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DOE Researchers Demonstrate Feasibility of Efficient Hydrogen Production from Nuclear Energy

WASHINGTON, DC – In a major step toward achieving President George W. Bush’s goal of ensuring America’s energy security through innovative technologies, researchers at the U.S. Department of Energy’s Idaho National Engineering and Environmental Laboratory (INEEL) and Ceramatec, Inc. of Salt Lake City, Utah have demonstrated the feasibility of using nuclear energy to efficiently produce hydrogen from water.

“With America’s growing demand for oil, also comes a host of environmental challenges. Because of the need to develop new energy sources in an environmentally sound way, the President and our Administration recognize that the benefits of hydrogen technologies are too great to ignore. This major breakthrough signals that we are systematically achieving our hydrogen goals,” Secretary Abraham said.

Using hydrogen to fuel our economy can reduce dependence on imported petroleum, diversify energy resources, and reduce pollution and greenhouse gas emissions. To this end, the Department of Energy is actively exploring clean hydrogen production technologies using fossil, nuclear and renewable resources to revolutionize the way we power our Nation’s cars, homes and businesses.

This achievement demonstrates high-temperature electrolysis which utilizes heat to decrease electricity needed for splitting water into hydrogen and oxygen. Instead of conventional electrolysis, which uses only electric current to separate hydrogen from water, high-temperature electrolysis enhances the efficiency of the process by adding substantial external heat – such as high-temperature steam from an advanced nuclear reactor system. Such a high-temperature system has the potential to achieve overall hydrogen production efficiencies in the 45 to 50 percent range, compared to approximately 30 percent for conventional electrolysis. Added benefits of the nuclear energy source include the avoidance of both greenhouse gas emissions and air pollutants.

The researchers have shown that hydrogen can be produced at temperatures and pressures suitable for integration with the new Generation IV nuclear reactor design being developed by the Department.

Energy Secretary Spencer Abraham stated, “The Generation IV nuclear technologies will take us to the next level in terms of efficiency, reliability, and safety. Coupling high temperature electrolyzer technology with the Gen IV reactors provides another pathway to produce hydrogen for powering future fuel cell vehicles.”

Fuel cell vehicles running on hydrogen produce no pollutants or carbon emissions.

Improvements in solid oxide electrolyzer design made by Ceramatec, Inc. will enable a 3-fold decrease in equipment size allowing greatly reduced capital costs. INEEL developed the system concept design and performed the feasibility testing.

This demonstration follows Secretary Abraham’s recent announcement of a \$2 million grant to Ceramatec who is teamed with INEEL, University of Washington, and Hoeganaes Corporation in Riverton, New Jersey. The team will continue to work remaining challenges to lower costs, increase materials durability and improve efficiency of the solid oxide

electrolyzer technology.

This development is a major step towards the hydrogen economy and realizing the President's vision described in his 2003 State of the Union Address that "the first car driven by a child born today could be powered by hydrogen, and pollution-free."

For more information on advanced nuclear energy concepts, see <http://gen-iv.ne.doe.gov/>. For more information on electrolyzers, see http://www.eere.energy.gov/hydrogenandfuelcells/production/technology_areas.html#electro.

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