Integrated Energy Systems for Nuclear Produced Hydrogen

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By 2050, the demand for low carbon electricity and hydrogen in the US is expected to increase from 4,000 to 7,000 TWh and from 10 to 41 million MT per year, respectively. A substantial portion of electricity will come from variable renewable energy (VRE). Electricity transmission and demand balancing with hydrogen production will be a challenge.

Steam methane reformation is a low carbon option for hydrogen production that avoids VRE capacity and transmission limitations. However, the need for geological storage of hydrogen, the sequestration of CO_2, and the challenge of long distance hydrogen delivery will limit the selection of practical and economic locations.

A viable option that addresses both VRE and steam methane reformation limitations is deployable hydrogen production via nuclear energy. The DOE predicts 200 GW of nuclear small modular reactor (SMR) capacity by 2050. This translates to ~2,000 SMRs with each having the ability to produce heat, electricity, and hydrogen. Small modular reactors will begin to come online in 2030 and Nu-H2 will be the first Integrated Energy System (IES) company to facilitate safe and efficient hydrogen production from nuclear energy.

Nu-H2 is a design, automation and safety company that provides:

- Location demand assessments for co-generation of H_2 and electricity via nuclear SMRs near end users
- Acquisition of hydrogen purchase agreements (HPAs)
- Selection and synergy between different nuclear and H_2 production technologies
- Design including automation and safety systems for the integration of a H_2 plant with the nuclear facility

The ability to deploy nuclear SMRs across the US along with the Nu-H2 approach will facilitate:

- Low transport costs and minimal pipeline length due to locating near hydrogen end users
- Minimal storage requirements due to continuous H_2 production based on HPAs
- Consistent behind the meter hydrogen production at steam methane reforming costs
- Ability to add electrochemical or thermochemical capacity, another nuclear SMR, or create gigafactories for production of energy carriers and synthetic fuels with nuclear trigeneration of H_2, steam and electricity