Nuclear Energy
A Business Driver For The Next Generation

Donald R. Hoffman
President & CEO, Excel Services Corporation
Immediate Past President, American Nuclear Society

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About ANS

ANS is a professional organization of engineers, scientists, and other professionals devoted to the peaceful applications of nuclear science and technology.
About ANS

- Founded in December 1954
- Created a forum for knowledge sharing
- Convened countless conferences
- Stimulated discussion and debate among professionals
- Fostered interest in the profession
- Provided recognition for excellence
- Influenced the conversation about nuclear with those outside the field
• More than 11,000 individual members
• Nearly 100 organizational members
• International alliances, bilateral agreements with some 30 nuclear societies outside the U.S.
• Over 60 local sections (including 9 outside the U.S.)
• 20 specialty professional divisions and technical groups including the Young Members Group
• More than 30 local student sections
ANS’s Unique Role

• Research
  – Professional divisions and technical groups

• Student and early career support
  – Scholarships, mentoring, leadership development

• Standards
  – Improving plant operations

• Education and professional development
  – Learning and sharing information, networking, leadership opportunities

• Public outreach and ANS’s Center
  – Community awareness, K12 education, policy maker resource, media engagement

• Unique voice representing the nuclear science community
  – Informing media, opinion leaders, and policy makers
ANS’s Unique Role

• Hosts numerous national and international technical conferences
• Publishes highly regarded magazines, journals, resource books, textbooks
• Hosts social interactions for members online and offline
• Sponsors local activities and meetings
• Offers professional development programs
• Prepares members for professional certification exam
• Offers opportunities for leadership in the Society

Center for Nuclear Science and Technology Information
An initiative of the American Nuclear Society
I and the American Nuclear Society through its position statements and interactions with policy makers is committed to:

- Treat our existing reactor fleet as a national asset
- Working with our National Governors Associations (NGA) and all Governors to address Nuclear role in states Energy Policy
- Encourage DOD to be an eager lead customer of SMRs
- Be timely and flexible negotiating 123 agreements
- Improve the 810 process
- Be aggressive with export financing
- Invest in human infrastructure
- Develop a sensible waste policy
In 2012, the United States generated about 4,054 billion kilowatthours of electricity. About 68% of the electricity generated was from fossil fuel (coal, natural gas, and petroleum), and of the fossil fuel generation 37% from coal.

Energy sources and percent share of total electricity generation in 2012 were:

- Coal 37%
- Natural Gas 30%
- Nuclear 19%
- Hydropower 7%
- Other Renewable 5%
- Biomass 1.42%
- Geothermal 0.41%
- Solar 0.11%
- Wind 3.46%
- Petroleum 1%
- Other Gases < 1%
US Electricity Production Costs 1995-2008

in 2008 cents per kilowatt-hour

Production Costs = Operations & Maintenance + Fuel. Production costs do not include indirect costs or capital.

Source: Ventyx Velocity Suite, via NEI
Emissions

Nuclear operates day and night in all weather while emitting no carbon dioxide, sulfur dioxide or nitrogen oxide.

Emission-free aspect of nuclear generation likely to become increasingly important.

Comparison of Life-Cycle Emissions

Tons of Carbon Dioxide Equivalent per Gigawatt-Hour

Source: University of Wisconsin
Emissions

Nuclear Plants produce nearly a fifth of the United States’ total power production, but in 2013 accounted for an overwhelming 63 percent of the country’s carbon-free energy. Nuclear energy also prevented 589 million metric tons of carbon dioxide emissions in 2013, equal to the carbon emissions emitted by 113 million passengers cars – more than all passenger cars in the country.
Where We Are Headed in the US

U.S. electricity demand expected to rise 28 percent by 2040 (*U.S. EIA Annual Energy Outlook 2013*)

The United States will need hundreds of new power plants of all types to meet this increased demand and replace older facilities

Nuclear energy is the only proven large-scale, emission-free electricity source that can be widely expanded
Cost of Natural Gas

- Pressures associated with low price and relative abundance of natural gas
- Recent delivery difficulties of natural gas, particularly in the Northeast of the US, caused megawatt hour costs to increase from around $40 to $250
- Demand will have an inevitable impact on price
- Additional regulation of fracking may also have price impact
State of Nuclear Power

• Kewaunee and Vermont Yankee
  o Demonstrates impact of low natural gas price

• Crystal River
  o Containment issues as well costs and uncertainties of repairs, too much risk

• San Onofre
  o Costs and uncertainties of repairs

• Fort Calhoun – regulatory evaluation
Nuclear power still continues to be an important source of electricity

- 32 companies are licensed to operate nuclear reactors
- 31 states have operating plants
- In seven of those states, nuclear power produced the largest percentage of those states’ electricity
- In 2011 nuclear power plants generated an estimated 789 billion kilowatthours
Overall Performance

- 2012 performance demonstrated safety and reliability
- Average capacity factor was 86.4 percent
  - Best reliability of any source of electrical generation
  - Even notwithstanding contribution to capacity factor of Crystal River 3 and San Onofre 2 and 3 effective all of 2012
Continued high levels of investment

- 2013 industry invested more than $8.5 billion (US) in facilities
- Investment maintains highest levels of safety and reliability
- Completes some significant uprates
- Positioned facilities to operate beyond original 40 year licenses to 60 years
- Now evaluating license extensions to 80 years and beyond
Impact of New Construction

- New construction at Vogtle and Summer underway
- Largest construction projects in their respective states, Georgia and South Carolina
- Directly employing nearly 4,000 workers, on a routine basis and twice that during peak construction
- Support about 35,000 jobs across America
For the Future

- Have 10 applications for construction and operating licenses under review at the NRC.
- Two applications for early site permits under review at NRC.
- Unlikely to be any new large build Nuclear Power Plant construction until the next decade, but will be new construction to respond as demand for electricity recovers.
- As a result of our impasse on waste disposal, licensing has stalled.
What about the impact on local communities where nuclear plants are located?

– Each year, the average nuclear facility generates approximately $470 million (US) in sales of goods and services

– The same average nuclear facility will create nearly $40 million (US) in total labor income

– Operation of the same average nuclear facility generates 400 to 700 permanent jobs, which pay 36 percent more than average salaries in the local area
Economics

- Permanent jobs at nuclear plants create equivalent numbers of support jobs locally – grocery stores, restaurants, dry cleaners, car dealers
- Every dollar spent by the average nuclear plant produces $1.04 in the local community
- Each nuclear plant generates an average of $16 million (US) in state and local tax revenue for schools, roads and similar infrastructure
- And the federal tax payments of each nuclear unit is roughly $67 million (US)!
Stability

• Nuclear generated electricity offers considerable price stability over its coal, natural gas, and renewable energy sources

• Only 28 percent of nuclear production costs are fuel costs, compared to 80-90 percent of fossil fuel production costs are fuel costs

• Uranium is the least price volatile fuel for all our sources of energy, while nuclear energy remains the most green of all
What Can We Do?

- Nuclear power is beset by challenges, but laden with opportunity
- What can we do?
  - Develop comprehensive energy policy that includes all carbon-free sources, including nuclear
  - Close the nuclear fuel cycle
  - Develop and deploy SMRs
  - Ensure a strong infrastructure for domestic nuclear energy production
  - Support the export of nuclear science and technology
Thank you!

Donald R. Hoffman
Immediate Past President, American Nuclear Society
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