consists of a set of separate secondary coils arranged in a line and is magnetically-coupled with this primary winding. Each secondary coil consists of at least two winding parts and is designed in a magnetically-coupled way with at least two electromagnetic-separated sections of the primary winding.

US2024401934 (A1) - METHOD OF MEASURING BENDING OF A NUCLEAR REACTOR FUEL CHANNEL

Method of measuring bending of a nuclear reactor fuel channel. A fiber-optic sensor comprises a gravity pendulum that is at the lower end of the fibre-optic sensor; a flexible hollow carrier rod with the fibre-optic sensor is passed along the central tube of a fuel assembly and detecting a gas gap with a photoreceiver, said gas gap varying during the passage of the fibre-optic sensor as a result of the angular motion of the gravity pendulum away from the axis of the bowed central tube of the fuel assembly. Profilograms of the variations of the gas gap for each fibre-optic line of each fibre-optic sensor are recorded; and the magnitude and direction of bending of the central tube of the fuel assembly from the vertical axis are calculated, according to which the presence and magnitude of bending of the nuclear reactor fuel channel are determined.

US2024404717 (A1) - UNDERGROUND NUCLEAR POWER REACTOR WITH A BLAST MITIGATION CHAMBER

An underground nuclear power reactor system has a hollow blast tunnel which extends from one end of a containment member. The system includes a nuclear reactor vessel and other components that may be positioned on a movable support member or on a bottom wall of the containment member. A blast tunnel, which defines a blast chamber, has a plurality of spaced-apart debris deflectors positioned therein. The blast chamber has an upper wall with a roof opening formed therein which is selectively closed by a roof portion. If the reactor needs to be repaired or replaced, the roof portion is opened so that the reactor vessel can through the roof opening. If the reactor vessel explodes, a blast therefrom drives debris therefrom through a blast door and into the blast chamber where the deflectors reduce blast force as the debris passes through the blast chamber.

US2024404715 (A1) - FUEL ASSEMBLY AND NUCLEAR REACTOR CORE

A fuel assembly includes: a square cylinder channel box having a square cross-section; and fuel rods disposed in a square lattice shape and filled with a nuclear fuel material. The fuel rods includes: a first rod disposed in an outer layer in the box and a second rod disposed in an inner layer in the box and having a larger diameter than the first rod. An absolute value of a difference between a hydraulic equivalent diameter around the first rod and a hydraulic equivalent diameter between a surface in the box and the first rod is more than or equal to a value obtained by multiplying an absolute value of a difference between the hydraulic equivalent diameter around the first rod and the hydraulic equivalent diameter around the second rod by a ratio of a cross-sectional area of the inner layer to a cross-sectional area of the entire box.

ZA202307579 (B) - MOLTEN SALT FISSION REACTOR WITH INTEGRATED PRIMARY EXCHANGER AND ELECTROGENERATOR COMPRISING SUCH A REACTOR

Molten salt nuclear fission reactor comprising a core through which a fuel salt flows, meansfor circulating the fuel salt, a primary heat exchanger through which a heat-transfer salt flows, a primary enclosure which is impermeable to liquid salts and contains the reactor core, and a shelter. The reactor comprises a parallelepiped matrix comprising alternating layers of fuel salt channels, and layers of heat-transfer salt channels. The matrix forms both the reactor core, in which the fission occurs, and the primary heat exchanger of the reactor. The means for circulating the fuel salt are entirely located within the primary enclosure and are configured to extract the fuel salt from one portion of the fuel salt channels on one side of the matrix and to propel the fuel salt into the other portion of the channels on the same side of the matrix.

RO138452 (A2) - NUCLEAR REACTOR REGENERATOR OF PLUTONIUM ISOTOPE 239

The invention relates to a nuclear reactor regenerator of plutonium isotope 239 meant for nuclear fuels. According to the invention, the reactor has a reaction zone made of bundles of fuel elements, zone included in a primary thermal circuit, a turbine rotor driven by a technical means for horizontal recycling of a molten liquid metal as heat-transfer medium, a device for reactivity control and reactor stop, a device for loading-unloading bundles of nuclear fuel elements, a toroidal secondary thermal circuit, a turbine rotor common to the circuits for horizontal countercurrent recycling of the heat-transfer medium driven by a technical means, a turbine rotor common to the circuits for recycling the heat-transfer medium to actuate an electric power generator, and an adsorber of gaseous isotopes produced by fission.

TW202437274 (A) - Solid-state fluid thermal bonded heat pipe micro-reactor

Disclosed is a passively cooled nuclear reactor, comprising a heat exchanger and a nuclear reactor core disposed proximal to the heat exchanger. The nuclear reactor core comprising a fuel rod, a heat pipe located proximate to the fuel rod and extending from the nuclear reactor core into the heat exchanger, a moderator monolith configured to house and space the fuel rod and the heat pipe, and a thermal bond material disposed internally throughout the moderator monolith to surround the fuel rod and the heat pipe with the thermal bond material and to facilitate heat transfer from the nuclear reactor core to the heat exchanger.

US2024395428 (A1) - THORIUM MOLTEN SALT REACTOR USING 100% NON-RADIOACTIVE THORIUM FUEL AND A NUCLEAR POWER GENERATING SYSTEM

The present invention is related to a Thorium Molten Salt Reactor (Th-MSR) using 100% non-radioactive Thorium fuel, composed of LiF+BeF2+ThF4 without containing any U-235. The Th-MSR is consisted of a reactor chamber, a fuel injector, a fuel reservoir, an in-line chemical extraction unit, a heat exchanger, a few KW electricity turbine generator and a condenser. A few KW nuclear power generation system is adopting the controlling devices comprised of a neutron flux sensor, a fuel injecting sensor, a thermal sensor and a power output sensor. A neutron generator with a high neutron flux of 1013 n/s is used. The high flux fast neutrons are slowing down into the thermal neutrons by the graphite moderators in the reactor for initiating the fission.

WO2024232443 (A1) - NEUTRON RADIATION SHIELDING MATERIAL, SHIELDING MATERIAL FOR SEMICONDUCTOR DEVICE, PACKAGE FOR SEMICONDUCTOR DEVICE, SHIELDING MATERIAL FOR NUCLEAR REACTOR, NUCLEAR REACTOR CONTAINMENT VESSEL, NUCLEAR REACTOR BUILDING, SHIELDING MATERIAL FOR NUCLEAR FUSION REACTOR, NUCLEAR FUSION REACTOR, AND NUCLEAR FUSION REACTOR BUILDING

This neutron radiation shielding material for blocking neutron radiation includes a resin-containing layer and a borohydride-containing layer, wherein one of the resin-containing layer and the borohydride-containing layer is disposed on a side exposed to the radiation source of neutron radiation.

US12140000 (B1) — NUCLEAR REACTOR INTEGRATED OIL AND GAS PRODUCTION SYSTEMS AND METHODS OF OPERATION

Nuclear energy integrated hydrocarbon operation systems include a well site having a subsurface hydrocarbon well configured to produce a produced water output. The system further includes a deployable nuclear reactor system configured to produce a heat output. The system may further include a deployable desalination unit configured to produce a desalinated water output using the produced water output of the subsurface hydrocarbon well and the heat output of the deployable nuclear reactor. The system may further include a deployable off-gas processing system configured to produce an industrial chemical using the off-gas output of the subsurface hydrocarbon well and the heat output of the deployable nuclear reactor.

US2024371534 (A1) - NUCLEAR REACTOR FUEL ASSEMBLIES AND PROCESS FOR PRODUCTION

A nuclear fuel assembly for a nuclear reactor core, the fuel assembly having at least one fuel element including an elongated shell defining an interior volume, a lattice structure disposed within the interior volume, at least one flow channel extending through the lattice structure, at least one lattice site disposed in the lattice structure, and at least one fuel compact disposed within a corresponding one of the at least one lattice site, a first end cap including a boss having a first cross-sectional shape, the first end cap being affixed to a first end of the shell, and a second end cap including a first bore having a second cross-sectional shape, the second end cap being affixed to a second end of the shell, wherein the first cross-sectional shape of the boss is the same as the cross-sectional shape of the bore.

More interesting nuclear reactor technologies in USA are following.

BWX Technologies is developing a transportable microreactor that can thrive in off-grid applications and remote areas to produce 50 megawatts of thermal energy for deployment in the early 2030s. The high-temperature gas reactor uses a different form of DOE’s TRISO fuel that contains a uranium nitride fuel kernel for higher performance. The team will work with Idaho National Laboratory (INL) and Oak Ridge National Laboratory (ORNL) to test and qualify the fuel. They will also focus on optimizing new manufacturing technologies that could help cut the cost of microreactors in half and develop capabilities that could benefit other advanced reactor designs in the process.

Westinghouse Electric Company is also pursuing a transportable microreactor that can be installed on-site in less than 30 days. The 15 megawatt thermal reactor utilizes TRISO fuel and a specialized heat pipe design to flexibly operate on a grid or in remote locations. The company will work with Los Alamos National Laboratory, INL, and Texas A&M University to test and manufacture components for its heat pipe and moderator in order to develop a small demonstration unit. This short term, two-year project supports a larger effort by Westinghouse to demonstrate a prototype reactor by 2024, with full commercial deployment targeted for the mid-to-late 2020/

Kairos Power will work with ORNL, INL, the Electric Power Research Institute (EPRI) and the Materion Corp. to deploy Hermes, a low-power demonstration reactor in Oak Ridge, TN. Hermes is a key milestone in the company's rapid iterative development pathway to prove its fluoride salt-cooled high temperature reactor can ultimately deliver low-cost nuclear heat. The reactor will use a TRISO fuel pebble bed design with a molten fluoride salt coolant and will achieve a thermal power level of 35 MWth. Hermes will be the predecessor to Kairos Power's future 140 MWe commercial reactor and could be operational by 2026.

ARDP plans to leverage the National Reactor Innovation Center at INL to efficiently test and assess these technologies by providing access to the world-renowned capabilities of our national laboratory system. In addition to these five designs, we also awarded $20 million on less mature, but novel advanced reactor designs later this month. The funding will further support their concept development in order to demonstrate these promising reactors by the mid-2030s. These aggressive timelines are needed to ensure the United States takes advantage of the advanced reactor market that's expected to be worth billions of dollars. That's why we plan to invest more than $600 million in these projects over the next seven years, pending the availability of future appropriations by Congress. Advanced reactors have the potential to create thousands of domestic jobs, grow our economy and lower emissions at the same time. By proactively pursuing a diverse portfolio of U.S. reactors, we can help reestablish our global leadership in the technology that we first developed.

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