

AMERICA'S ENERGY

NATIONAL ACADEMY OF SCIENCES

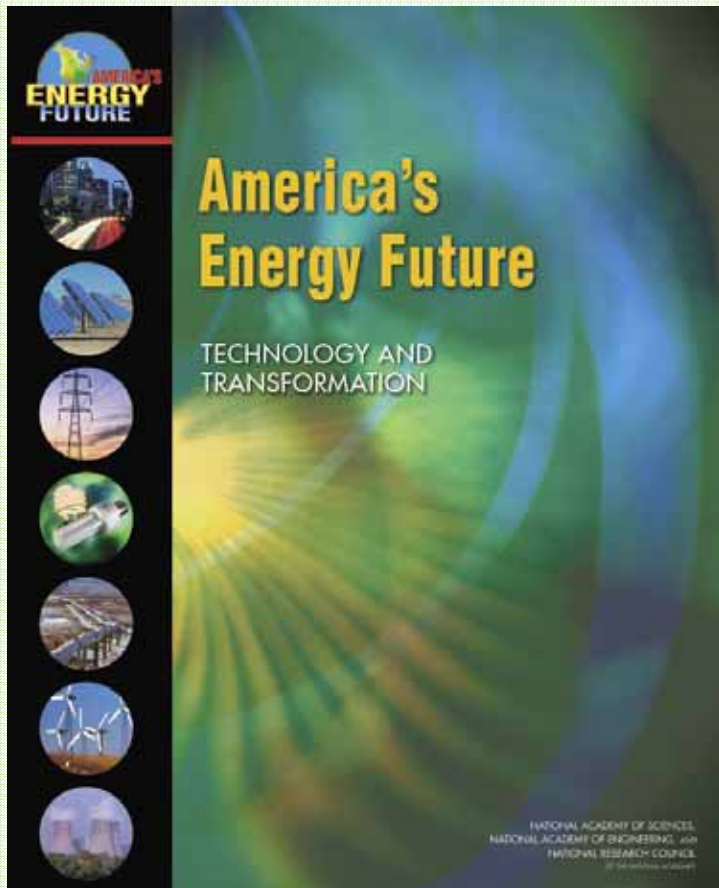
NATIONAL ACADEMY OF ENGINEERING

INSTITUTE OF MEDICINE

NATIONAL RESEARCH COUNCIL

FUTURE

America's Energy Future: Technology and Transformation



*National Research Council
Committee on
America's Energy Future*

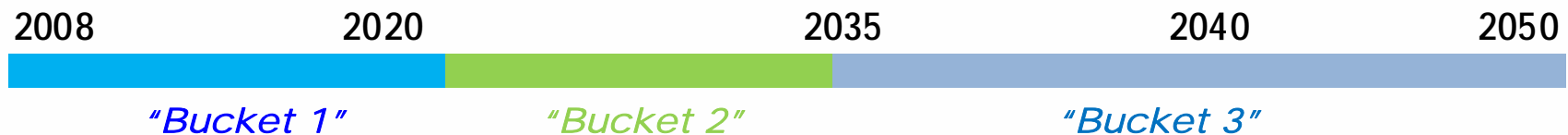
The AEF committee carefully considered the potential of critical technological options (including their costs and limitations) that might be deployed to pursue a transformation of the energy sector that would meet the identified economic, environmental and national security concerns.

AEF "Global" Conclusion

The only way to meet the concerns identified given our initial conditions is to embark on a sustained effort to transform the manner in which we produce and consume energy.

Finding 1: Potential for Transformational Change

With a sustained national commitment, the United States could obtain substantial energy-efficiency improvements, new sources of energy, and reductions in greenhouse gas emissions through the accelerated deployment of existing and emerging energy-supply and end-use technologies.



Finding 2: Energy Efficiency Potential

The deployment of existing energy-efficiency technologies is the nearest-term and lowest-cost option for moderating our nation's demand for energy, especially over the next decade.



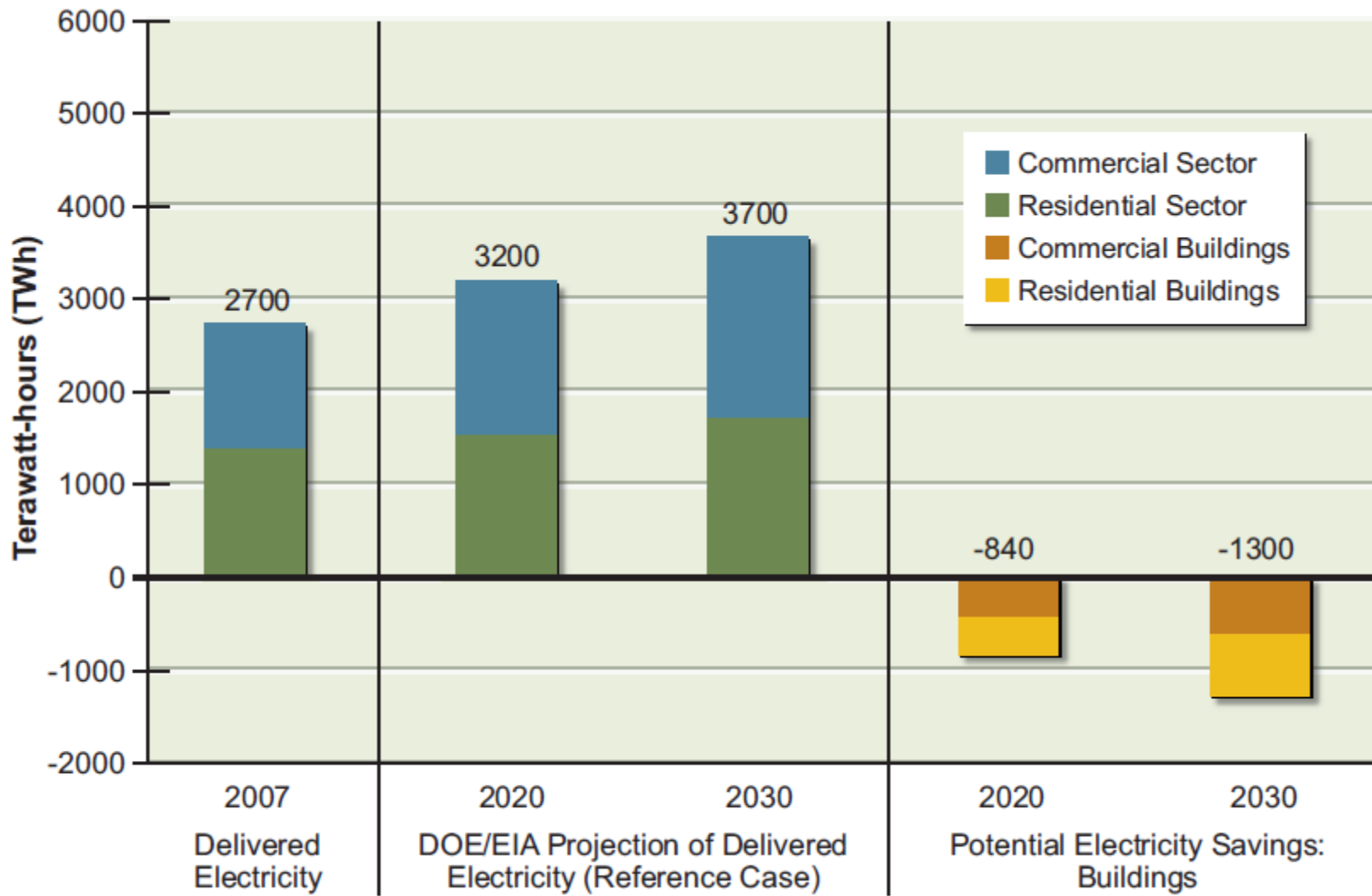
15 Percent (15-17 Quads) by 2020

30 Percent (32-35 Quads) by 2030

NOTE: Even greater savings would be possible with more aggressive policies and incentives.



Potential Electricity Savings in Commercial and Residential Buildings, 2020 and 2030

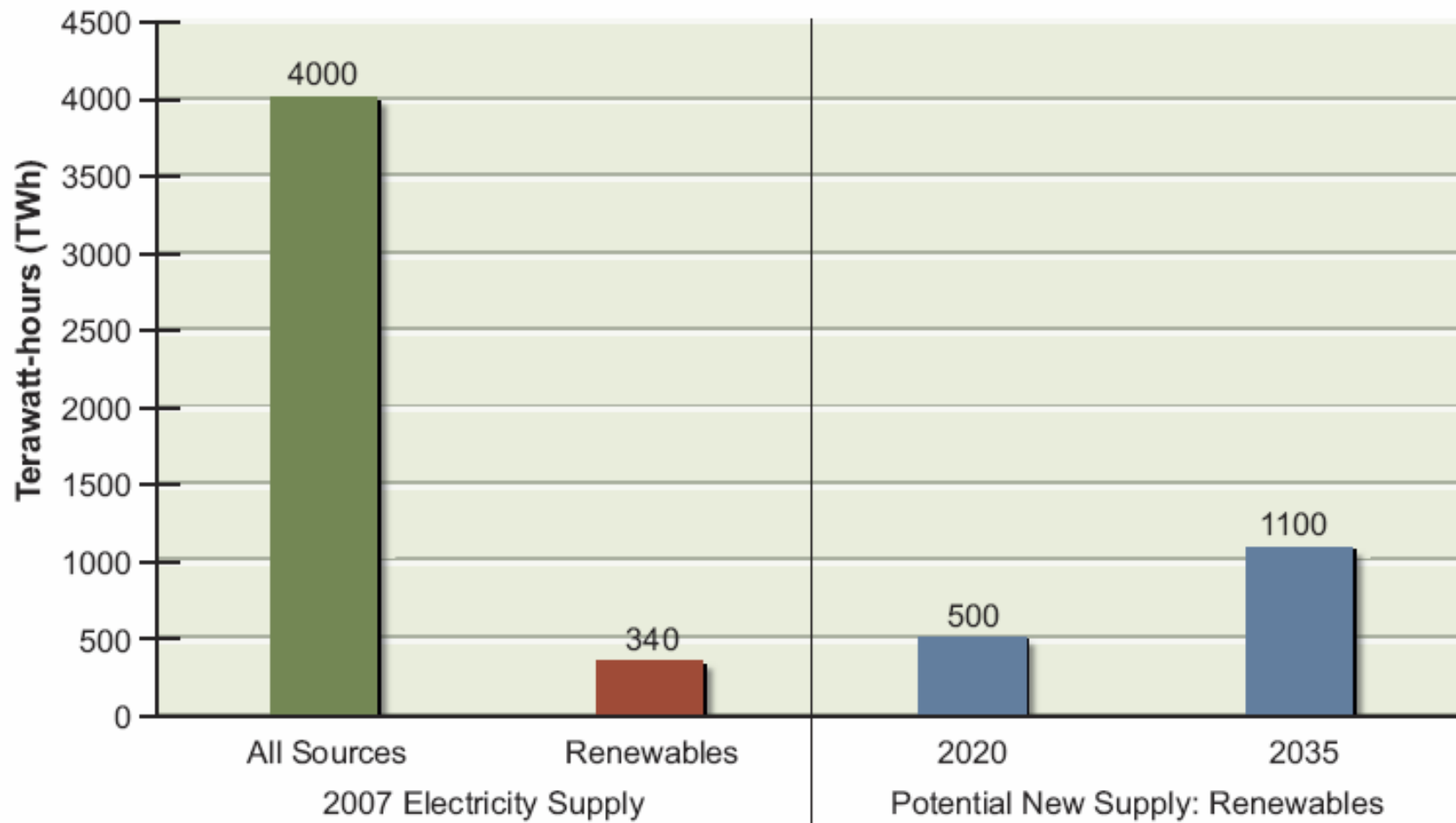


Finding 3: Electricity Supply Options

The United States has many promising options for obtaining new supplies of electricity and changing its supply mix during the next two to three decades, especially if carbon capture and storage (CCS) and evolutionary nuclear technologies can be deployed at required scales.

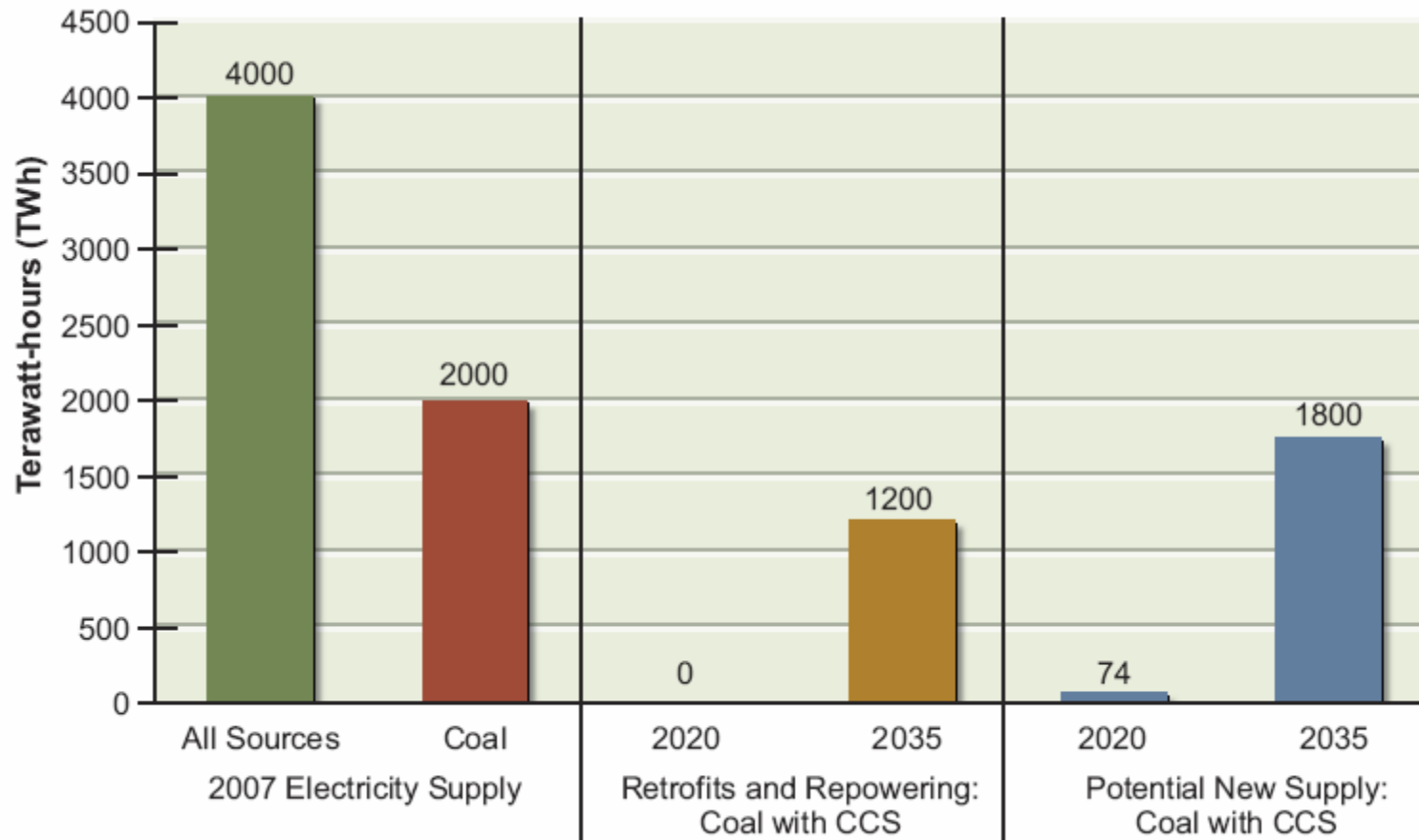
However, the deployment of these new supply technologies is very likely to result in higher consumer prices for electricity.

Prospects for Renewable Electric Power in the U.S.

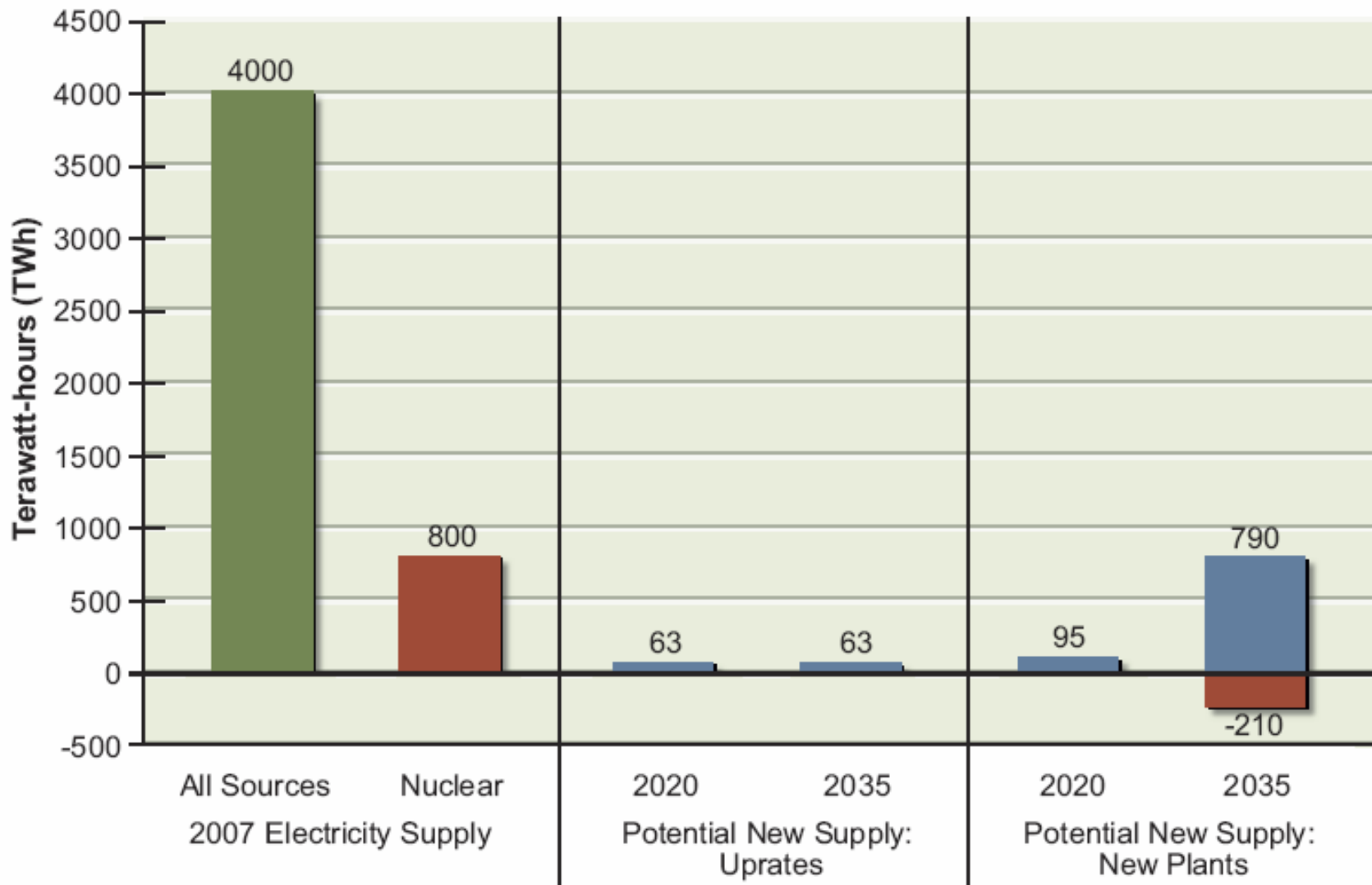


12/07

Future of Coal with Carbon Capture and Sequestration: Retrofits and New Supply

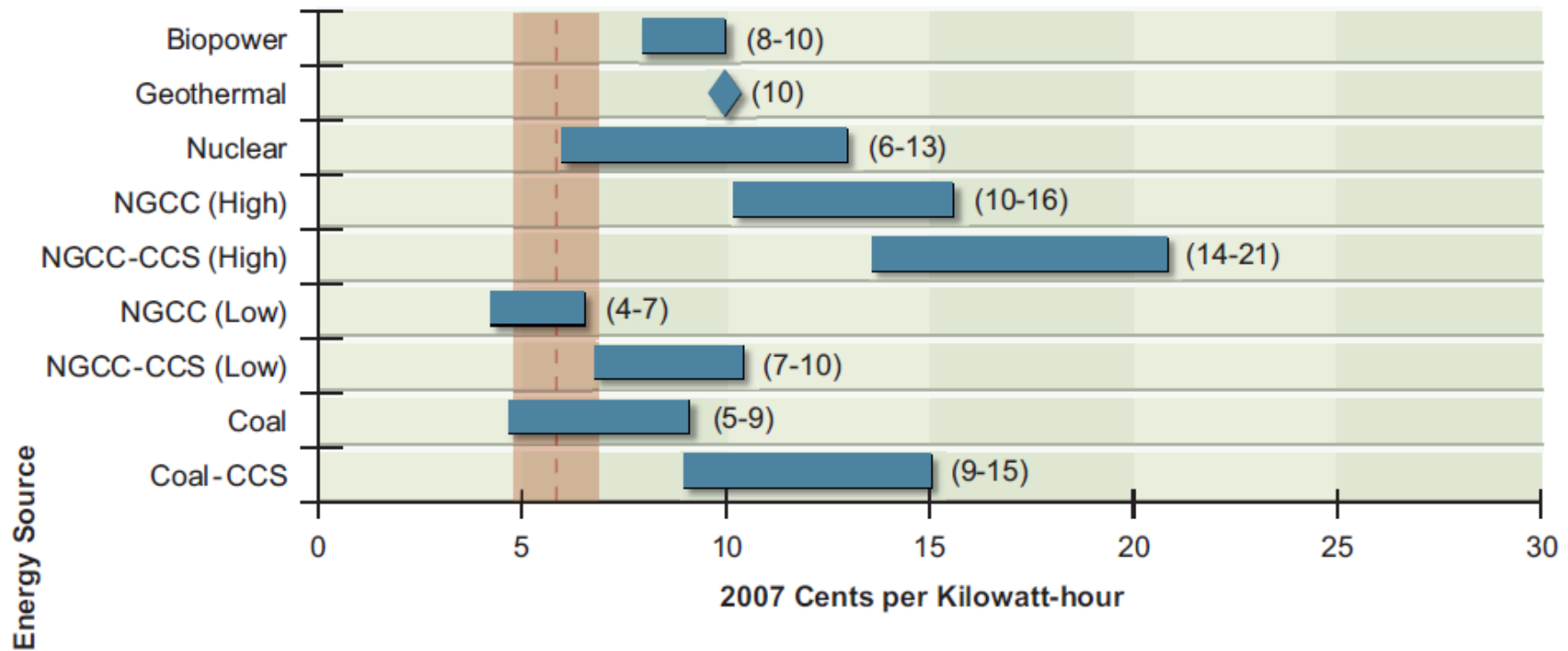


Prospects for Nuclear Power in the U.S.

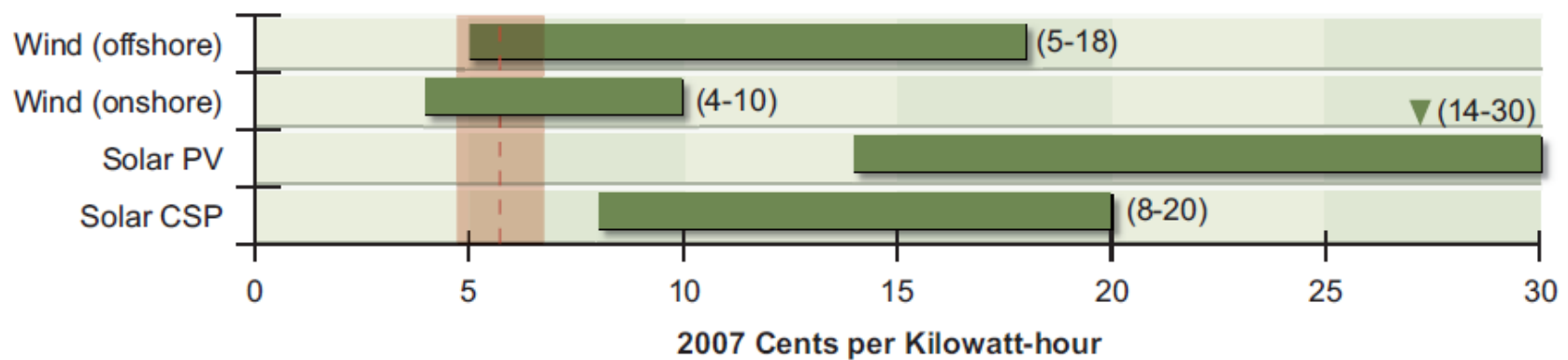


Levelized Cost of Electricity Generation

Levelized Cost of Electricity for New Baseload Sources



Levelized Cost of Electricity for New Intermittent Sources



Demonstration of Technology at Scale

To clarify our options for the future, we must:

- Demonstrate whether **carbon capture and storage (CCS)** technologies for sequestering carbon from the use of coal and natural gas to generate electricity are technically and commercially viable for application to both existing and new power plants.
- Demonstrate whether **evolutionary nuclear technologies** are commercially viable in the United States by constructing a suite of about five plants during the next decade.

Failure to do this during the next decade would greatly restrict options to reduce the electricity sector's CO₂ emissions over succeeding decades. The urgency of getting started cannot be overstated.

Finding 4: Modernizing the Nation's Power Grid
Expansion and modernization of the nation's electrical transmission and distribution systems (i.e., the power grid) are urgently needed.

The AEF Committee estimates that it would cost (in 2007 dollars) \$175 billion for expansion and \$50 billion for modernization of the **transmission** system when they are done concurrently and \$470 billion for expansion and \$170 billion for modernization of the **distribution** system (again done concurrently).



Finding 8: Barriers to Accelerated Deployment

A number of barriers could delay or even prevent the accelerated deployment of the energy-supply and end-use technologies described in this report.

Policy and regulatory actions, as well as other incentives, will be required to overcome these barriers.



Some Closing Thoughts

- *Progress before 2020 will largely determine outcomes for 2050*
- *Creating additional technology options is essential*
- *The big wildcards – natural gas and retirement of existing infrastructure.*