Problems Facing the U.S. Civil Nuclear Sector

Challenges and Opportunities for South Korea

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U.S. Civil Nuclear Sector is in Trouble

- In 2010, the Department of Commerce's International Trade Administration warned that the U.S. nuclear sector had "atrophied"

- This sharp decline in the U.S. nuclear program should disturb any American policymaker who understands the national security dimensions of commercial nuclear power, including the dependence of the U.S. military on the civil sector

- It should also trouble environmental activists, given the importance of an expansion of nuclear power in climate mitigation strategies

Operators – Threat to Existing Units

Near term closure of a number of reactors increasingly inevitable, absent policy changes

- Impact of cheap shale gas on the economics of nuclear
- Poorly structured, deregulated markets and market distortions– mainly in the form of subsidies and mandates for other power generation – are severely undermining the competitiveness of much of the nation's existing fleet, particularly smaller reactor units
- Because these externalities and distortions are unlikely to change or be corrected in the near term, we are more likely than not to see a greater number of premature shutdowns or operator decisions not to pursue relicensing

U.S. Nuclear Fleet is Contracting

Despite the construction of five new reactors in regulated markets in the American South, last year's announced shutdown of five reactors reflected the industry's actual state – one of contraction

- Operators decided to retire two small reactors (Kewaunee and Vermont Yankee) prematurely for a number of reasons, some of which included cheap shale gas, subsidized renewables, and poor market structure that does not fully value base load power

- U.S. nuclear generating capacity could fall to about 80 GWe by 2030 – down from roughly 100 GWe at the beginning of 2013

- This is in stark contrast to the much more optimistic forecast by the Energy Information Administration (EIA), which does not include an analysis of the impact of market externalities, distortions, or structure on the nuclear reactor fleet

Merchant Markets are Broken

Roughly half of the U.S. nuclear fleet is located in merchant markets that also have renewable portfolio standards and in many cases, energy efficiency/demand destruction mandates

- In merchant or deregulated markets, generators respond to market demand and sell their electricity at the going market price

- In contrast, generators in regulated markets receive a price that is determined by state regulatory authorities, which allows them to recover the cost of their investment, plus an authorized return

Of particular concern is the impact of subsidies for non-nuclear generation on the continued profitability of merchant market single units that have much higher per unit costs

- The future of a number of single units in merchant markets is in doubt – putting at risk roughly an additional 7,500 MW for early retirement

- Some larger merchant dual units are threatened – particularly those located in areas of the country where there is a large amount of subsidized wind power

Impact on Environmental Goals and Grid Reliability

Such a decline in baseload capacity that is also zero emissions would greatly complicate greenhouse gas reduction goals in many parts of the country, as well as challenge grid reliability, particularly during periods of high demand

- In 2012, U.S. nuclear plants avoided 570 million metric tons of CO2

- This past winter with the Polar Vortex, nuclear energy, which operated at a fleet capacity of 95 percent, became the primary provider of electricity in New England, edging out gas, 29 to 27 percent; generation from oil and coal were about 15 percent a piece

Without the nuclear fleet in the Northeast, what would have happened during the freezing winter?

Vendors – Relying on Foreign Markets

With few nuclear build opportunities at home, U.S. vendors are increasingly dependent on foreign markets to preserve or expand their capacity

- Access to overseas nuclear markets is crucial to the maintenance of the U.S. private sector's research and development programs

- Over the next ten years, the global market for nuclear goods and services has an estimated value of $500 to 740 billion

At first glance, U.S. companies should benefit substantially from this expansion

- The reputation of American firms in operational excellence, combined with the "gold standard" stamp of approval from the Nuclear Regulatory Commission (NRC), provide major competitive advantages

- Moreover, U.S. industry remains a leader in advanced and innovative nuclear technologies and designs, including small modular reactors and passive safety features

Vendors are Facing Greater Foreign Competition (1)

- **According to a 2010 report published by the U.S. Government Accountability Office (GAO), American vendors are losing global market share on a number of fronts, despite the increase in the value of related U.S. exports from 1994 through 2008**
  - The U.S. share of global exports of sensitive nuclear material (e.g. enriched uranium) decreased significantly from 29 to 10 percent
  - Despite an almost doubling in the value of exports of nuclear reactors, major components and equipment, and minor reactor parts, the market share enjoyed by U.S. firms declined from roughly 11 to 7 percent
  - GAO found that U.S. firms were not involved in the majority of new foreign reactor construction projects during the period, having only participated in only eight builds when over 60 reactors came on line

Vendors are Facing Greater Foreign Competition (2)

While the report's data is somewhat dated, anecdotal evidence suggests that the trend continues

- American firms clearly face intense competition from state-owned or state-aligned enterprises that enjoy significant government political and financial support, which often includes favorable financing, subsidies, turnkey services, and fuel take-back options

- Moreover, state-owned competitors are located in many of the largest markets for nuclear goods and services, creating an additional obstacle to U.S. exports

- U.S firms also face a burdensome export regulatory regime and nonproliferation policy that fail to take into full consideration the current political realities and dynamics in the global market

Struggling with Fuel Cycle Issues

The United States no longer enriches uranium with its own technology

- Nuclear fuel is not viewed as a strategic asset by most policymakers – only as another energy feedstock (coal, natural gas, etc.)
- U.S. enrichment program has come under intense criticism from the left and the right

No federal solution of the nuclear waste issue is likely in the foreseeable future

- Nine U.S. States require such a solution before any new nuclear can be built within their jurisdiction
- Then with the advance of EPA climate regulation, what will replace coal plants and eventually natural gas in those States?

The Future of U.S. Commercial Nuclear

Long-term outlook for a true nuclear renaissance in the United States remains positive, determined largely by the likelihood of increased regulation of greenhouse gases, traditional pollutants, and hydraulic fracturing

- This regulatory scenario, however, will play out slowly and may take decades before the economic case for new nuclear builds can be justified in many parts of the country

- Moreover, these rules will not fix the fundamental structural problems in power markets nor will they level the playing field vis-à-vis subsidized and mandated renewables, which will ramp up between now and 2025

- In the meantime, the United States is at risk of losing much of its domestic manufacturing capacity for a technology that is indispensable to promoting U.S. national and energy security interests

Searching for Solutions

Subsidies and mandates or market mechanisms for reducing greenhouse gases – such as carbon trading or a carbon tax – would not significantly help ease the challenges faced by the sector:

- Even with subsidies, *new* nuclear is unlikely to be built in the near term in deregulated markets because of cheap shale gas, low economic growth, and excess capacity. Moreover, *existing* reactors will continue to face the threat of externalities and market distortions, including government subsidization of other power generation.

- Redefining renewable energy mandates to include *new* or *existing* nuclear as a compliance option would face substantial opposition from the renewable industry, which depends on existing government policy to preserve its artificial market.

- Carbon trading and taxes lacks a critical mass of political support from conservatives without EPA preemption on existing environmental law and regulation. Most Democrats and their environmental allies would balk at such a transformation of policy when current conventional thinking holds that implementation of existing environmental law is more certain to achieve climate change goals.

Pursuing a Rational Approach to Civil Nuclear Policy

- The federal government and the states – given their dominant role in electricity legislation and regulation – should explore and implement regulatory and market reforms that do not distort the market and recognize the contribution of nuclear power to grid reliability and security
  - Maintaining the current fleet would help stabilize the domestic industry and improve the outlook for investment in the sector, including small modular reactors and U.S. enrichment technology
- Washington should also pursue a more rational approach to nuclear trade policy that reflects the current state of the global market, including the recognition that formidable competitors will continue to seek greater market share to the detriment of U.S. national interests
  - Improving U.S. vendor access to global nuclear markets would help maintain domestic manufacturing capacity during a time of few nuclear builds in the United States

Specific Recommendations

(forthcoming R Street Paper)

1. **States should reform or repeal Renewable Portfolio Standards (RPS)**

2. **Congress should not renew the federal wind production tax credit (PTC)**

3. **The Federal Energy Regulatory Commission (FERC) should ensure that capacity markets adequately compensate assets that provide critical services to the grid and address the impact of subsidies on energy markets**

4. **Congress needs to conduct effective oversight of the Nuclear Regulatory Commission (NRC) to ensure beneficial post-Fukushima regulation and a transparent process for determining fees charged to the private sector**

5. **The federal government should pursue a pragmatic approach to negotiating and approving nuclear cooperation or 123 Agreements**

6. **The federal government needs to reform its burdensome export regulations on nuclear trade while promoting an effective global nonproliferation regime**

Challenges for South Korea

- Many U.S. policymakers, including Members of Congress and their staff, do not fully understand the link between the civil nuclear sector and U.S. defense needs

- They also do not appreciate the current dynamic in the global marketplace and its impact on U.S. national interests (e.g. global standards and non-proliferation)

  - The awarding of the $20-billion United Arab Emirates (UAE) contract to the South Korean-led consortium in 2009 serves as probably the best example of the changing dynamic in the global nuclear marketplace

- Bottom line: Many policymakers are missing the big, strategic picture

Opportunities for South Korea

- Embrace your leadership role in the global expansion of commercial nuclear power
- Strongly advocate the highest standards in safety, operation, and non-proliferation
- Propose bilateral and multilateral initiatives with the United States and other major suppliers that advance these goals
  - This is key to U.S. policymakers treating Seoul as a true partner in the civil nuclear space

Frame the Issue in Terms of U.S. National Interests

- Help Washington make the link between commercial and national security issues; the United States needs to understand the big picture
- Broaden out your engagement of U.S. policymakers (e.g., energy and economics influencers); diversify away from the State Department
- Educate Washington on the energy security benefits to the R.O.K. of its fuel cycle objectives – current dependence on coal and natural gas imports; make the link to U.S. protection of shipping lanes, etc.
- Consider new or strengthen existing partnerships with the U.S. government and private sector on small modular reactors (SMR), advanced designs, and other technology issues
  - The United States, for example, has had recent setbacks with its SMR program
  - Currently planning a Capitol Hill forum on international cooperation in nuclear technology
- Engage the United States on its own fuel cycle problems (front and back end)
  - What could South Korea do to help the United States?

Questions?

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