



## Small Modular Nuclear Reactors for the Chemical Industry

**Small Modular Nuclear Reactors for the Chemical Industry is a NexantECA Special Report, covering emerging topics in industry, previous topics include Low Carbon Intensity Hydrogen (2023) and Sustainable Aviation Fuel: Soaring Over the Blendwall (2023).**

### Overview

New small modular nuclear reactor (nuclear SMR) technologies allow installations to be ideally sized for the needs of manufacturing, and unlike conventional low-carbon sources of energy offer reliable, consistent energy without geographic restrictions or transmission bottlenecks. Nuclear energy is now seen as a real option for low-carbon manufacturing, particularly for energy-intensive processes like power-to-X and heavy users of fossil fuel-fired heating, such as methane reforming. Interest has been especially high since the high-profile partnership of Dow and X-Energy, a prominent nuclear SMR developer, announced in 2023.

However, nuclear energy is a complex, heavily regulated sector unfamiliar to many chemical and fuel manufacturers. Moreover, the recent cost performance of new nuclear reactors leaves significant doubts about economic competitiveness. To truly understand nuclear energy options, players in the ongoing push for net-zero manufacturing need to understand the impact of regulatory requirements, the nuclear investment and project lifecycle, best practices for deployment, and the sources and magnitude of downside cost risk.

### Technologies

This report covers major commercial nuclear SMR technology offerings, with a focus on Pressurized Water Reactors (PWRs), Boiling Water Reactors (BWRs), and High-Temperature Gas-Cooled Reactors (HTGRs) for near-term commercialization, with detailed commercial, technical, and economic profiles of 7 developers. Fast reactors and molten salt reactors are covered at a higher level due to lower levels of communication.

This report also investigates the compatibility, engineering challenges, and operational suitability of integrating nuclear SMRs with existing major chemical and fuels manufacturing processes.

### Process Economics

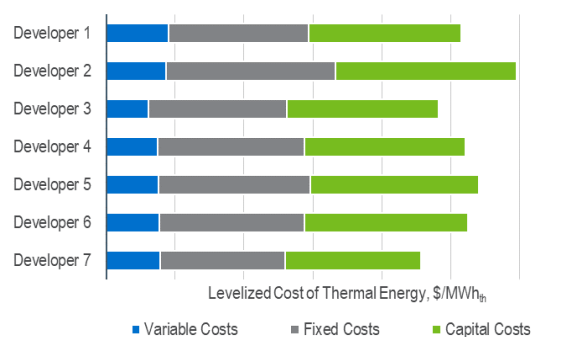
This report approaches nuclear SMR energy economics from a critical perspective, evaluating claims made by nuclear SMR technology providers and advocates using NexantECA's cost engineering expertise and studies of

post-2010 commercial nuclear deployments. It includes a detailed investigation of operating costs and capital cost inflation, and identifies sources of cost overruns and project management challenges in deployment to help subscribers understand the complex factors behind recent nuclear deployment performance.

These insights are used to normalize available developers' cost claims and analyze levelized cost of thermal and electrical energy from major developers. NexantECA also estimates levels of expected cost overrun from common issues during deployment to aid in cost contingency planning.

This report also leverages NexantECA's techno-economic expertise to present cash costs of production for high temperature electrolytic hydrogen and electrically heated steam methane reforming hydrogen, both featuring design optimization to make maximal use of nuclear thermal and electrical energy.

**Levelized Cost of Thermal Energy from Major Small Modular Nuclear Offerings**



### Strategic Environment

This special report covers the strategic environment for applications of nuclear SMRs in the process industries, including:

- Near and medium-term strategic case for investment
- Outlook for major technology providers
- Current deployment trends
- Discussion of major financial and non-financial risks during implementation and operation.

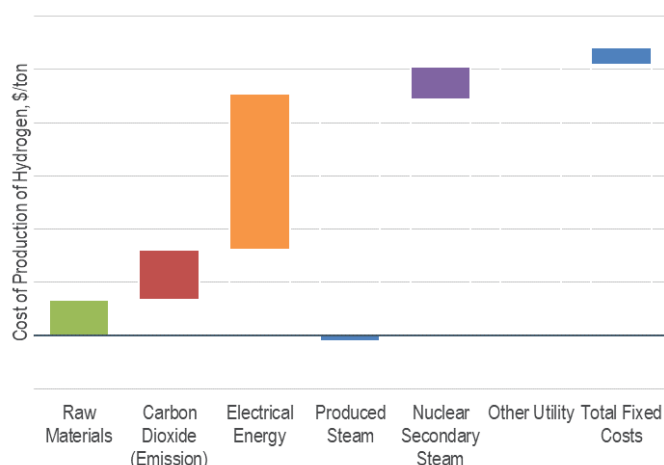
**For more information,**

**[ContactUs@NexantECA.com](mailto:ContactUs@NexantECA.com) or [www.NexantECA.com](http://www.NexantECA.com)**

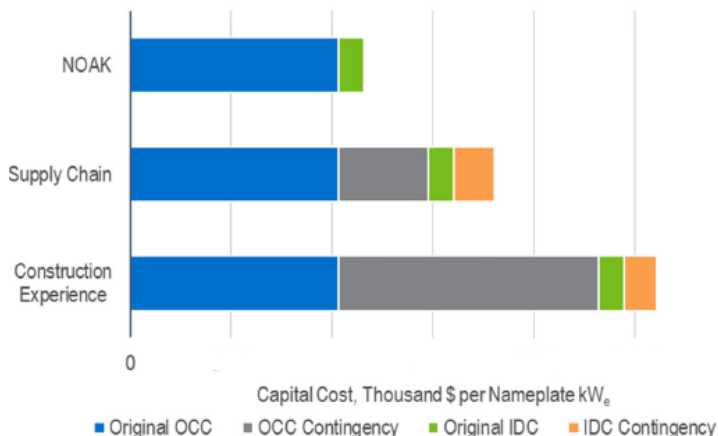


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Cash Cost of Production of Hydrogen using Nuclear-Integrated e-SMR



Effects on *n*th-of-a-kind (NOAK) Nuclear SMR Capital Cost of Construction Experience and Supply Chain Issues



## Subscription Options

A subscription to a Special Report includes:

- A PDF report including detailed technology analyses, process economics, as well as commercial overviews and industry trends
- Cost of production tables in spreadsheet format (as requested)
- Consultation time with the project team

For more information, please contact  
[ContactUs@NexantECA.com](mailto:ContactUs@NexantECA.com) or [www.NexantECA.com](http://www.NexantECA.com)



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### Americas

Tel: +1 914 609 0300  
 169 Mamaroneck Avenue  
 2nd Floor, Suite 100  
 White Plains, NY 10601  
 USA

### Europe, Middle East & Africa

Tel: +44 20 7950 1600  
 110 Cannon Street  
 London EC4N 6EU  
 United Kingdom

### Asia Pacific

Tel: +662 793 4600  
 22nd Floor, Rasa Tower I  
 555 Phahonyothin Road  
 Kwaeng Chatuchak  
 Bangkok 10900  
 Thailand

For more information,  
[ContactUs@NexantECA.com](mailto:ContactUs@NexantECA.com) or [www.NexantECA.com](http://www.NexantECA.com)