DOE Laboratory Water Patents with a High Potential for Commercialization by the Private Sector

WASHINGTON - The Department of Energy (DOE) has been continuously engaged in the energy-water nexus since issuing *The Water-Energy Nexus: Challenge and Opportunities* in 2014. This factsheet contains a selection of patents from DOE's National Laboratories that align with the energy-water initiative and have high potential for commercialization. A subset of these patents is eligible for a licensing discount based on energy and/or water savings under an energy-water licensing agreement developed by the DOE's National Renewable Energy Laboratory (NREL).

DOE's laboratories are responsible for the research and development (R&D) of solutions that will help to resolve water security issues. The labs examine innovative, highly-effective and accessible techniques for removing unsafe elements like arsenic from water, and accelerating groundwater and wastewater cleanup through the use of agriculture oils. Through the development of various advanced treatment techniques, such as using naturally occurring microalgae to detect the presence of toxic substances, DOE labs are working to ensure the quality of water for use in a multitude of ways.

The NREL ENERGY License is designed to incentivize large-scale deployment of energy and water technologies by allowing licensees to deduct a portion of fuel, electricity and water offsets against a portion of the royalty obligation owed to NREL or other national laboratory licensors offering this license option.

SELECT DEPARTMENT OF ENERGY LABORATORY WATER PATENTS

Wastewater Energy Recovery

- Enhanced Renewable Methane Production System benefits: Wastewater Treatment Plants, Farms, & Landfills—Patent No. 8,247,009: A low-cost process that accelerates biological methane production rates at least fivefold thus addressing one of the largest barriers to the use of renewable methane. Contact Argonne National Lab: Dr. CJ Guron, cguron@anl.gov

Desalination and Brine Management

- Flow-Through Electrode Capacitive Desalination—Patent No. 20120273359: FTE-CD represents a robust and low-maintenance path for efficiently and cost-effectively producing clean drinking water. Contact Lawrence Livermore National Lab: Annemarie Meike, meike1@llnl.gov

- Fresh Water From Brackish Ground or Surface Water using Composite Resin Electrodes— Patent Pending: Ion removal using composite resin electrodes. Electrodes can be customized to remove ions from all size water sources and can be applied to industrial, commercial and residential settings. Contact Lawrence Berkeley National Lab: Shanshan Li, shanshanli@lbl.gov

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- Switchable Polarity Solvent Forward Osmosis: SPS FO's high recovery makes it possible to address very concentrated solutions and reduce the volume of brine byproduct, often by a factor of five. Contact Idaho National Lab: Aaron Wilson, aaron.wilson@inl.gov

Water Treatment for Removal of Heavy Metals and Organics

- Hedgehog™ Water Contaminant Removal System – Patent No. 7,514,004: The invention is a low-cost water treatment system and method for reducing arsenic contamination in small community water storage tanks. Contact Sandia National Lab: Samantha Updegraff, supdegr@sandia.gov

- Superhydrophic Sponges as Efficient Oil and Organic Liquid Absorbents—Patent No. Patent Pending: Researchers at Brookhaven National Laboratory have a developed superhydrophobic sponges that absorb oil and organic solvents from water with exceptional capacity and recyclability. Contact Brookhaven National Laboratory: Avijit Sen, ASen@bnl.gov

- Remediating Heavy Metals in Drinking Water with post-Synthetically Modified MOFs—Patent Pending: By post-synthetically introducing a ligand or polymer that binds to Metal Organic Frameworks (MOFs) at one point and to metal ions at another. Contact Lawrence Berkeley National Lab: Russell Carrington, krcarrington@lbl.gov

- Self-Assembled Monolayers on Mesoporous Supports (SAMMS)*: Surface Functionalized Mesoporous Materials—Patent No. 6,326,326: Nano-engineered sorbents, have proven to be exceptionally selective and efficient in removing heavy metals and other contaminants form waste streams. Contact Pacific Northwest National Lab: Eric Lund, eric.lund@pnnl.gov

- Optimized Alumina Coagulants for Water Purification – Patent No. 8,119,011: A technology of removing anionic contaminants. Contact Sandia National Lab: Samantha Updegraff, supdegr@sandia.gov

Sensor Systems

- BEADS (Biodetection Enabling Analyte Delivery System) Sample Preparation Technology*—Patent No. Patent Pending: BEADS represents enabling technology for deployment of microanalytical sensors at the point-of-use. Contact Pacific Northwest National Lab: Ronald Thomas, ronald.thomas@pnnl.gov

Simulation

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- Simulator for Subsurface Transport Over Multiple Phases (STOMP)*—Patent No. Battelle #: 11621, 14566, 16572: The simulator was specifically designed to provide scientists and engineers from varied disciplines with multidimensional analysis capabilities for modeling subsurface flow and transport phenomena. Contact Pacific Northwest National Lab: Sara Hunt, sara.hunt@pnnl.gov

Groundwater Treatment

- Low Cost Fluoride Remediation for Groundwater in Developing Countries— Patent Pending : A technology using easily-processed, low cost bauxite can treat fluoride-contaminated groundwater and achieve World Health Organization (WHO) fluoride limits for drinking water (1.5 ppm). Contact Lawrence Berkeley National Lab: Shanshan Li, shanshanli@lbl.gov

Other

- pH Adjustment of Power Plant Cooling Water with Flue Gas/Fly Ash – Patent No. 9,140,145: The invention includes a conventional power plant system with a boiler containing a flue for exhaust from the boiler. Contact Sandia National Lab: Samantha Updegraff, supdegr@sandia.gov

- Boron Nitride Nanotubes—Patent No. 8206674 B2: Efficient and cost effective production of boron nitride nanotubes. Contact at Thomas Jefferson Lab: Drew Weisenberger, drew@jlab.org

Learn more about DOE laboratory capabilities as well as patentable water technologies from the Department of Energy's upcoming Lab Investor Knowledge Series on water technologies. More information coming soon.

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