

Nuclear Energy for Hydrogen Generation

Position Statement

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The American Nuclear Society (ANS) believes that an important role for nuclear power plants is the production of hydrogen. ANS supports research and development activities related to new nuclear power plant designs optimized for the production of hydrogen.

The expected implementation of a hydrogen-based economy will permit an evolution towards a sustainable energy regime with lower dependence on both domestic and foreign fossil fuel resources. This will enable meeting stricter environmental requirements with regard to atmospheric pollution (such as sulfur oxides, nitrogen oxides, mercury, heavy metals and particulates). Hydrogen is expected to have growing applications in industry and transportation. In fact, large quantities of hydrogen are already now being used as feedstock in the petrochemical industry, among others, for upgrading heavy crude oil and producing fertilizers.

At present most hydrogen (about 95%) is produced by steam reforming of methane with process heat provided by the combustion of some of the methane. If this were done utilizing nuclear-derived process heat, it would result in a substantial reduction in the consumption of methane and a decrease in the amount of carbon dioxide generated per unit of hydrogen produced. Hydrogen production through nuclear-assisted steam reforming of methane is viewed by many as an intermediate step to large-scale nuclear-driven hydrogen production from water.

Hydrogen may be produced from water by electrolysis and thermochemical cycles using nuclear energy. Electrolysis requires electrical energy as input and can be performed at any temperature. It is, however, considerably more efficient at higher temperatures ("hot" electrolysis). Thermochemical cycles, involving various recycled reactants, require process heat as input and have to be performed at relatively high temperatures.

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