



## **Center for Energy Economics Nuclear Energy Roundtable III**

**January 6, 2016, Federal Reserve Bank Houston Branch**

### **Executive Summary**

Nuclear energy is at risk of being sidelined in Western countries because of the tension between nuclear project costs and competitive electricity markets; promotion of renewables for environmental and local economic benefits; and concerns associated with nuclear waste and safety. In contrast, there is growing interest in nuclear in other countries, as nuclear energy offers a feasible baseload solution to address energy security and environmental concerns.

In the U.S., suppressed electricity prices owing to subsidized renewable energy and low cost of natural gas, along with low demand growth, have challenged the economics of the existing fleet. Increasing O&M costs is a particular challenge to aging incumbent units. The heightened risk of early retirement of some nuclear units will certainly create challenges to meeting EPA's CPP goals in some jurisdictions. It is difficult to see any new nuclear facility built in the U.S., except in regulated markets, unless there are changes to pricing schemes, government support, and/or credits associated with lowering GHG emissions.

Worldwide, as of the end of 2015 (four years after the Fukushima accident), 64 reactors were under construction in 14 countries, 159 units were on order or planned in 27 countries, and 329 reactors were proposed in 34 countries. France continues to generate more than 70-75% of its electricity from nuclear but a new policy is aiming to increase renewables going forward while capping nuclear generation capacity at its current level. Turkey is pursuing its first nuclear reactors while UK is building its first new unit in a long while with two more planned. Nuclear power is expected to be resumed to pre-Fukushima-accident levels and supply around 20 to 22% of electricity in Japan by 2030. Mexico has plans to commission three new nuclear power plants by 2026, 2027 and 2028. UAE is another newcomer with four units under construction.

Several new reactor technologies are under development. Small modular reactor (SMR) technology, which is almost ready for commercial-scale development, allows for thinking about nuclear in desalination, hydrogen production, behind-the-fence generation for refineries and petrochemical facilities, and back-up for intermittent renewables. Strategies of combining nuclear and renewables are pursued: at-reactor thermal energy storage, production of alternate energy carriers (e.g., hydrogen production via high-temperature electrolysis), and nuclear-fossil hybrids. Nevertheless, the lack of permanent solution to used nuclear fuel and radioactive waste storage remains a significant challenge in the U.S.