### Prolif

#### US commercialization key to underground designs

Levy 2012 (Edward Levy, MSc in Globalisation and Development from London University’s School of Oriental and African Studies, February 1, 2012, “Small Modular Reactors: What’s on the Horizon for 2012?,” Nuclear Energy Insider, http://analysis.nuclearenergyinsider.com/small-modular-reactors/small-modular-reactors-what’s-horizon-2012)

To this end, the small reactor industry is crowded with international enterprises, state funded and private, striving to promote their models for design certification in their home countries and to advance toward the day when the first units can be constructed.¶ While Europe, Russia, China, Korea and other places are developing small reactors, most of these designs consist of single or double modules, mounted above ground, on barges, or in submarines. However, the drive toward multi-modular plants with underground containment is led by the Americans and Japanese.

#### US must sell the SMRs so we own the fuel inside

Wald 2011 (Matthew Wald, March 30, 2011, “Nuclear Industry Thrives in the U.S., but for Export,” New York Times, http://www.nytimes.com/2011/03/31/business/energy-environment/31NUKE.html?\_r=3&pagewanted=all)

Hand in hand with development of civilian power reactors is the possibility of development of nuclear weapons. When the United States exports fuel, it usually keeps control over what can happen to the fuel after it has been through the reactor, a crucial detail because when uranium-powered reactors make electricity, they also make plutonium, which can be used for bombs.¶ That strikes Michael J. Wallace, a 40-year veteran of the nuclear industry, most recently at Constellation Energy, as a reason for the United States to seek to be a technology exporter, to compete with Russia and, eventually, China. “If the United States is going to be relevant in the global market place and have an ability to continue to exercise leadership on matters of nonproliferation,” he said, “it would seem that we’ve got to have a viable program going forward.”

#### NRC is ready

Solan 2010 (David Solan, Director, Energy Policy Institute, Associate Director, Center for Advanced Energy Studies, Assistant Professor of Public Policy and Administration at Boise State University, June 2010, “ECONOMIC AND EMPLOYMENT IMPACTS OF SMALL MODULAR NUCLEAR REACTORS,” Energy Policy Institute, http://www.nuclearcompetitiveness.org/images/EPI\_SMR\_ReportJune2010.pdf)

While the NRC is actively engaged in developing technology-neutral guidelines for new plant licensing, it has developed its current regulations based on 40 years of design and operation of LWR facilities (U.S. Nuclear Regulatory Commission, 2010). In addition, the NRC has been challenged to significantly upgrade its workforce and capacity to license LWR designs in the last five years (U.S. Government Accountability Office, 2007). Because of these factors, the SMRs which utilize light water designs should have a distinct advantage over non-LWR reactors in the NRC design and certification process, and the Department of Energy has publicly endorsed this view with the aim to financially assist SMR LWR designs through the licensing process (Chu, 2010). This should lead to faster certification and give LWR designs an early adoption advantage in the SMR market. An example of this LWR advantage is the backing of Babcock & Wilcox by three large utilities, Tennessee Valley Authority, First Energy Corp. and Oglethorpe Power Corp. These utilities recently signed a multi-firm agreement to solidify a mutual commitment to acquire necessary approval for the commercial use of B&W’s new reactor design within the U.S (Smith, 2010). Likewise, NuScale Power has met with Energy Northwest, a joint operating agency for public utilities, about interest in adopting its design, and Energy Northwest has initiated studying SMRs and held informational meetings with its local partners (Dininny, 2009; Haviland, 2009).

### Solvency

#### No chokepoints- Labor shortages, etc.

Kessides and Kuznetsov 2012 (Ioannis N. Kessides, Development Research Group at The World Bank, and Vladimir Kuznetsov, consultant for The World Bank, July 2012, “Small Modular Reactors for Enhancing Energy Security in Developing Countries,” Sustainability, http://www.mdpi.com/2071-1050/4/8/1806/htm)

Reduced construction duration. The smaller size, lower power, and simpler design of SMRs allow for greater modularization, standardization, and factory fabrication of components and modules. Use of factory-fabricated modules simplifies the on-site construction activities and greatly reduces the amount of field work required to assemble the components into an operational plant. As a result, the construction duration of SMRs could be significantly shorter compared to large reactors leading to important economies in the cost of financing.

#### We keep supply chain here

Rosner and Goldberg 2011 (Robert Rosner, astrophysicist and founding director of the Energy Policy Institute at Chicago, and Stephen Goldberg, Special Assistant to the Director at the Argonne National Laboratory, Energy Policy Institute at Chicago, “Nuclear Reactors: Generation to Generation,” American Academy of Arts and Sciences, http://www.amacad.org/pdfs/nuclearreactors.pdf)

The future economics of nuclear energy will be determined, in part, by the tooling up and supply chain improvements currently underway in Russia and several non-Western states. Russian and Chinese suppliers will soon meet the needs of their domestic markets and are beginning to ramp up in the expec- tation of large-scale exports. Korean industry provides components interna- tionally and by 2013 will possess the capacity to forge even the largest nuclear plant components.30 The Republic of Korea’s new very heavy forging capac- ity will join that of Japan (JSW), China (China First Heavy Industries), and Russia (OMX Izhora). Japan and Korea are already building further capacity (JSW and Doosan, respectively), as is France (Le Creusot), and new capacity is planned in both the United Kingdom (Sheffield Forgemasters) and India (Larsen & Toubro).¶ GE Hitachi Nuclear Energy (GEH) recently announced it has signed a nuclear power plant development agreement with India’s top engineering and construction company, Larsen & Toubro Ltd. The agreement with L&T is¶ an important part of GEH’s strategy to establish an extensive network of lo- cal suppliers to help build a future GEH-designed Advanced Boiling Water Reactor (ABWR) power station in India. The power station is one of several being planned by India to increase the country’s nuclear generation capacity more than tenfold over the next two decades—from 4.1 GW today to 60 GW by 2030. The nuclear power initiative is a key part of India’s broader plan to expand its energy infrastructure to meet the country’s surging demands for electricity.

### Renewables DA

#### Renewables fail

Gue 2010 (Elliott H. Gue, energy markets analyst, October 11, 2010, “Nuclear Power: A Better Investment than Alternative Energy,” Investing Daily, http://www.investingdaily.com/13512/nuclear-power-a-better-investment-than-alternative-energy)

Renewable and alternative energies are the centerpiece of many governments’ energy policies. Germany has been a market leader in wind and solar. Generous feed-in tariffs effectively guarantee attractive returns for new alternative energy projects for 20 years. Despite relatively modest wind and solar resources, Germany is among the fastest-growing markets in the world for both technologies.¶ Although alternative energies hold some longer-term promise, blind and seemingly unwavering confidence in these solutions near-term benefits is misplaced.¶ By their very nature, wind and solar power are intermittent energy sources; when the wind isn’t blowing or the sun isn’t shining, natural gas-fired plants provide for much of the shadow capacity that keeps the electricity flowing. This pie graph breaks down Germany’s electricity mix from 1998 to 2008.¶ As you can see, thermal sources–primarily gas and coal–have lost share in Germany’s electricity grid over the past decade, though they still accounts for more than half of the nation’s net power generation. Natural gas consumption is up roughly 8 percent over this period, but coal use has flattened or declined.¶ Although Germany’s generous subsidies have increased its wind-power capacity significantly, this renewable energy accounts for just 6 percent of total generation. The country’s investments have produced a relatively small increase in electricity generated from wind power.¶ Wishful thinking aside, current wind- and solar-power technologies don’t offer a real alternative to fossil fuels.

#### Numbers yo

Harvey 2012 (Fiona Harvey, environment correspondent, quotes Jeff Sachs, Director of The Earth Institute at Columbia University, world-renowned professor of economics, leader in sustainable development, senior UN advisor, bestselling author, May 3, 2012, “Nuclear power is only solution to climate change, says Jeffrey Sachs,” Guardian, http://www.guardian.co.uk/environment/2012/may/03/nuclear-power-solution-climate-change)

Combating climate change will require an expansion of nuclear power, respected economist Jeffrey Sachs said on Thursday, in remarks that are likely to dismay some sections of the environmental movement.¶ Prof Sachs said atomic energy was needed because it provided a low-carbon source of power, while renewable energy was not making up enough of the world's energy mix and new technologies such as carbon capture and storage were not progressing fast enough.¶ "We won't meet the carbon targets if nuclear is taken off the table," he said.¶ He said coal was likely to continue to be cheaper than renewables and other low-carbon forms of energy, unless the effects of the climate were taken into account.¶ "Fossil fuel prices will remain low enough to wreck [low-carbon energy] unless you have incentives and [carbon] pricing," he told the annual meeting of the Asian Development Bank in Manila.¶ A group of four prominent UK environmentalists, including Jonathon Porritt and former heads of Friends of the Earth UK Tony Juniper and Charles Secrett, have been campaigning against nuclear power in recent weeks, arguing that it is unnecessary, dangerous and too expensive. Porritt told the Guardian: "It [nuclear power] cannot possibly deliver – primarily for economic reasons. Nuclear reactors are massively expensive. They take a long time to build. And even when they're up and running, they're nothing like as reliable as the industry would have us believe."¶ But Sachs, director of the Earth Institute and professor of sustainable development at Columbia University in the US, said the world had no choice because the threat of climate change had grown so grave. He said greenhouse gas emissions, which have continued to rise despite the financial crisis and deep recession in the developed world, were "nowhere near" falling to the level that would be needed to avert dangerous climate change.¶ He said: "Emissions per unit of energy need to fall by a factor of six. That means electrifying everything that can be electrified and then making electricity largely carbon-free. It requires renewable energy, nuclear and carbon capture and storage – these are all very big challenges. We need to understand the scale of the challenge."¶ Sachs warned that "nice projects" around the world involving renewable power or energy efficiency would not be enough to stave off the catastrophic effects of global warming – a wholesale change and overhaul of the world's energy systems and economy would be needed if the world is to hold carbon emissions to 450 parts per million of the atmosphere – a level that in itself may be inadequate.¶ "We are nowhere close to that – as wishful thinking and corporate lobbies are much more powerful than the arithmetic of climate scientists," he said.

#### SMRs key to solve warming

Rosner and Goldberg 2011 (Robert Rosner, astrophysicist and founding director of the Energy Policy Institute at Chicago, and Stephen Goldberg, Special Assistant to the Director at the Argonne National Laboratory, Energy Policy Institute at Chicago, “Small Modular Reactors – Key to Future Nuclear Power Generation in the U.S.”, Technical Paper, Revision 1, November 2011)

Nuclear power occupies a unique position in the debate over global climate change as the only carbon-free energy source that (1) is already contributing to world energy supplies on a large scale, (2) has potential to be expanded if the challenges of safety, nonproliferation, waste management, and economic competitiveness are addressed, and (3) is technologically fully mature. We concluded that any alternative nuclear development pathway (such as additional flexibility in technology approaches and deployment strategies) would need to be evolutionary, rather than a disruptive, radical shift. The urgency of scale-up is such that only technologies that have either already been tested in the marketplace or at least are close to commercial demonstration should be eligible for consideration. We further concluded that (1) small modular light-water reactor (SMR) designs offer such opportunities for scale-up and, therefore, could move us faster to clean energy supplies, but (2) because of the high capital intensity of nuclear energy projects, the cost of nuclear electricity is particularly sensitive to the availability of financing at competitive rates. In the report Nuclear Reactors: Generation to Generation,4 we described the evolution of nuclear reactor designs from Generation I technology to Generation IV designs, and concluded that the determining factor in establishing the future nuclear marketplace will likely be based on “who wants to invest and where.” We discussed the significant nuclear activity in China and, given the degree that manufacturing and design work has gone off-shore for the current generation of reactors, the United States has an opportunity to be the leader in the design and deployment of SMRs. And we opined that SMRs are the logical choice for smaller countries or countries with limited electrical grid capacity and the attendant safety, security, and nonproliferation benefits, stating that a detailed economic analysis would be done shortly that will address the relative competitiveness of SMRs.

#### SMRS solve warming

Kessides 2010 (Ioannis N. Kessides, Lead Economist in the World Bank's Development Research Group, June 2012, “The Future of the Nuclear Industry Reconsidered Risks, Uncertainties, and Continued Potential,” The World Bank Development Research Group Environment and Energy Team, http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2012/06/29/000158349\_20120629130837/Rendered/INDEX/WPS6112.txt)

In the longer term, however, increasing concerns about CO2 emissions may imply¶ stronger prospects for nuclear power than the near-term, post-Fukushima outlook. Coal-fired¶ generation will have to be reduced in order to limit emissions. Hydropower is cost effective in anumber of locations, but utilization of potential new sites is likely to be limited given that these sites are often less accessible and precious for environmental and social reasons. A major expansion of biofuels would require vast land areas for cultivation, in competition with increasing food production and the preservation of natural ecosystems. The cost characteristics of solar photovoltaics, while much improved, are still unfavorable, except in off-grid locations where the costs of alternatives are even higher. There is considerable interest in the promise of Concentrating Solar Power (CSP), but it is not yet commercially mature, with challenges related to cost, location, and constraints on delivery from source to demand. The most promising renewable technology for the near to medium term is seen by many to be wind power, which is already near commercial viability and is achieving high penetration rates in some countries. Where a wide area power grid can even-out local fluctuations in wind availability, problems of intermittency can be handled even for appreciable shares of wind power in total generation. However, while some countries have a substantial wind resource, in others wind resources are less satisfactory and would require substantial complementary investments in transmission and reserve capacity (Kessides, 2010). Storage also remains a technical and economic challenge, though pumped hydro storage is an option in some circumstances.¶ Wind and solar are intermittent technologies. A large increase in the quantity of intermittent renewable energy has important implications for the costs of balancing electricity supply and demand in real time. It will certainly require substantial investment in reserve generation capacity, thereby adding to the overall cost of supply. Moreover, the most efficient sites for renewable energy facilities, especially wind and large scale solar, are often located far from load centers, in remote areas and off-shore. To take advantage of these opportunities, very significant investments in new long-distance transmission facilities will be required.¶ Nuclear power can deliver low-carbon electricity in bulk, without intermittency, and it has a very small land take in contrast to renewable technologies. Although capital costs have risen substantially in recent years, some of this has been due to secular increases in costs of various materials that increase the costs of other capital-intensive generation options. Nuclear power retains the potential to be cost-competitive relative to current investment costs for other large-scale low-carbon alternatives. However, even if the safety concerns related to large nuclear plants with substantial radioactive inventories abate, the huge upfront investment requirements of these plants will constitute a major impediment to their deployment—especially¶ at a time when many governments face serious fiscal constraints and there is large demand for capital for other sorts of infrastructure investment. The experience at Olkiluoto clearly suggests that the new generation of large-scale reactors will be no easier or cheaper to build than the ones of a generation ago, when construction delays and cost overruns—along with the accidents at TMI and Chernobyl—brought to a halt the last nuclear construction boom (Kanter, 2009). Furthermore, such large-scale nuclear reactors would simply be unsuitable for many developing countries with small electric grids. ¶ For nuclear power to play a major role in meeting the future global energy needs and mitigating the threat of climate change, the hazards of another Fukushima and the construction delays and costs escalation of Olkiluoto have to be substantially reduced. The technical complexity, management challenges, and inherent risks of failure posed by the construction of new nuclear plants have been amplified considerably (perhaps non-linearly) as their size increased to the gigawatt scale and beyond. And so have the financing challenges. One potential solution might be to downsize nuclear plants from the gigawatt scale to smaller and less-complex units. New generations of nuclear reactors are now in various stages of planning and development promising enhanced safety, improved economics, and simpler designs. Small modular reactors (SMRs) are scalable nuclear power plant designs that promise to reduce investment risks through incremental capacity expansion, become more standardized and lead to cost reductions through accelerated learning effects, and address concerns about catastrophic events since they contain substantially smaller radioactive inventory.5 Thus, SMRs could provide an attractive and affordable nuclear power option for many developing countries with small electricity markets, insufficient grid capacity, and limited financial resources. They may also be particularly suitable for non-electrical applications such as desalination, process heat for industrial uses and district heating, and hydrogen production. Moreover, multi-module power plants with SMRs may allow for more flexible generation profiles.