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## NUCLEAR POWER 2021 ACT (S. 512)

G. Graham Thompson\* & Kyle Hosmer\*

In March 2011 an enormous tsunami hit Fukushima, Japan, causing “a natural catastrophe of biblical proportions.”<sup>1</sup> The Fukushima Dai-ichi Nuclear Plant was especially devastated, with cooling systems in multiple reactors being destroyed, resulting in surging radiation levels in Fukushima.<sup>2</sup> Recognizing that the size of nuclear reactors, such as those in the Fukushima Dai-ichi Nuclear Plant (very large, and 40 years old)<sup>3</sup>, contributes to the severity of plant accidents (in addition to having extremely high start-up costs)<sup>4</sup>, nuclear agencies in the United States have been working on alternative designs, one of which is the small modular reactor—a type of reactor that is safer, cheaper, and capable of being manufactured on an assembly line in a factory.<sup>5</sup>

Seven Senators acknowledged the barriers to the development of nuclear power that large reactors pose and the need for alternative methods by introducing the Nuclear Power 2021 Act (S. 512) into the U.S. Senate.<sup>6</sup> Though not the impetus for the development of small modular nuclear

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1. *See Nuclear Power: When the Steam Clears*, THE ECONOMIST (Mar. 24, 2011) <http://www.economist.com/node/18441163> (last visited Oct. 16, 2012) (describing the debate over nuclear power generally and discussing how the Fukushima Dai-ichi disaster impacts it) (on file with the Washington and Lee Journal of Energy, Climate, and the Environment).

2. *See Radiation Leak: The Threat Made Real*, THE ECONOMIST (Mar. 15, 2011) [http://www.economist.com/blogs/banyan/2011/03/radiation\\_leak](http://www.economist.com/blogs/banyan/2011/03/radiation_leak) (last visited Oct. 16, 2012) (describing the destruction at the Fukushima Dai-ichi power plant) (on file with the Washington and Lee Journal of Energy, Climate, and the Environment).

3. *See Japan's Nuclear Industry: The Risks Exposed*, THE ECONOMIST (Mar. 17, 2011) <http://www.economist.com/node/18398734> (last visited Oct. 16, 2012) (describing how the earthquake and tsunami affected the Fukushima Dai-ichi nuclear plant and how that in turn is affecting the town) (on file with the Washington and Lee Journal of Energy, Climate, and the Environment).

4. *See* S. REP. NO. 112-57, at 3 (2011) (describing the problems of large nuclear reactors). *See also* *Japan's Nuclear Industry: The Risks Exposed*, *supra* note 3 (describing how the large nuclear reactors are more difficult to cool, and therefore more dangerous in the event of an accident).

5. *See generally* S. REP. NO. 112-57 (noting the benefits of small modular reactors).

6. *See generally* Nuclear Power 2021 Act, S. 512, 112th Cong. (2011) (“The purpose of S. 512 is to require the Secretary of Energy to carry out programs to develop and demonstrate small modular nuclear reactor designs.”).

reactors or the Act, the Fukushima Dai-ichi tragedy underscores the need for alternatives to the traditional, large nuclear power plant.<sup>7</sup>

Though the text of the bill is comprised of only four pages, the Nuclear Power 2021 Act has significant implications for the future of energy production in the United States.<sup>8</sup> An amendment to Section 952 of the Energy Policy Act of 2005, the Nuclear Power 2021 Act requires the Secretary of Energy to carry out programs to develop designs for two small modular nuclear reactors.<sup>9</sup> The Nuclear Power 2021 Act is not designed to be a “silver bullet” solution to America’s energy woes; rather, it is viewed as one aspect of the “silver buckshot” approach to combating the rising costs of energy production.<sup>10</sup> Small modular reactors are less capital intensive, can be fabricated at one site and assembled at another, can be operated singularly or in conjunction with other reactors, would be more easily available in small markets or for industrial purposes, and are a source of clean energy.<sup>11</sup>

Noting that the earliest nuclear reactors had a capacity of 60 electrical megawatts and that the increase of reactor size over time also brought about an increase in cost, complexity, and construction time and a decrease in safety, the Committee on Energy and Natural Resources favorably recommended the Act be passed by the Senate as a means of mitigating energy production costs and dangers—to humans and the environment.<sup>12</sup> The Committee views large reactors as a barrier to the establishment of new nuclear power plants because they are capital intensive and susceptible to construction headaches and delays;<sup>13</sup> small modular reactors, it reasons, might be the vehicle for transporting nuclear power to new markets.<sup>14</sup>

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7. See S. REP. NO. 112-57, at 7–8 (describing the Fukushima Dai-ichi disaster and how small modular reactors are designed to be a safer alternative than large reactors).

8. See generally Nuclear Power 2021 Act, S. 512, 112th Cong. (advancing the use of small modular nuclear reactors).

9. See Nuclear Power 2021 Act, S. 512, 112th Cong. § 2(c)(2)(A) (outlining the duties imposed upon the Secretary by this program).

10. See Press Release, S. Comm. on Energy and Natural Resources (Mar. 8, 2011) (statement of Sen. Mark Udall) (describing how to combat today’s energy challenges) (on file with the Washington and Lee Journal of Energy, Climate, and the Environment).

11. See S. REP. NO. 112-57, at 3 (describing the benefits of small modular reactors).

12. See *id.*, at 2–3 (describing the history of nuclear reactors). See also Press Release, S. Comm. on Energy and Natural Resources (Mar. 8, 2011) (describing the reasoning behind submitting the bill to Congress) (on file with the Washington and Lee Journal of Energy, Climate, and the Environment).

13. See *id.* at 3 (explaining how large reactors are a barrier to nuclear power development).

14. *Id.*

*I. Summary of the Bill*

The Nuclear Power 2021 Act is relatively simple as it is written: it amends Section 952 of the Energy Policy Act of 2005 to require the Secretary of Energy—working with private sector partners—to develop a standard design for no less than two small modular reactors.<sup>15</sup> The purpose of the bill is to increase research and development of small modular reactors so that they may become cheaper, safer, and more accessible.<sup>16</sup>

The bill defines a small modular reactor as a nuclear reactor “with a rated capacity of less than 300 electrical megawatts” that “can be constructed in combination with similar reactors at a single site.”<sup>17</sup> One of the designs must be for a reactor with a rated capacity of 50 or fewer electrical megawatts.<sup>18</sup>

The bill requires the Secretary to work with the private sector, stating that he is to choose a partner from among the proposals through impartial, competitive procedures based upon scientific and technical merit.<sup>19</sup> The Secretary must consider the efficiency, cost, safety, and proliferation resistance of the reactor design in his evaluation of the proposals.<sup>20</sup>

Additionally, the Act charges the Secretary with obtaining certification for each design from the Nuclear Regulatory Commission (NRC) by January 1, 2018 and a combined license from the NRC by January 1, 2021.<sup>21</sup>

The projected cost of the Nuclear Power 2021 Act is \$414 million over the 2012–2016 period.<sup>22</sup> The Act requires the Secretary to enter into cooperative financing agreements with the partners that he selects, stipulating that not less than fifty percent of design funding must come from

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15. See Nuclear Power 2021 Act, S. 512, 112 Cong. § 2(c)(2)(A) (2011) (outlining the requirements and deadlines for the development of both designs).

16. See S. REP. NO. 112-57, at 3 (2011) (explaining the purpose of the bill).

17. Nuclear Power 2021 Act, S. 512, 112 Cong. § 2(c)(1)(D).

18. See *id.* § 2(c)(2)(A)(i) (requiring that one design not exceed a specific megawatt capacity well under the defined limit for a small modular reactor).

19. See *id.* § 2(c)(3) (outlining the procedure for the Secretary’s review of proposals).

20. See *id.* § 2(c)(4) (outlining the technical considerations to be weighed by the Secretary).

21. See *id.* § 2(c)(2)(A) (setting a timetable for the Secretary’s implementation of the program).

22. See S. REP. NO. 112-57, at 5–6 (2011) (describing the financial requirements of the bill).

non-federal sources and not less than seventy-five percent of licensing demonstration costs must come from non-federal sources.<sup>23</sup>

## II. Legislative History

Senator Jeff Bingham (NM) introduced the Nuclear Power 2021 Act on March 8, 2011.<sup>24</sup> There are seven cosponsors to the bill: Senators Mark Udall (CO), Lisa Murkowski (AR), Mary L. Landrieu (LA), Mark L. Pryor (AR), Mike Crapo (ID), James E. Risch (ID), and Roy Blunt (MO).<sup>25</sup> The bill was read twice before being recommended to the Committee on Energy and Natural Resources.<sup>26</sup> The committee held hearings on small nuclear reactors and alternative fuels on June 7, 2011, during which the Act was discussed.<sup>27</sup> Over a month later, on July 21, 2011, the Committee favorably recommended the Senate pass the bill.<sup>28</sup> On August 30, 2011 submitted its report on the bill, which was placed on the Senate Legislative Calendar on the same day.<sup>29</sup>

Representative Jason Altmire (PA-4), along with cosponsor Representative Tim Murphy (PA-18), introduced an identical bill to the House of Representatives on May 10, 2011.<sup>30</sup> That same day the bill was referred to the House Committee on Energy and Commerce and the House Committee on Science, Space, and Technology.<sup>31</sup> It was subsequently

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23. See Nuclear Power 2021 Act, S. 512, 112th Cong. § 2(c)(5) (2011) (outlining the “cost-share requirements”); S. REP. NO. 112-57, at 5 (requiring certain levels of private funding).

24. *Bill Summary & Status, 112th Congress (2011–2012) S. 512*, THOMAS (Library of Congress) <http://thomas.loc.gov/cgi-bin/bdquery/z?d112:SN00512:@@L&summ2=m&> (last accessed Oct. 16, 2012) [hereinafter *Bill Summary*] (outlining the bill’s procedural history) (on file with the Washington and Lee Journal of Energy, Climate, and the Environment).

25. *Id.*

26. *Id.*

27. See *Small Nuclear Reactors and Alternative Fuels: Hearing Before the Comm. on Energy and Natural Resources*, 112th Cong. 1 (2011) [hereinafter *Small Nuclear Reactors and Alternative Fuels*] (debating the merits of three pieces of proposed legislation including the Nuclear Power 2021 Act).

28. See S. REP. NO. 112-57, at 4 (describing the legislative history).

29. See *Bill Summary* (detailing the bill’s most recent major actions).

30. *Bill Summary & Status, 112th Congress (2011–2012) H.R. 1808*, THOMAS (Library of Congress) <http://thomas.loc.gov/cgi-bin/bdquery/z?d112:HR01808:@@L&summ2=m&> (last accessed Oct. 16, 2012) [hereinafter *House Bill Summary*] (outlining the procedural history of House Bill 1808) (on file with the Washington and Lee Journal of Energy, Climate, and the Environment).

31. *Id.*

referred to the Subcommittee on Energy and Power and the Subcommittee on Energy and Environment on May 13, 2011.<sup>32</sup>

### III. Small Modular Nuclear Reactors

Despite what the name implies, small modular reactors are not actually all that small—they are still about the size of a shopping mall.<sup>33</sup> Small modular reactors have built-in safety features such as gravity and thermodynamic cooling systems, making them safer in an emergency.<sup>34</sup> Small modular reactors are also small enough that they would be able to be built underground, which would protect them from certain natural disasters, though they might still be susceptible to earthquake.<sup>35</sup> There are even designs for gas-cooled small modular reactors, which, because of gas' extremely high boiling point, would theoretically never meltdown.<sup>36</sup>

Because of their size, small modular reactors do not need large, complex cooling systems.<sup>37</sup> And because their cores create less energy, they do not get as hot and consequently do not need large fans, pumps, or other cooling devices.<sup>38</sup> This improves both size and safety.<sup>39</sup>

Small modular reactors are designed so that they can be built in a factory but assembled on site.<sup>40</sup> This reduces the start-up costs, which can be prohibitively high.<sup>41</sup> Small modular reactors can be used singularly, or

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32. *Id.*

33. See Sarah Fecht, *Next Up in Nuclear: Small Nuclear Reactors*, POPULAR MECHANICS (Jan. 28, 2012, 10:00 AM) <http://www.popularmechanics.com/science/energy/nuclear/next-up-in-nuclear-small-modular-reactors> (last visited Oct. 16, 2012) [hereinafter *Next Up in Nuclear*] (describing the technology, benefits, and risks of small nuclear reactors) (on file with the Washington and Lee Journal of Energy, Climate, and the Environment).

34. See *id.* (explaining some of the safety features of newer reactors).

35. See *id.* (explaining the benefits of placing the reactors underground away from most weather systems).

36. See *id.* (comparing the safety capabilities of newer designs with those of older reactors).

37. See Tom Ramstack, *U.S. Energy Department Suggests Smaller Nuclear Reactors for Better Safety*, ALL HEADLINE NEWS (June 7, 2011, 1:08 PM) <http://gantdaily.com/2011/06/07/u-s-energy-department-suggests-smaller-nuclear-reactors-for-better-safety/> (last visited Oct. 16, 2012) [hereinafter *Energy Department Suggests Smaller Reactors*] (describing small modular reactors) (on file with the Washington and Lee Journal of Energy, Climate, and the Environment).

38. See *id.* (stating an additional benefit of smaller nuclear reactors)

39. See *id.* (showing that smaller reactors have benefits beyond their reduced price tags)

40. See *id.* (stating some of the cost benefits of smaller reactors).

41. See *id.* (continuing his fiscal analysis).

they can be used in conjunction with one another.<sup>42</sup> This allows for towns or companies employing small modular reactors to tailor their energy production to their energy and growth needs; it also means that if one reactor fails or is damaged the others are not affected, which is an implicit safety mechanism.<sup>43</sup> Small modular reactors are designed to burn fuel at higher temperatures, which improves efficiency while reducing waste.<sup>44</sup> Additionally, small modular reactors are designed to run for between fifteen and thirty years without needing to refuel.<sup>45</sup> This allows for greater versatility in power plant placement.<sup>46</sup>

Small modular reactors are lauded as a super-technology of the future by some, and while this may be over the top, they certainly have distinct advantages over large-output nuclear reactors: they are safer because of built-in, simple safety mechanisms such as gravity and thermodynamic cooling systems; they are safer because they can be built underground and because they are operated in clusters, so that if one is damaged the rest are left unaffected; they are able to run on gas, which means they would be impervious to meltdown; and they are cheaper because of their ability to be manufactured in one place and assembled in another.<sup>47</sup>

#### IV. Analysis

##### A. Flexibility

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42. *See id.* (displaying the flexibility advantages of using several smaller reactors instead of one or two larger reactors).

43. *See id.* (explaining that some areas have only small energy deficiencies that would be better served by small reactors).

44. *See id.* (outlining some of the newer reactors' improvements in efficiency).

45. *See* Louise Lerner, *Small Modular Reactor Could be a Superstar*, PHYSORG (Feb. 10, 2012) <http://www.physorg.com/news/2012-02-small-modular-reactor-superstar.html> (last visited Oct. 16, 2012) [hereinafter *Superstar*] (describing the benefits of small modular reactors) (on file with the Washington and Lee Journal of Energy, Climate, and the Environment).

46. *See id.* (explaining that many energy markets do not need the amount of energy produced by larger reactors).

47. *See generally* *Next Up in Nuclear*, *supra* note 33 (outlining the government's "next move in boosting energy technologies"); *Energy Department Suggests Smaller Reactors*, *supra* note 37 (reporting on the Energy Department's official recommendation to build smaller reactors); *Superstar*, *supra* note 45 (outlining the advances in technology that would make newer reactors more safe).

First, the pieces of small modular reactors can be produced in factories, as if on an assembly line.<sup>48</sup> Small modular reactors can be built in a controlled environment, ensuring that the final product will be constructed with the highest regard to safety.<sup>49</sup> The modular pieces can then be loaded onto trains, trucks, or barges to be taken to sites prepared ahead of time, and can be installed in a relatively short time.<sup>50</sup> Traditional nuclear reactors can take up to five years to construct on permanent sites.<sup>51</sup>

Second, small modular reactors can be set up in areas not suitable for large traditional nuclear power plants. Large reactors require millions of gallons of water each day for cooling.<sup>52</sup> Because of this, traditional nuclear power plants must be located near large water sources. Small modular reactors can be cooled using much less water, and many potential designs can even be air-cooled.<sup>53</sup> According to Congressman Altmire, this can open up new areas of the country to nuclear power that cannot support traditional nuclear power because of a dearth of sufficient water sources. Russia already uses small modular reactors in isolated areas of the Siberian Arctic.<sup>54</sup> The Bilibino, Russia, co-generation plant utilizes four units generating sixty-two megawatts each in an area where a large traditional nuclear reactor would be impractical.<sup>55</sup>

Third, small modular reactors can be installed in locations previously occupied by less environmentally-friendly generating options such as coal-fired power plants.<sup>56</sup> Because they already have the infrastructure in place (i.e., water, rail, transmission capability, and roads), these locations could be easily converted to nuclear power using small

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48. See 157 CONG. REC. H3164 (daily ed. May 11, 2011) (statement of Rep. Altmire) (explaining the boost in manufacturing time when reactors can be produced in factories and not onsite).

49. See *id.* (describing further benefits of factory construction).

50. See 157 CONG. REC. H3164, *supra* note 48 (describing how the modular pieces would be transported to the reactor site).

51. See *id.* (stating the amount of time it used to take to build a large reactor for comparison).

52. See *id.* (explaining that smaller reactors would not need to be located near large bodies of water).

53. See World Nuclear Association, *Small Nuclear Power Reactors* (updated Sept. 2012) <http://www.world-nuclear.org/info/inf33.html> (last visited Oct. 16, 2012) [hereinafter WNA Report] (exploring various designs and implementation of small modular reactor technology around the world) (on file with the Washington and Lee Journal of Energy, Climate, and the Environment).

54. See *id.* (describing the successful use of small modular reactors instead of traditional larger reactors in Bilibino, Russia).

55. See *id.* (explaining that a traditional reactor could not have been utilized in Bilibino, Russia).

56. See *Small Nuclear Reactors and Alternative Fuels*, *supra* note 27, at 32 (explaining that many areas in the Midwest would be able to replace older energy sources).



modular reactors, rather than building a new traditional nuclear reactor on the site.<sup>57</sup>

### B. Cost

According to floor remarks made by Congressman Jason Altmire, traditional reactors can cost between \$5 billion and \$10 billion dollars, producing 1,000 to 1,700 megawatts of electricity.<sup>58</sup> Small modular reactors, on the other hand, can produce up to 300 megawatts while costing about \$750 million each, achieved by mass-producing these smaller reactors on a larger scale than large traditional reactors.<sup>59</sup>

The data cited by Congressman Altmire is challenged by some; the Institute for Energy and Environmental Research (IEER) released its own report on small modular reactors in September 2010.<sup>60</sup> In the report, IEER claims that small modular reactors will actually be *more* expensive to operate than larger nuclear reactors, arguing that economies of scale favor *larger* reactors, not a greater number of small reactors.<sup>61</sup>

### C. Safety

Because small modular reactors produce less energy, they are easier to shut down in the event of a malfunction.<sup>62</sup> Joe Colvin, President of the American Nuclear Society, states that new small nuclear reactor designs have significant safety features.<sup>63</sup> Small nuclear reactor designs feature underground containment structures that can be filled with water, providing heat removal without the use of external power (a flaw in the design of the

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57. *See id.* at 32 (describing how attractive small modular reactors could be certain locations with existing infrastructure).

58. *See* 157 CONG. REC. H3164, *supra* note 48 (expressing the high cost and large energy output associated with traditional, large reactors).

59. *See id.* (explaining the vast differences in energy output and cost between large and small reactors).

60. *See* Arjun Makhijani and Michele Boyd, *Small Modular Reactors – No Solution for the Cost, Safety, and Waste Problems of Nuclear Power*, Report for the Institute for Energy and Environmental Research, at 3 (Sept. 29, 2010) available at <http://www.ieer.org/fctsheets/small-modular-reactors2010.pdf> [hereinafter Makhijani] (stating a differing point of view in relation to the potential economic benefits of smaller reactors) (on file with the Washington and Lee Journal of Energy, Climate, and the Environment).

61. *See id.* (arguing that the price per kilowatt would be cheaper in larger reactors).

62. *See* 157 CONG. REC. H3164, *supra* note 48 (reiterating the safety advantages inherent with smaller reactors).

63. *See Small Nuclear Reactors and Alternative Fuels*, at 30–33 (outlining the advantages that smaller reactors have in terms of safety).

Fukushima Aichi plant).<sup>64</sup> Small modular reactors can also take advantage of “integral” designs that involve placing the steam generators and pressurizers within the reactor pressure vessel itself, avoiding the threat of a rupture in the primary coolant loop.<sup>65</sup>

A drawback of small modular reactors is that with the increase in the number of nuclear reactors, we will increase the number of nuclear *sites*. This raises the issue of what to do with the waste. Congressman Altmire suggests that when the modular reactor is no longer needed, it can be sealed and returned to the factory for defueling.<sup>66</sup> The IEER report claims that current designs for small modular reactors create problems for removing and disposing of spent fuel.<sup>67</sup>

#### D. National Security

According to Colvin, over sixty nations have expressed an interest in developing new nuclear generation capabilities.<sup>68</sup> Many of these nations simply do not have electrical grids capable of handling the output of large nuclear reactors.<sup>69</sup> Colvin suggests that if the United States is unwilling to develop small-output nuclear reactors, there are several nations that can meet the global demand.<sup>70</sup> America has traditionally been a global leader in developing new reactor technology.<sup>71</sup> According to the World Nuclear Association, there are currently seventeen designs for small reactors in development.<sup>72</sup> The majority of those are headed by either Russian or American companies.<sup>73</sup>

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64. *See id.* at 31 (explaining that power outages will not affect these types of safety features).

65. *See id.* at 31 (describing how the new system’s design will reduce the possibility of coolant loop rupture).

66. *See* 157 CONG. REC. H3164, *supra* note 48 (explaining that returning the fuel to the original factory will minimize the spread of nuclear material).

67. *See* Makhijani, at 7 (stating that gathering nuclear waste from several underground sites would be logistically difficult).

68. *See Small Nuclear Reactors and Alternative Fuels*, at 31 (citing the worldwide enthusiasm for this new type of technology).

69. *See id.* at 31 (identifying the fact that smaller reactors are more compatible with less developed infrastructures).

70. *See id.* at 31 (stating that the United States needs begin utilizing this technology as soon as possible).

71. *See id.* at 31 (fearing that the United States could lose its status as the premier nation in terms of developing nuclear energy).

72. *See* WNA Report, *supra* note 53, at 2 (expressing that many other nations have already begun researching or utilizing this type of energy source).

73. *See id.* (noting that the two global leaders in terms of small nuclear reactors are Russia and the United States).

In December 2011, the Energy Policy Institute at Chicago published its report *Small Modular Reactors – Key to Future Nuclear Power Generation in the U.S.* in which EPIC concluded:

Clearly, a robust U.S. commercial SMR industry is highly advantageous to many sectors in the United States. It would be a huge stimulus for high-valued job growth, restore U.S. leadership in nuclear reactor technology, and, most importantly, strengthen U.S. leadership in a post-Fukushima world, on matters of nuclear safety, nuclear security, nonproliferation, and nuclear waste management.<sup>74</sup>

Small modular reactors, says the World Nuclear Association, offer an opportunity for the United States to “recapture a slice of the nuclear technology market that has eroded over the last several decades.”<sup>75</sup> Colvin sees the Nuclear Power 2021 Act as an opportunity to advance American small modular reactor research to bring us up to speed with the global competition.

#### E. The “Silver Buckshot”

In 2011 Senator Mark Udall of the Senate Energy and Natural Resources Committee said, “I’ve long said that there is no silver bullet to solve today’s energy challenges; we’re going to need silver buckshot . . . . [S]mall reactors have the potential to make nuclear power more cost-efficient and secure. This bill will help bring small modular reactors to the market.”<sup>76</sup> Senator Jeff Bingaman, the Chairman of the Committee, stated,

The climate change issue we face today is too large to exclude any one technology that can produce energy without emitting carbon dioxide. The [National Academy of Science’s study entitled *America’s Energy Future*] acknowledges the important role nuclear energy has and

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74. Robert Rosner & Stephen Goldberg, *Small Modular Reactors – Key to Future Nuclear Power Generation in the U.S.*, at 51 (Nov. 2011) [http://epic.uchicago.edu/sites/epic.uchicago.edu/files/uploads/SMRWhite\\_Paper\\_Dec.14.2011copy.pdf](http://epic.uchicago.edu/sites/epic.uchicago.edu/files/uploads/SMRWhite_Paper_Dec.14.2011copy.pdf) (expounding upon the likely benefits of utilizing this type of energy production).

75. See WNA Report, *supra* note 53, at 2 (advocating that the United States reassert itself as the dominant force in nuclear energy production).

76. See Press Release, Bingaman-Murkowski-Udall Bill Seeks to Show Utility of Small-Scale Nuclear Reactors, Senate Committee on Energy and Natural Resources (Mar. 8, 2011) <http://www.energy.senate.gov/public/index.cfm/2011/3/press-14a90399-7ff4-4d9f-8502-40191cb9e1e8> (publicizing the Senators’ bill and its recommendation that the government invest in smaller nuclear reactors) (on file with the Washington and Lee Journal of Energy, Climate, and the Environment).

must play in a carbon constrained energy world; [S. 512] I hope is another step to address some of the recommendations of this report.<sup>77</sup>

Small modular reactors represent another piece of the puzzle to address climate change and the developing energy.

#### *V. Drawbacks of the Bill*

Congressman Altmire himself stated that it could take upwards of twenty years to develop and deploy new nuclear reactor technology.<sup>78</sup> The timeline suggested by the Bill may be unrealistic. Mr. Colvin suggests that codes and standards related to small modular reactors must be developed in step with the technology itself.<sup>79</sup> He raises the issue of “off-shore” component manufacturing, which has quality and security implications.<sup>80</sup> Colvin also encourages the Congress to support education in nuclear engineering to ensure that there is a sufficient number of technically skilled workers to develop, deploy, and operate these new reactors.<sup>81</sup> With the suggested ease of manufacturing and deploying these reactors, this is a pressing need.

On December 10, 2009, in response to S. 2812, the predecessor to S. 512, the NRC issued a statement to the Senate Energy and Natural Resources Committee.<sup>82</sup> In the statement, Chairman Gregory Jazcko expressed worries that the NRC would not be prepared to develop the safeguards and standards for some small modular reactor designs.<sup>83</sup> Jazcko

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77. 155 CONG. REC. S11884-5 (daily ed. Nov. 20, 2009) (statement of Sen. Bingaman).

78. See 157 CONG. REC. H3164, *supra* note 48 (expressing his desire to begin work on this long term project).

79. See *Small Nuclear Reactors and Alternative Fuels*, at 33 (expressing that Congress ought to act immediately and begin the slow process of developing rules and regulations).

80. See *id.* at 33 (warning that unless Congress acts these jobs could be lost to overseas competitors).

81. See *Small Nuclear Reactors and Alternative Fuels*, at 33 (stating that education must be supported to ensure that qualified engineers exist in America to run these facilities).

82. See S. Rep. No. 111-314, at 9–10 (2010) (recording a letter from Gregory Jazcko, Chairman, United States Nuclear Regulatory Commission, to Senator Jeff Bingaman, Chairman, Senate Committee on Energy and Natural Resources, in which Jazcko warned that the NRC may not be able to develop safeguards and standards for small modular reactors at the same pace as the reactor designs themselves) (on file with the Washington and Lee Journal of Energy, Climate, and the Environment).

83. See *id.* at 9 (relaying the large amount of regulatory work that still needs to be done by the NRC).

suggested adding language to S.2812 to alleviate undue pressure on the NRC with regard to safety and security measures.<sup>84</sup>

#### VI. Conclusion

We encourage the Senate to pass S. 512 with amendment. We find the national security argument most compelling. America has been on the cutting edge of nuclear technology for the last seventy years.<sup>85</sup> The U.S. nuclear power industry should be encouraged to continue to develop new nuclear technologies to compete in the growing global nuclear energy community. Secondly, Udall's "silver buckshot" argument is important. The United States should invest in as many green/renewable energy sources as possible. Small market power grids that currently rely on coal-fired plants can make use of small modular reactors, even adding more as their energy needs increase.

However, we should not ignore NRC Chairman Jazcko's warnings about preparing NRC for the new designs.<sup>86</sup> The NRC should be allowed sufficient time to develop regulations and protocols related to new modular reactor designs. Also, Mr. Colvin's concerns regarding education and training should be heeded. If the United States moves quickly with small modular reactor technology, nuclear engineers should be ready to operate them on site. With this in mind, we recommend further hearings to allow NRC to advise the Senate on the technology. Then, S. 512 should be amended to allow NRC to have sufficient time to shape its regulatory approach with regard to small modular reactors, and phase in designs as they are investigated and approved.

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84. *See id.* at 10 (requesting that the NRC not be asked to compromise safety in order to comply with Congressional deadlines).

85. *See Small Nuclear Reactors and Alternative Fuels*, at 7 (summing up the benefits provided by further developing this type of technology).

86. *See* S. Rep. 111-314, *supra* note 82, at 10 (reaffirming the need to begin working on the necessary legwork as soon as possible).