Nuclear Energy: policies, politics, paths forward

ANS DC Local Section Meeting

Craig Piercy, ANS Washington Representative

August 29, 2018
1 Million Barrels of Oil
Uranium 235 Energy Equivalent
1.1 GW Wind Energy Footprint
Recognizing Nuclear Energy’s Carbon-Free Value

- Nuclear energy is the largest source of carbon-free electricity with 62.4%.
- Hydropower provides the second-largest amount at 19.3%.
- Wind, solar, and geothermal together provide 18.3% of America’s carbon-free electricity.

Nuclear energy is by far the largest source of carbon-free electricity.

Source: U.S. Environmental Protection Agency, U.S. Energy Information Administration
The safest energy choice

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Deaths per TWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal (world avg)</td>
<td>161</td>
</tr>
<tr>
<td>Coal (China)</td>
<td>278</td>
</tr>
<tr>
<td>Coal (USA)</td>
<td>15</td>
</tr>
<tr>
<td>Oil</td>
<td>36 (36% of world energy)</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>4 (21% of world energy)</td>
</tr>
<tr>
<td>Biofuel/Biomass</td>
<td>12</td>
</tr>
<tr>
<td>Hydro</td>
<td>1.4</td>
</tr>
<tr>
<td>Solar (rooftop)</td>
<td>0.44 (0.2% of world energy for all solar)</td>
</tr>
<tr>
<td>Wind</td>
<td>0.14 (1.6% of world energy)</td>
</tr>
<tr>
<td>Nuclear</td>
<td>0.04 (5.9% of world energy)</td>
</tr>
</tbody>
</table>

Sources: World Averages from The World Health Organization and European national averages from EU ExternE
What’s happening to U.S. Nuclear plants?
US Electricity Demand Growth

Source: EIA Annual Energy Outlook 2016
Figure 3. Nuclear power generation capacity and natural gas price profiles - Reference and High and Low Oil and Natural Gas Resource and Technology cases

- Nuclear Generation Capacity
- Natural Gas Prices (Henry Hub)
- Natural Gas Prices ($2017)/MMBtu

US Electricity Generation in 2017 and Nuclear Power At Risk

- **Nuclear**
  - Operating: 513 TWh
  - Kept Open: 67 TWh
  - At Risk: 135 TWh
  - Retiring: 90 TWh
  - Shut Down: 38 TWh

- **Renewables**
  - Hydro: 300 TWh
  - Wind: 254 TWh
  - Solar: 77 TWh
  - Biomass/Biogas: 64 TWh
  - Geothermal: 16 TWh

- **Oil**: 21 TWh

- **Gas**: 1287 TWh

- **Coal**: 1208 TWh

Source: Carbon Brief
Figure 2. Projected changes in nuclear power generation capacity (2017-2050) under Reference case assumptions

Figure 7. Nuclear power generation capacity (GW) under different carbon fee assumptions

Net US GHG Emissions Under Current Policy (Baseline Scenario)

Source: EPA, Rhodium’s US Climate Service
Now, let’s look at the rest of the world
The $64T Question

How do we lift 2B people out of energy poverty, peacefully and without cooking the planet?
Access to energy = quality of life

80% of the world’s population is below 0.8 on the UN’s Human Development Index (HDI)
World GDP Compared to Energy Consumption
1969 to 2013

\[ y = 6.8899x - 17.394 \]

\[ R^2 = 0.99313 \]

GDP in Trillion 2010 US$

Energy Consumption in Billion Metric Tons Oil Equivalent

GDP

Linear (GDP)
Global Gas Production by type

Source: BP Energy Outlook 2016
Energiewende: The German experiment

Goals:

- one-third renewables; 40% co2 reduction by 2020, nuclear phaseout by 2022

Realities:

- $800 billion invested
- Electricity prices 3X higher than US: “Second Rent”
- Negligible decrease in per capita co2 emissions
World Primary Energy Use

Today

2050

525 EJ

2900 EJ
US Per Capita Equivalent

925 EJ
Historical Trend
Per Capita Equivalent: Bulgaria

709 EJ
Flat Per Capita Energy Consumption;
Population Growth only

Source: World Bank, United Nations Department of Economic and Social Affairs (DESA)
400 EJ $\rightarrow$ 9% NUCLEAR $\rightarrow$ 36 EJ

36 EJ = 10,000 TWh = 1.42 TW

1,420 1GW NPPs

50% SMR

710 1GW NPPs + 5680 125 MW SMRs

Installed capacity, assuming 80% capacity factor
Global capacity
GW

Source: Exxon Outlook for Energy 2016
Nuclear Batteries / Micro Reactors
Fusion
Reactors planned and under construction today

Source: 2017 Nuclear News World List of Nuclear Power Plants
Percentage of Worldwide Reactors supplied by the US, by decade

Source: 2017 Nuclear News World List of Nuclear Power Plants
Snapshot of
U.S. Nuclear Policy
Section 202(c) of the Federal Power Act (FPA) (codified at 16 U.S.C. 824a(c)), through section 301(b) of the Department of Energy Organization Act (codified at 42 U.S.C. 7151(b)), authorizes the Secretary of Energy, upon finding “that an emergency exists by reason of a sudden increase in the demand for electric energy, or a shortage of electric energy or of facilities for the generation or transmission of electric energy, or of fuel or water for generating facilities, or other causes,” to issue an order “requir[ing]...such temporary connections of facilities for the generation, delivery, interchange, or transmission of electric energy as in [the Secretary’s] judgment will best meet the emergency and serve the public interest.” 16 U.S.C. 824a(c)(1)

DOE may act either upon application or upon its own motion, and orders under this authority may take effect without prior notice or hearing.
## Budget Growth Comparison

<table>
<thead>
<tr>
<th>Year</th>
<th>DOE-NE</th>
<th>DOE</th>
<th>All Discretionary Spending</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>$888M</td>
<td>$27.2B</td>
<td>$1T</td>
</tr>
<tr>
<td>2015</td>
<td>$883M</td>
<td>$27.9B</td>
<td>$1.1T</td>
</tr>
<tr>
<td>2016</td>
<td>$986M</td>
<td>$29.6B</td>
<td>$1.2T</td>
</tr>
<tr>
<td>2017</td>
<td>$1B</td>
<td>$30.8B</td>
<td>$1.1T</td>
</tr>
<tr>
<td>2018</td>
<td>$1.3B</td>
<td>$30.1B</td>
<td>$1.2T</td>
</tr>
<tr>
<td>5 yr Δ</td>
<td>+46%</td>
<td>+11%</td>
<td>+2%</td>
</tr>
</tbody>
</table>
H.R. 3053: Nuclear Waste Policy Amendments Act of 2018

- Passed House May 2018 340-72, referred to Senate

**Major provisions:**
- Reconstitutes OCRWM / five-year fixed-term for director
- Authorizes DOE to pursue consolidated storage options
- Tweaks to Nuclear Waste Fund
- Directs DOE to take ownership of commercial spent fuel once it is accepted for transport to interim facility

NO SENATE ACTION SO FAR. Lame duck session?
Nuclear Energy Innovation Capabilities Act

S. 97: (Unanimously) Passed Senate March 2018

Major provisions:
• Versatile Neutron Source: DOE report to Congress: assess mission need, assume operations by end of 2025.
• Authorize National Reactor Innovation Center to enable physical validation of advanced nuclear reactor concepts / systems
• DOE/NRC licensing cost share program
• Implements a NRC/DOE MOU for sharing technical information and expertise to accelerate advanced reactor licensing
H.R. 589: Department of Energy Research and Innovation Act

- Passed House Jan 2017 with NEICA, passed Senate July 2018 without NEICA

- **Major provisions:**
  - Permits DOE national labs to use tech transfer funds for early stage demonstration and commercial applications
  - DOE to identify strategic opportunities for collaborative R&D, demonstration, and commercial application for innovative science and technology
  - Instructs DOE to establish and operate Energy Innovation Hubs to facilitate multi-disciplinary innovative R&D
  - Directs DOE to restart the low-dose radiation research program
S. 512: Nuclear Energy Innovation and Modernization Act

• Introduced March 2017, reported by EPW

• **Major provisions:**
  • User fee reform / budget transparency
  • staged and risk-informed, performance-based licensing frameworks within 24 months / licensing project plans
  • DOE cost-sharing grants to applicants to help fund review fees
  • Mandates 10 year DOE excess uranium inventory management plan / transfer caps
  • Many reports to Congress
Other items of interest

• DOD study of micro reactors in NDAA
• NDAA delegation of authority on certain Part 810 export approvals
• 45j tax credits extended
• Nuclear Energy Leadership Act
  (Coming soon!)
And now… Politics
THE “DISRUPTORS” WHITE HOUSE

33% Through Trump’s First Term

876 Days Remaining

Trump in Office 584 Days
WAVE ELECTION?

*Democratic tide rising*
- Generic Ballot (D+6-10%)
- Trump Net Approval (-12-14%)
- Enthusiasm Gap (D+18)
- Recruiting (52% more candidates)
- Midterm History

Data from Real Clear Politics, Fox News, and the New York Times
HOUSE GOP MAJORITY IN SERIOUS JEOPARDY

Dems need 24 seats to control

Current competitive districts

GOP: 60
Dem: 5

Data from UVA Center for Politics, Real Clear Politics, CQ Roll Call, Inside Elections, 538 Blog, Cook Political Report
SENATE GOP MORE PROTECTED

- Dems Defending 26 States (10 Trump States)
- GOP Defending 9 States (1 Clinton State)

Data from UVA Center for Politics, Real Clear Politics, CQ Roll Call, Inside Elections, 538 Blog, Cook Political Report
ANS Policy Engagement
Our Mission:

Serve as the full-throated voice of the nuclear community in the Washington policymaking arena
Our Mission:

1. Provide unbiased technical and contextual information to policymakers – and policy insights and engagement opportunities to ANS members

2. Advocate for policies that support the nuclear community, both today and tomorrow
Washington Office

Our activities:

- Congressional outreach
- Executive branch engagement
- NGO relations
- ANS Engage / grassroots
- Policy Roundtables
- Storm the Hill events
- ANS Nuclear Policy Wire
- Capitol Critical
A Crowded Playing field
ANS Public Policy “Heat Map”

The “Hot Corner”

High

Importance
To ANS membership

Low

Operating fleet challenges
Spent fuel management
Advanced reactor R&D commercialization
Continued availability of radiological sources
Coalitions and Partners
U.S. Export control
Low dose radiation research
Nonproliferation engagement
K-12 Nuclear Education
Univ Programs NEUP/IUP
Full Scale Engagement
Advanced reactor standards
Intelligence Gathering

Broad/ Industry

Issue Specificity

ANS Specific

Decommissioning MOX
NRC reform
Isotope production
Watchful Waiting

U.S. Export control
Full Scale Engagement
Advanced reactor standards
Intelligence Gathering

Operating fleet challenges
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Broad/ Industry

Issue Specificity

ANS Specific
ANS Engage

• www.ans.org/engage
• sponsored by ANS Operations & Power Division
• Managed by ANS DC office
• Easy way to contact elected officials with pre-written messages on email, Twitter, and Facebook
• Campaigns: House nuclear waste bill, FERC NOPR, Democratic support for nuclear export legislation.
Advocating as a Federal Employee

- *It is your First Amendment right to petition your government*
- Advocate on your personal time with personal resources
- Use a disclaimer to indicate that the views you express are your own
- When engaging with elected officials, i.e., visiting an office, identify yourself as an ANS member instead of with your employer
- **Note:** Do not engage on campaign activities or in an election on behalf of ANS
What you should do

- Be an Active ANS National member
- Read Nuclear Policy Wire / Capitol Critical
- Respond quickly/loudly to ANS Engage Alerts
- Be a voice in your community.
ANSA Center for Nuclear Science and Technology Information’s Education Initiative in Collaboration with Discovery Education