

The Future of Nuclear Energy in a Carbon-Constrained World

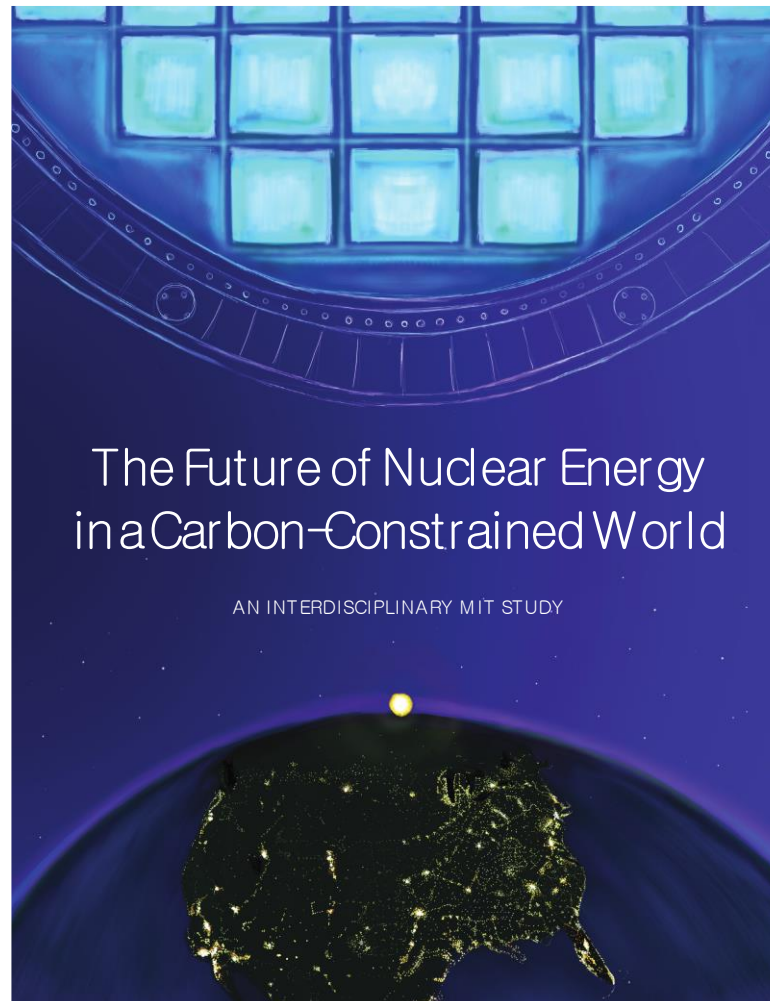


JOHN PARSONS

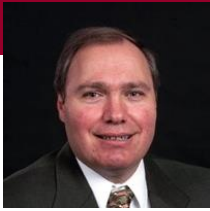
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Université Paris-Dauphine Conference

<http://energy.mit.edu>



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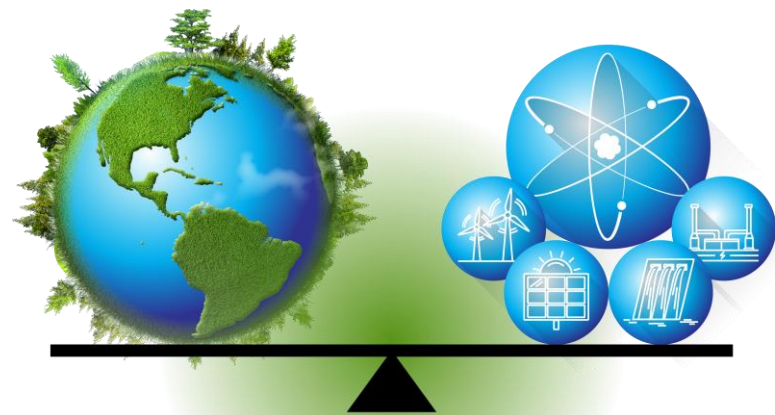
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Study Take-away Messages

- The opportunity is carbon
- The problem is cost
- There are ways to reduce it
- Government's help is needed to make it happen



The Opportunity is Carbon #1: Existing Reactors

- **cost-efficient source of low-carbon electricity**
- **closures of existing plants undermine efforts to reduce GHG emissions and increase the cost of achieving reduction targets**

MIT CEEP

MIT Center for Energy and Environmental Policy Research

Working Paper Series

The Climate and Economic Rationale for Investment in Life Extension of Spanish Nuclear Plants

Anthony Frattolillo and John E. Parsons



November 2018

CEERPWP2018-016

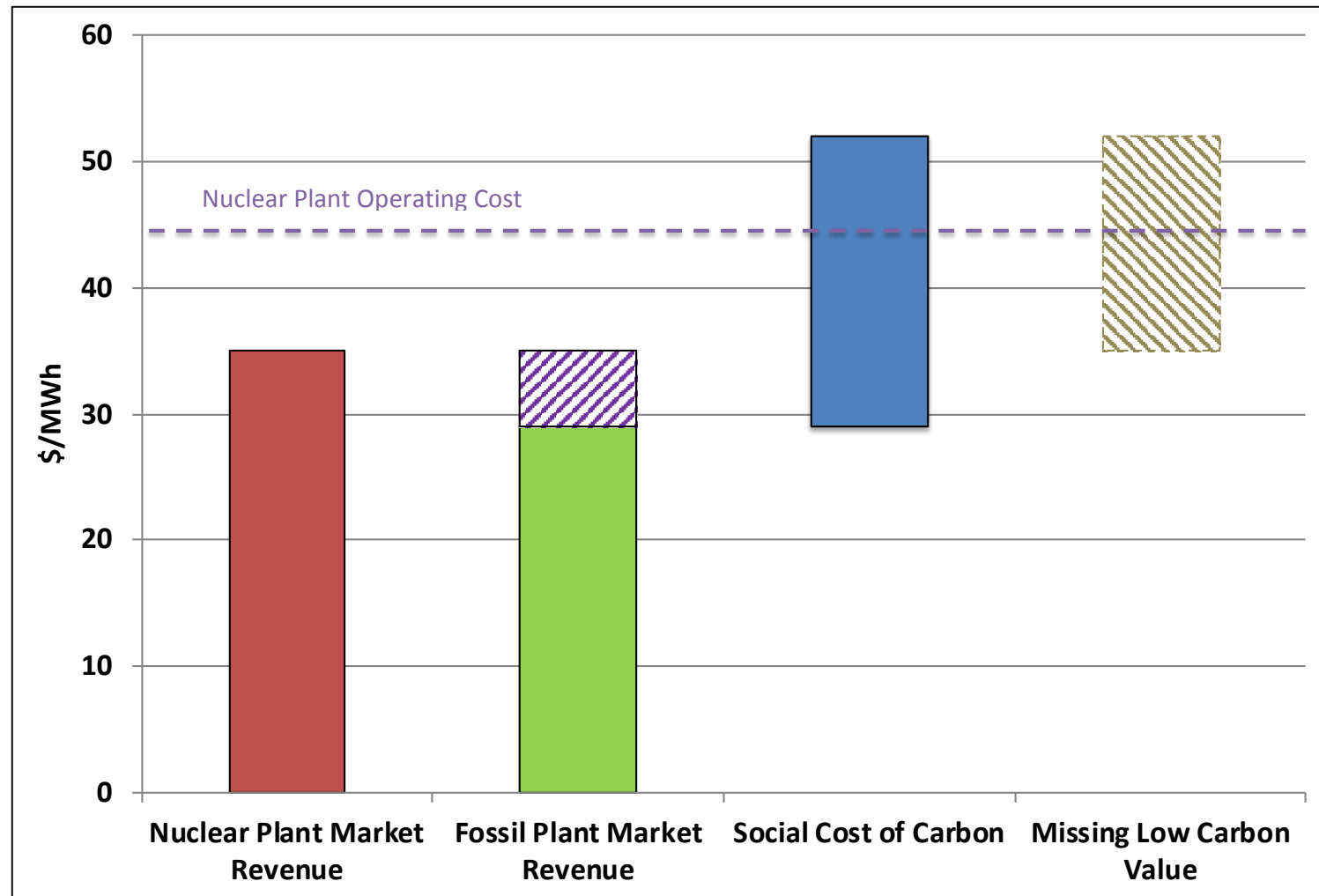


MASSACHUSETTS INSTITUTE OF TECHNOLOGY

<http://ssrn.com/abstract=3290828>

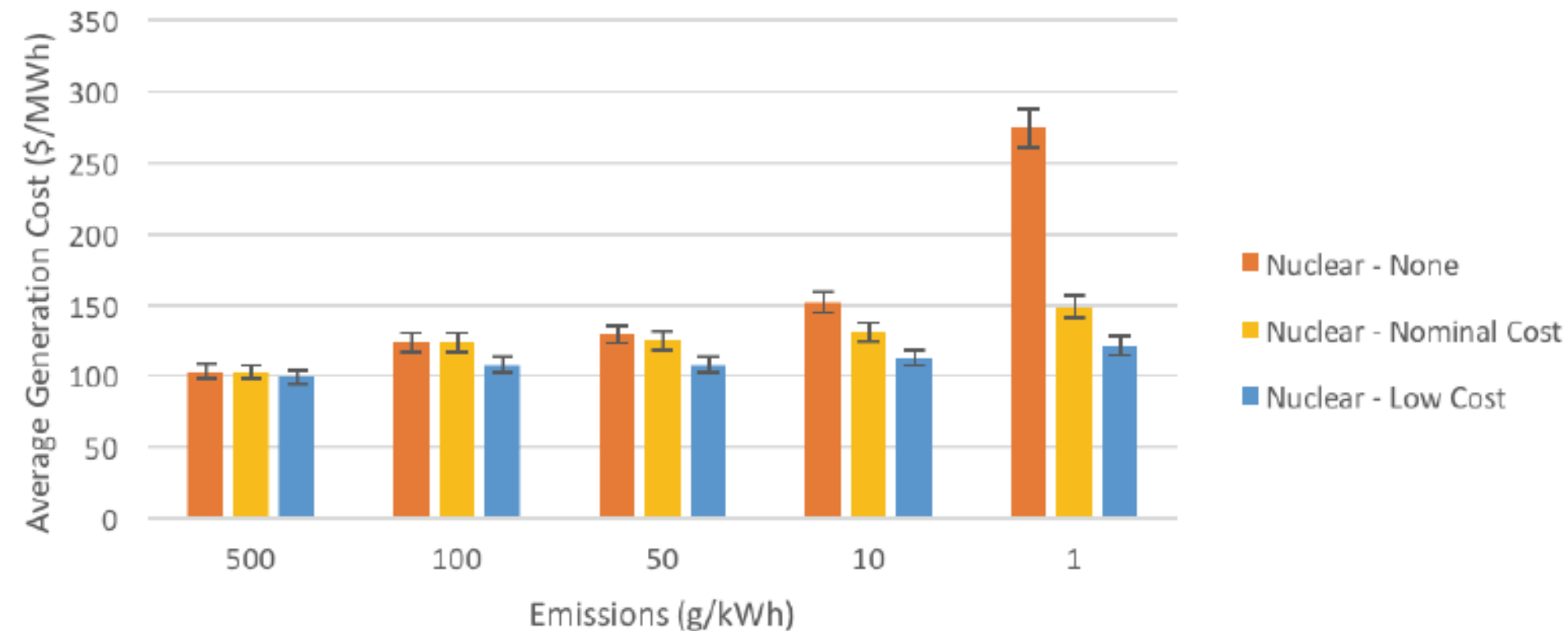


Recognizing the Full Value of Low-Carbon Would Restore Profitability



The Opportunity is Carbon #2: Deep Decarbonization by 2050

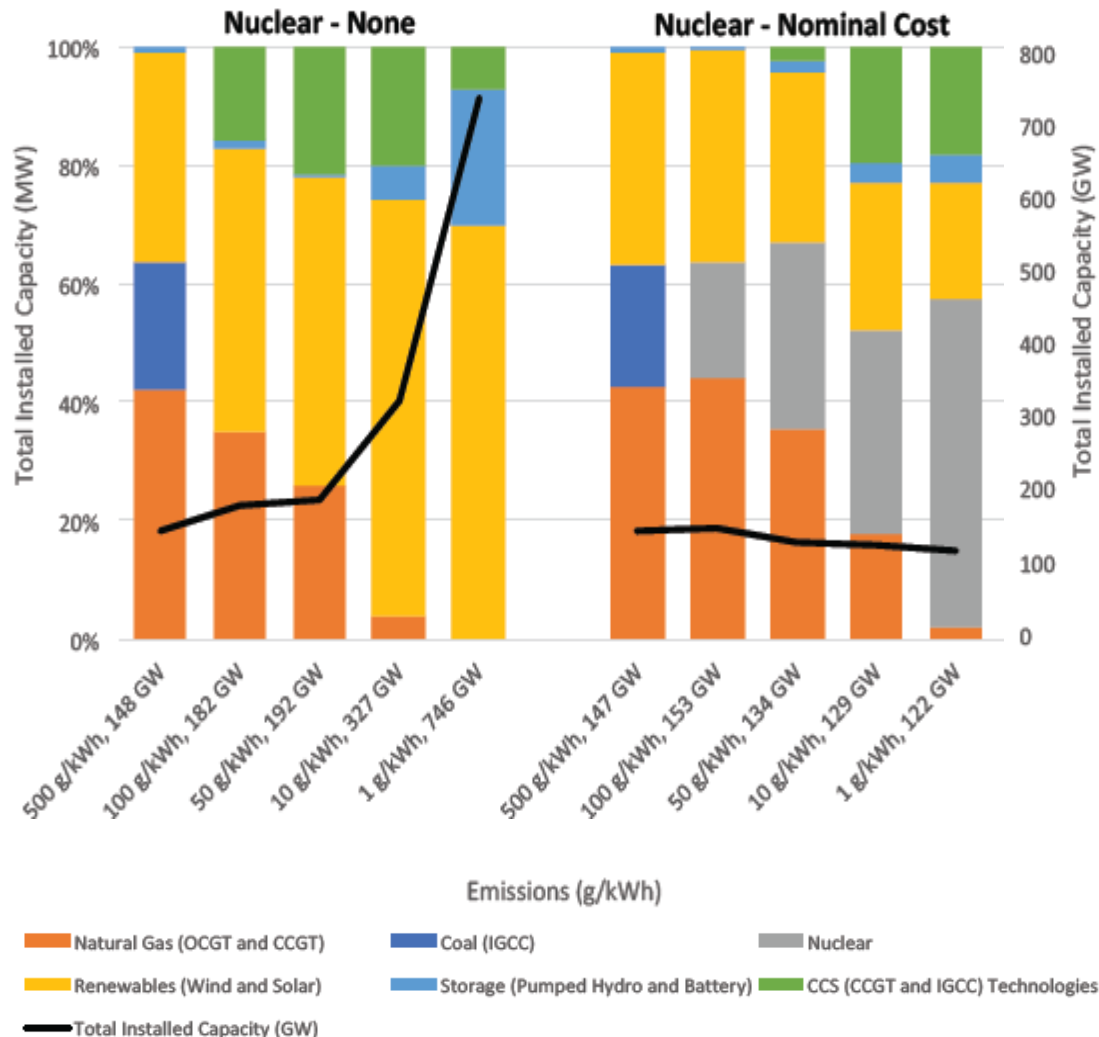
Figure 1.5e: France cost of electricity generation



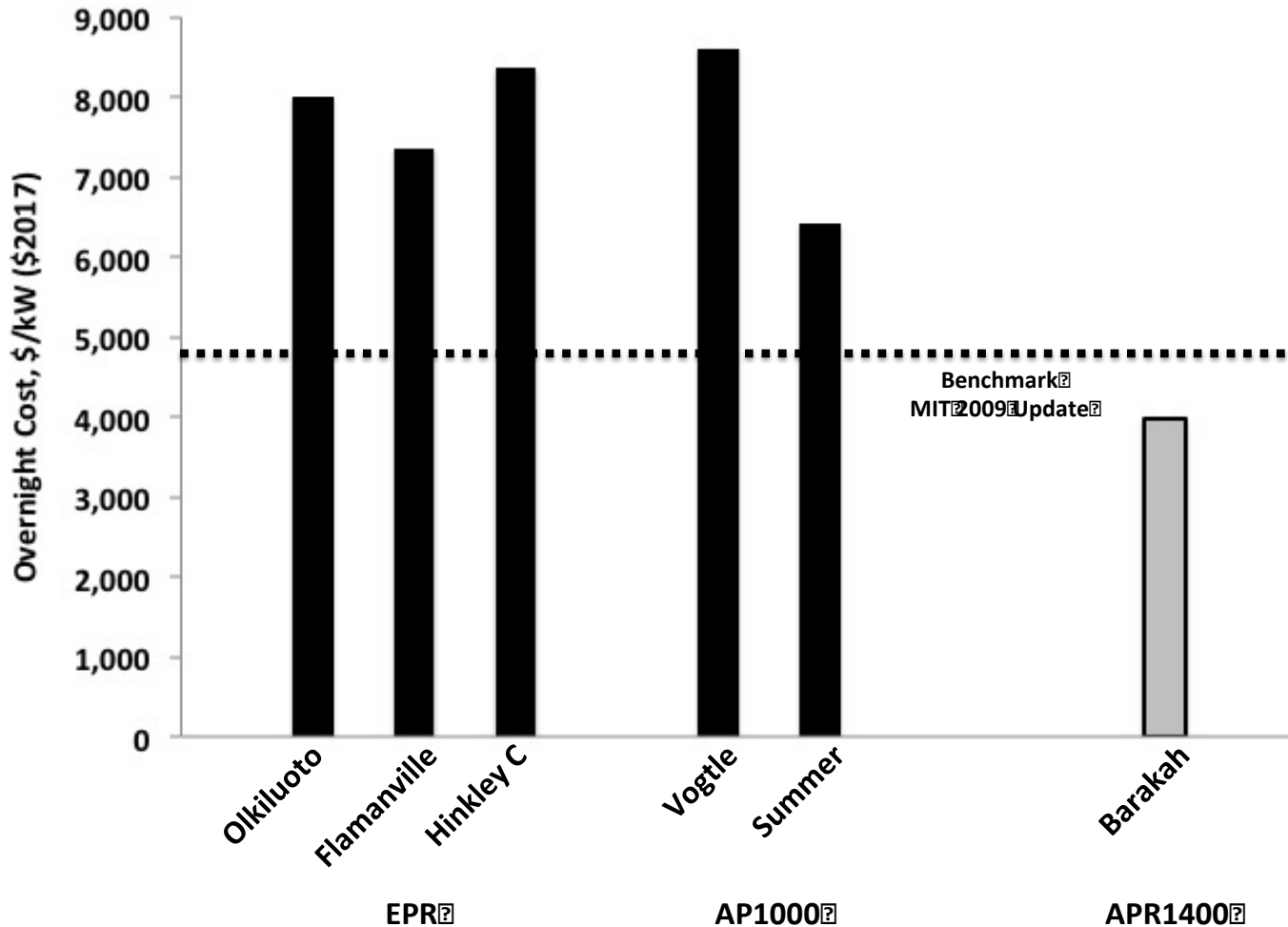
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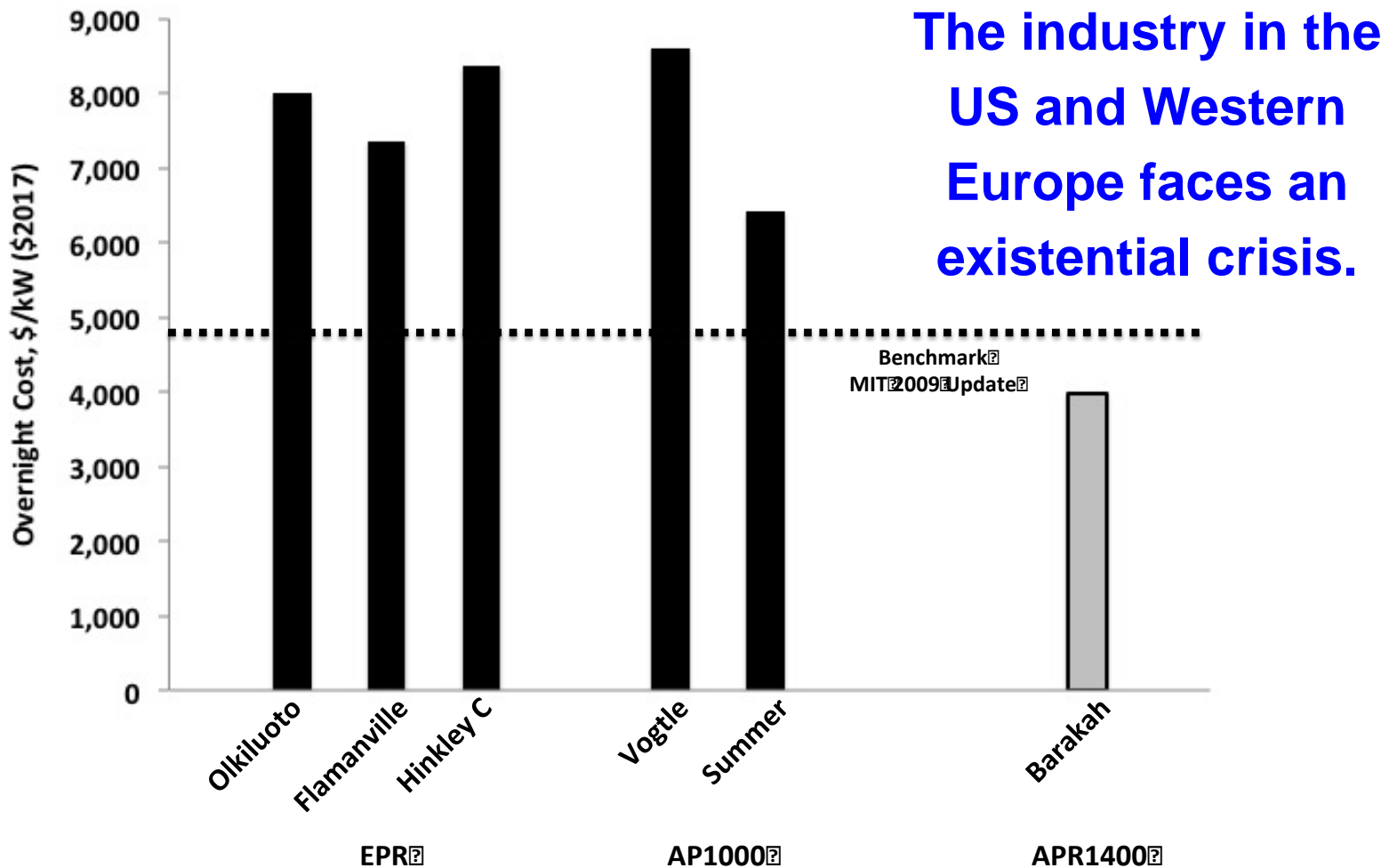
The Opportunity is Carbon #2: Deep Decarbonization by 2050



Recent New Builds in the U.S. and W. Europe Have Proven Expensive

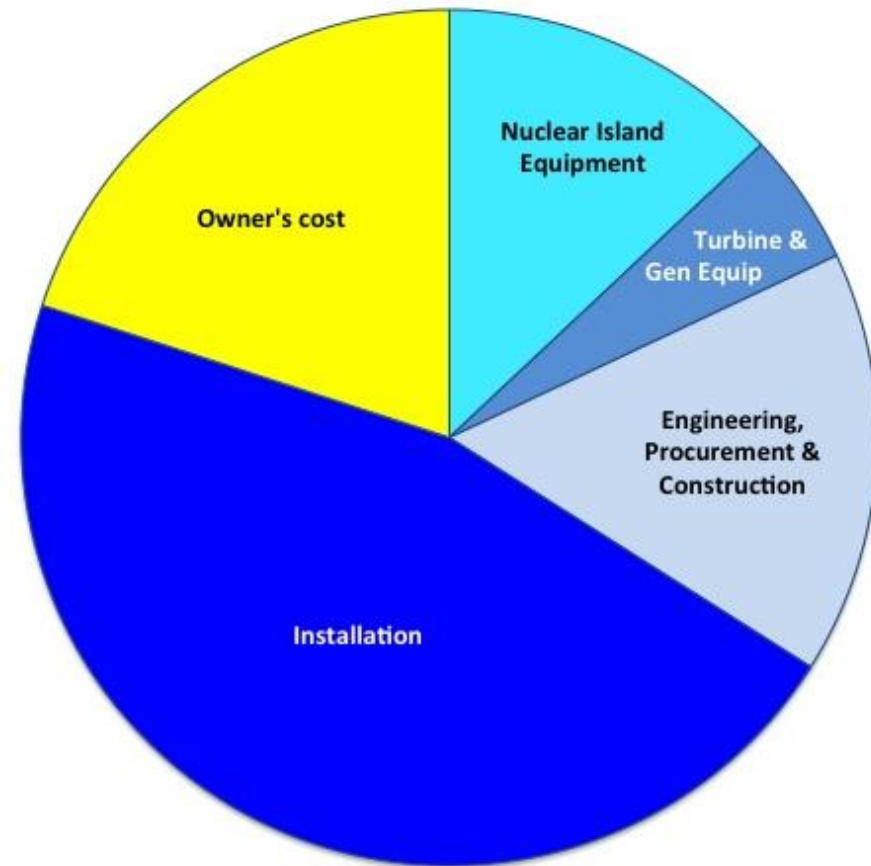


Recent New Builds in the U.S. and W. Europe Have Proven Expensive



Where is the Cost in a Nuclear Power Plant?

Nuclear Island Equipment	13%
Turbine & Generator Equipment	5%
Engineering, Procurement & Construction	16%
Installation	46%
Owner's Cost	20%



The Civil Works is Where Its At!

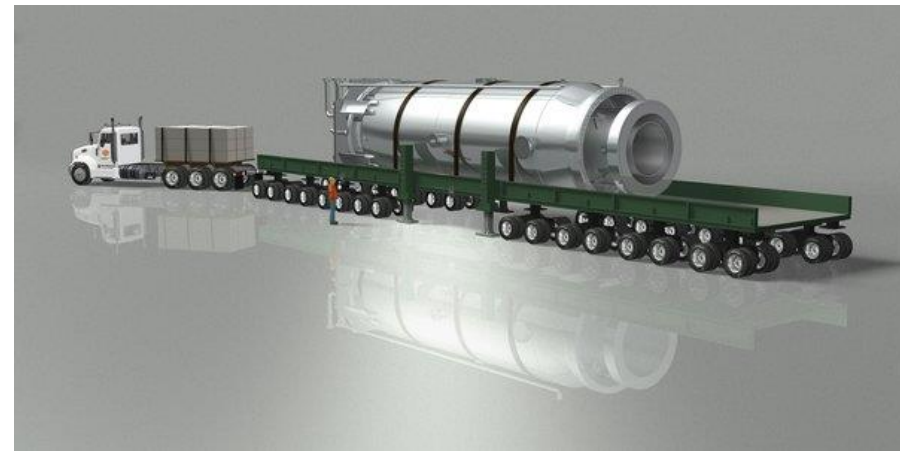


There are Ways to Reduce Cost

Basic blocking and tackling comes first.

And, then...

- **Advanced concrete solutions**
- **Seismic isolation and embedment**
- **Modular construction and factory fabrication**



What About Advanced Reactors?

- **Opportunities for passive and inherent safety features are valuable.**
- **Reductions in cost are possible, but unproven.**
 - most advertised claims are ill-informed.
- **Parable of the jewel and the box.**
 - cost reductions are potentially available if the focus is on the right items;
 - improved fuel cycles cannot dent total cost;

