Reference Number	Name of Institution	Technology Title	Technology Summary	Technology Focus Area	IP Position	Licensing Availability	Technology Readiness Level (TRL)
BSU234	Boise State Unviersity	Methods and Processes for Manufacturing an Advanced Electrochemical Sensor	Electrochemical measurements can provide valuable information and are employed in a vast range of applications. For example, electrochemical sensors are used to detect gases, measure blood sugar level, and as ion selective electrodes. While many sensors function as desired, some have limitations in terms of obtainable information, particularly when deployed in harsh environments. In recent years, advanced manufacturing (AM) techniques have brought revolutionary advancement in such fields as medical, aerospace/defense, and electronics. The present invention is about the application of an AM technique that can be employed to fabricate advanced electrochemical sensors. The fabricated sensors are expected to provide high quality data, hitherto unpublished. Such a sensor could prove to be the tool needed to effectively function in a variety of industries (both nuclear and non-nuclear) and endure harsh conditions.	Robotics	US11635404B2 Issued	Exclusive	TRL 5
19-056	Colorado State University	Preventing the Clogging of Crude Oil Pipelines	Researchers at Colorado State University have developed methods to identify specific aggregation inhibitors for asphaltenes present in crude oil pipelines. Asphaltene aggregation is estimated to clog more than 72,000 miles of pipeline in the U.S. alone – creating not only huge economic burden, but also devastating environmental impacts during cleaning or repair. Methods here include proprietary algorithms to identify appropriate aggregation inhibitors (both natural or synthetic) or combinations thereof.	Ops and Facilities	US20210139792A1 Issued	Exclusive	TRL 3
15-031	Colorado State University	Advanced Controller Utilizing Natural Gas Engines for Microgrid Systems	Natural gas engines cannot currently operate in scenarios requiring significant transient performance, which arises from variable loads and/or variable generation of renewable (wind/solar) power. This technology facilitates the use of natural gas engines in those environments. The storage device is used to supply transient power during net load variations, and the control system manages both the engine and storage systems, and their interaction.	Heat and Energy Storage Systems	US10683815 and US11378025 Issued	Exclusive	TRL 5
9453	Georgia Tech University	Nonpremixed, Rich, Relax, Lean Combustor	As the global economy shifts towards decarbonization, the demand for fuel-flexible and low-emission combustion technologies has never been greater. Current lean, premixed combustor designs face significant limitations, including high NOx emissions, combustion instability, and the need for complex fuel staging systems. These challenges are particularly pronounced when using hydrogen-rich fuels. Researchers at the Georgia Institute of Technology are working to address these issues with the NRRL combustor, a breakthrough in combustion technology that accommodates a wide range of fuels while dramatically reducing NOx emissions and enhancing operational flexibility, making it a critical tool in the transition to renewable energy sources. Additional published paper available here.	Hydrogen and Renewable Energy	Filed	Exclusive	TRL 3
8720	Georgia Tech University	Dewatering Platform Using Ultrasonic Transducers	This innovative technology dries or assists in the drying of slurry or gel-based systems, such as those containing nanomaterials, through the application of high-frequency vibrations. Unlike traditional methods that use heat or energy-intensive processes, this ultrasound-based system offers a low-cost, energy-efficient alternative with faster dewatering rates, making it both environmentally and economically sustainable. It can be adapted for batch or continuous mode operations, seamlessly integrating with existing industrial processes. Researchers at the Georgia Institute of Technology are providing a solution for damage to heat-sensitive materials by conventional drying methods with this technology. It is a great improvement from the high costs and energy requirements of existing dewatering/drying technologies.	Solutions for a Circular Economy	Pending	Exclusive	TRL 4
2023-035	Oklahoma State University	Long Range Flat Wing UAV that Inductivly Recharges Using Powerlines - PowerLine Unmanned Surfer (PLUS)	Researchers at OSU have developed a novel UAV design that delivers power opportunities for long-range endurance UAVs, the PowerLine Unmanned Surfer (PLUS). This fixed-wing UAV is capable of mutual inductance charging while flying, by employing an innovative approach: PLUS perceives powerlines using optical time of flight sensors, and dynamically morphs its shape directing its flight pattern to closely fly along powerlines through a novel spatial frequency matching controller. Powerline surfing, non-contact charging enables PLUS to greatly extend its endurance to previous unattainable ranges while simultaneously enabling long-range GPS-denied navigation, as powerline charging in this fashion utilizes dead reckoning and feature detection, providing critical spatial information for a variety of defense and industry applications.	Wireless Power	Pending	Exclusive and Non-Exclusive	TRL 3
2020-5203	Penn State University	Smart Lost Circulation Materials (LCMs) for Sealing Large-Width Fractures During Drilling (Oil and Gas, Geothermal, and Other Wells)	Revolutionary shape memory polymer-based Lost Circulation Materials (LCMs) that address critical drilling challenges by sealing large-width fractures in wellbores. The technology leverages advanced materials science where LCMs are programmed into compact temporary shapes that easily navigate through drilling equipment, then expand up to 10 times their original size when exposed to wellbore temperatures. This creates robust, interlocking networks that effectively seal fractures up to 12mm wide - a capability far beyond existing solutions that can only seal fractures less than 5mm wide. The technology has been validated in laboratory testing and is supported by industry partner Cudd Energy with $15,000 in matching funds.	Hydrogen and Renewable Energy	Nationalized PCT 18/695,840 Pending	Exclusive or Non-Exclusive	TRL 5
2024-138	Penn State University	Additive Manufacturing and Post-processing of Branching Heat Pipes Click PDF Icon for Additional Information 	Processes to additively manufacture and post-process branching heat pipe structures with integral wicks in high performance materials enabling extremely mass & thermally efficient heat transfer solutions.	Energy Storage Systems	Provisional	Non-Exclusive	TRL 2-4
22-3892-1	Princeton University	Modular Multi-Material Additive Manufacturing System for Automated Deposition of Concrete, Polymer, and Silicone	An automated 3D printer uses a tool-changing mechanism and software-controlled extrusion to switch between concrete, polymer and silicone nozzles, managing flow, temperature and parking to prevent oozing and create integrated multi-material reinforced structures.	Robotics	US20230294363A1 Pending	Exclusive and Non-Exclusive	TRL 4
2024-105	Rice University	Self-Looped Electrochemical Recycling of Spent Lithium-Ion Battery Cathodes to Manufacturing Feedstocks	A demonstrated a self-looped electrochemical battery recycling approach that enables a sustainable and efficient recovery of lithium and transition metals from spent cathode materials into battery manufacturing feedstocks. Use of a three-chamber porous solid electrolyte reactor, enables a sustainable process that requires only low energy, does not consume external chemicals (except H2O2 to assist acid leaching), and avoids external cation contaminations or waste stream treatments.	Energy Storage Systems	Provisional Patent Application Filed	Exclusive and Non-Exclusive	TRL 2-3

2024-097	Rice University	Dual-Function Electrically Conductive Membranes for Efficient Water Production and Fouling Reduction	This invention is a new process to remove fouling and scaling from membranes used in water treatment. More specifically, the invention is the tailored geometric parameters (such as the thickness and width of electrically conductive lines, and their spacing) and operational parameters (including the type, amount, and duration of external electrical application) that simultaneously enhance electrical conductivity, fouling cleaning efficiency, as well as water production efficiency. This approach presents a cost saving and potentially more effective alternative to traditional fouling control methods, such as chemical cleaning and backwashing, within membrane-based water/wastewater treatment plants. Traditional fouling and scaling control methods can account for up to 25% of the operational cost of membrane processes.	Solutions for a Circular Economy	Provisional Patent Application Filed	Exclusive and Non-Exclusive	TRL 2-3
6664	Texas A&M University	PCB Rotor Brushless Magnet-Free Wound Field Synchronous Machine See External Supplementary Document	Advancing electric vehicle propulsion through high power rare-earth-free electric motor development.	Solutions for a Circular Economy	Pending US Utility	Exclusive	TRL 3-4
6087	Texas A&M University	Hydrogen Energy Storage via Plasma-Based Technology	This developed modularized process can reform natural gas to hydrogen and co products using electricity. This process produces hydrogen via a plasma-based reformer at ambient temperature and pressure. Hydrogen is being separated from co-products through a designed membrane system.	Hydrogen and Renewable Energy	Pending PCT	Exclusive	TRL 4-5
4667	Texas A&M University	System and Apparatus of Power Electronic Intelligence at the Network Edge	The disclosed invention, PINE technology, is a power electronic interface that is at the end-user level, which consists of a front-end Pulse-width modulation converter connected to the distribution utility terminals. Applications: Power distribution	Heat and Energy Storage Systems	US11637426B2 Issued	Exclusive	TRL 3-4
2024-035	Uninversity of Cincinnati	Rechargeable Liquid Metal-CO2 Battery for Large-Scale Energy Storage	Current research has sought to eliminate dependence on toxic lithium-ion batteries by creating a new battery system which enables a longer lifespan and carbon reduction capabilities. Metal-carbon dioxide batteries [MCBs] have posed a potential solution to these safety and environmental concerns. Dr. Junhang Dong and his team have invented a new type of MCB which offers a disruptive enhancement of power density without the use of precious metals. This battery can operate in flow battery mode to decouple power and storage capacity that offers modularity and scalability. It also avoids solid blockage issues, is rechargeable, and produces a carbon negative effect. Additional journal article available here.	Heat and Energy Storage Systems	PCT US2024/052226 Pending	Exclusive	TRL 4
2023-083	Uninversity of Cincinnati	Energy-Efficient and Stable Modified Amines and Methods for CO2 Separation	Dr. Joo-Youp Lee has developed a sorbent chemical for CO2 separation, combining amine functionalized with epoxide chemicals impregnated onto a mesoporous silica support. This innovative sorbent includes amines like polyethylenimine and epoxides such as isobutylene oxide, offering enhanced CO2 binding capabilities. The technology is novel in its use of microwave energy for sorbent regeneration, allowing efficient CO2 desorption and continuous operation across multiple monolith structures. PATENT: https://patents.google.com/patent/WO2024216296A1/en?oq=WO2024216296A1 INVENTOR: https://researchdirectory.uc.edu/p/leejo	Carbon Utilization	PCT WO2024216296A1 Filed	Exclusive	TRL 4
2023-048	Uninversity of Cincinnati	High-Voltage and High-Energy- Density Membrane-Free Redox Flow Batteries	Lithium-metal-based nonaqueous redox flow batteries (LRFBs) have high operating voltage and large theoretical energy density, yet the large-scale applicability of LRFBs is limited by the poor availability and high cost (approaching 40% of the total battery cost) of the critically important ion-selective membranes. To address this problem, Drs. Jiang and Gautam have developed two ultra-high-voltage all-organic membrane-free LRFB configurations – a biphasic system and a tri-phasic system. The proposed LRFBs facilitates no self-discharge and results in superior battery performance with Coulombic efficiency of close to 100%. In addition, the membrane separator is not required owing to self-stratification of the electrolytes. PUBLICATION: https://www.nature.com/articles/s41467-023-40374-y INVENTOR: https://researchdirectory.uc.edu/p/jiangjb	Heat and Energy Storage Systems	PCT Application WO2024206583 Filed	Exclusive	TRL 4
2019-112	Uninversity of Cincinnati	Pretreatment for Improved Fermentability of Lignocellulosic Biomass	Dr. Maobing Tu, Professor at the University of Cincinnati, has developed a new Lignocellulosic biomass (LCB) pretreatment method. The invention maintains the improved hydrolysis and access to sugars from dilute acid pretreatment. Additionally, the technology also avoids inhibition of fermentation through the addition of specific proteins and amino acids which react with the inhibitory carbonyl compounds in hydrolysates. This allows for successful dilute acid pretreatment of LCB and subsequent fermentation into useful biofuels without additional detoxification processing. Initial testing has shown increased glucose consumption and ethanol production compared to dilute acid pretreatment alone. PUBLICATION: https://www.researchgate.net/publication/341222922_Enhancing_Prehydrolysates_Fermentability_by_Adding_Nucleophilic_Amino_Acids_and_Proteins_in_Biomass_Pretreatment INVENTOR: https://researchdirectory.uc.edu/p/tumg	Hydrogen and Renewable Energy	US20220251610A1 Pending	Exclusive	TRL 4
2023-024	University of Connecticut	Electrochemical Hydrogen Separation and Recovery by Non-Platinum Group Metal Catalyst (α-MoO3) on High-Temperature Proton Exchange Membrane Fuel Cell Stacks	This fuel cell system recovers up to 43% of H2 from Plasma Pyrolysis Assemblies (PPA), outpacing commercial catalysts that get less than 1% recovery from expensive, precious metal catalysts. Less expensive and more efficient than conventional platinum catalysts. Efficient recovery of hydrogen from fuel cell effluent is essential for reducing fuel cell emissions by recycling them back into fuel, lessening fuel costs, and mitigating carrying excess fuel on long voyages (space travel).	Energy Storage Systems	Pending	Exclusive	TRL 4
2021-089/2021-090	University of Connecticut	Physics-Informed Partial Least Squares Regression Modeling for Failure Detection in Power Electronic Devices; Nonlinear Autoregressive Exogenous Modelling for Power Electronic Device Modelling	The proposed plug and play diagnostic device (P2D2) will be placed in line with any motor or generator to monitor current and voltage signals that are going into the motor or out of the generator, and determine if specific faults have occurred in the machine. This can also be utilized for health monitoring where degradation of insulation as well as mechanical components, e.g. bearings, can be seen as time and frequency signatures in the machine's current. Health data of the machine can be displayed on the device itself or sent via 5G or Wi-Fi to the cloud where aggregated health information from the field can be used with AI tools. The P2D2 can also be expanded for use with electric drive diagnostic for semiconductor and capacitor failures in the drive itself beyond the rotating machine.	Robotics	Pending Non-Provisional 17/492,442 & 17/492,391	Exclusive and Non-Exclusive	TRL 4

2016-044	University of Connecticut	AI-Powered All-In-One Solid-State Compact Milli-Electrode Arrays (MEA) for Real-Time In Situ Nitrogen Monitoring	This compact and miniature sensor array monitors nitrogen contaminants (e.g., NH4+, NO3-) and key water parameters (e.g., pH, conductivity, temperature, redox potential) in real-time in situ mode in water, soil, and crops.	Robotics, Solutions for a Circular Economy	US10753900B2 Issued	Exclusive and Non-Exclusive	TRL 4
TF09094	University of Illinois Urbana-Champaign	Adaptive Control for Uncertain Nonlinear Multi-Input Systems in the Presence of Significant Cross Coupling with Guaranteed Performance	In flight control and other safety-critical control systems, baseline controller is often augmented by robust adaptive elements to ensure uniform behavior across varying operating conditions. Even with the benefit of gain scheduling often used in this process, the resulting control effort is unable to provide performance guarantees under conditions outside the preconfigured set of parameters. Furthermore, because developing e.g., a gain-scheduled controller requires developing and linking several independent controllers, the development process is very lengthy and extremely costly.	Robotics	US8712559B2 Issued	Exculsive and Non-Exclusive	TRL 3
2023-079	University of Maryland	Advanced Sorbent Membranes for Efficient Lithium Ion Extraction	Advanced membranes are created using radiation-induced polymerization to efficiently extract and recycle lithium from sources like brine and waste, enabling sustainable and environmentally friendly lithium recovery for applications such as battery production.	Heat and Energy Storage Systems, Solutions for a Circular Economy	Pending	Non-Exclusive	TRL 4
2022-027	University of Maryland	Millisecond Catalytic Wall Reactor for Autothermal Non-Oxidative Conversion of Methane to Ethylene	A novel wall reactor uses dual catalysts and built-in heating to convert methane directly into ethylene and hydrogen in milliseconds, achieving high conversion, selectivity and stability with minimal coke and potential for carbon-neutral operation.	Heat and Energy Storage Systems	Pending	Exclusive	TRL 3
20170206	University of Minnesota	Heat to Electricity Using Phase Transformations in Ferroelectric Oxides	A device with a ferroelectric oxide crystal layer in a capacitive arrangement and a switch converts heat to electric energy in a small temperature difference regime. The method uses oxide crystals that undergo highly reversible phase transformations from a strongly ferroelectric phase to a paraelectric phase upon heating. As the crystal is cooled through the phase transformation it releases (latent) heat, transforms to the ferroelectric phase, and develops a strong polarization. If this crystal is the dielectric of a capacitor that is connected in parallel to a reference capacitor, it will draw charge from the reference capacitor. Sloshing of this charge back and forth between the active and reference capacitor through a load resistance constitutes the direct conversion of heat to electricity. This technology has many applications, such as waste heat recovery in data centers and handheld devices, solar-thermal sources, household waste heat, waste heat from power plants, waste heat from heavy industry and air conditioning systems, powering of satellites, geothermal sources.	Heat and Energy Storage Systems	US10950777B2 Issued	Exclusive	TRL 2-3
2025-017	University of Southern California	Calcium Carbonate-Based Biodegradable Composites as an Alternative Material to Industrial Plastics	Persistent pollution caused by conventional plastics poses significant risks to marine ecosystems and human health. Thus, there is a need for the development of biocompatible and biodegradable materials that mimic the properties of plastics that are also safe for environmental and public health. To address this, we engineered a plastic substitute by integrating calcium carbonate (CC), an abundant mineral naturally found in seashells, into poly (1,8-octanediol-co-citrate) (POC), a synthetic biodegradable elastomer already used as the binder of FDA-approved orthopedic fixation devices containing calcium minerals. We hypothesized that POC-CC is a biocompatible plastic substitute that can degrade in marine environments while maintaining sufficient strength for industrial applications. To test this, POC-CC was synthesized with varying CC concentrations (0, 15, 30 wt%). Weight degradation rate in ocean water, pH of ocean water after long-term incubation, elastic modulus, and the morphology of POC-CC using SEM was evaluated over 6 months. Our results show the degradation rate increases with increased POC content, and the addition of CC maintains the pH of ocean water. Additionally, to evaluate biocompatibility, Scenedesmus sp. algae was incubated with the POC-CC supernatant after incubation with simulated ocean water for six months. High cell viability was found, confirming the biocompatibility of POC-CC with marine microorganisms. Lastly, a model can holder was made with POC-CC to demonstrate its proof-of-concept as an alternative plastic material. In sum, we demonstrate POC-CC as a new material and the feasibility of its use as a biodegradable plastic alternative.	Solutions for a Circular Economy	Provisional Application Pending	Exclusive	TRL 3
2023-131	University of Southern California	On-Site Generation of Clean, Ultra-High Pressure Hydrogen via Catalytic Reforming of Methanol and Other Alcohols	Generation of clean and ultra pure hydrogen at high pressures via homogeneous and heterogeneous catalytic reforming of methanol and other alcohols in alkaline media has been developed. The carbonates and bicarbonates left over in the aqueous media after reforming are again converted back to methanol and alcohols completing a carbon neutral cycle.	Hydrogen and Renewable Energy	PCT WO2024243583A2 Pending	Exclusive	TRL 3-4
1. 2015-024; 2. 2021-004; 3. 2023-113; 4. 2024-096	University of Southern California	Dehydrogenation of Neat Formic Acid	This portfolio of technologies enables formic acid as a 2-way liquid organic hydrogen carrier. With substantial DOE support (DE EE-0008825), we developed reusable catalysts and a high pressure reactor that rapidly convert neat liquid formic acid to pressurized H2 (ANSI spec, <2 ppm impurities, DOI: 10.1038/ncomms11308). CO2 is separated and sequestered, and no other by-products are observed (< 5 ppm). This has been demonstrated through TRL 6 at lab scale, processing 10^0 liters of formic acid per pass (DOI: 10.1039/D2CY00676F). The catalysis is based on a homogeneous iridium system that is stable through millions of turnovers. Still, we have demonstrated mild conditions for metal recovery and recycling at 87% yield (DOI: 10.1039/d4gc00151f). This hydrogen release technology is complemented by new methods to convert the CO2 product back to formate, enabling a closed-loop hydrogen storage system in a single site.	Hydrogen and Renewable Energy	1. 3 issued US patents (10,179,798, 10,556,921, and 10,052,621); 2. 1 pending US patent application (17/717,786); 3. Provisional filed 6/3/2023; 4. Provisional filed 2/7/2024	Exclusive and Non-Exclusive	1: TRL 6; 3-4: TRL 4-5
3294	Washington State University	A Novel Sequential Catalytic Solvolysis Process for Deconstructing Waste Plastics	A cost-effective deconstruction of the comingled waste plastics streams through the novel sequential catalytic solvolysis process. This is an emerging novel technology developed at WSU for the selective deconstruction of an individual polymer or classes of polymers in a polymer mixture with homogeneous or or heterogeneous catalysts stage-by-stage under mild conditions, to produce monomers, chemicals, and hydrocarbon fuels or lubricants.	Solutions for a Circular Economy	US National Stage Filing US20240025085A1	Exculsive and Non-Exclusive	TRL 4