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#### A strong SMR industry’s key to US leadership, market share, and cradle to grave

Mandel 9 (Jenny – Scientific American, Environment & Energy Publishing, LLC, “Less Is More for Designers of "Right-Sized" Nuclear Reactors” September 9, 2009, http://www.scientificamerican.com/article.cfm?id=small-nuclear-power-plant-station-mini-reactor)

Tom Sanders, president of the American Nuclear Society and manager of Sandia National Laboratories' Global Nuclear Futures Initiative, has been stumping for small rectors for more than a decade. American-made small reactors, Sanders insists, can play a central role in global nonproliferation efforts. "Our role at Sandia is the national security-driven notion that it's in the interests of the U.S. to be one of the dominant nuclear suppliers," Sanders said. While U.S. companies have been exiting the industry over the past decades as government and popular support for new construction has waned, Sanders maintains that strong U.S. participation in the nuclear energy marketplace would give diplomats a new tool to use with would-be nuclear powers. "It's hard to tell Iran what to do if you don't have anything Iran wants," he explained. Sanders said mini-reactors are ideal to sell to developing countries that want to boost their manufacturing might and that would otherwise look to other countries for nuclear technologies. If the United States is not participating in that market, he said, it becomes hard to steer buyers away from technologies that pose greater proliferation risks. Sanders been promoting this view since the 1990s, he said, when he realized "we were no longer selling nuclear goods and services, so we could no longer write the rules." The domestic nuclear industry had basically shut down, with no new construction in decades and a flight of talent and ideas overseas. There is a silver lining in that brain drain, though, he believes, in that U.S. companies getting back into the game now are less tied to the traditional, giant plants and are freer to innovate. A feature that several of the new product designs share is that the power plants could be mass-produced in a factory to minimize cost, using robots to ensure consistency. Also, with less design work for each installation, the time to complete an order would be shortened and some of the capital and other costs associated with long lead times avoided, Sanders said. Another feature he favors is building the plants with a lifetime supply of fuel sealed inside. Shipped loaded with fuel, such reactors could power a small city for 20 years without the host country ever handling it. Once depleted, the entire plant would be packed back up and shipped back to the United States, he said, with the sensitive spent fuel still sealed away inside. Sanders is working on a reactor design hatched by the lab with an undisclosed private partner. He believes it is feasible to build a prototype modular reactor -- including demonstration factory components and a mockup of the reactor itself -- as early as 2014, for less than a billion dollars. A mini-reactor could ring up at less than $200 million, he said, or at $300 million to $400 million with 20 years of fuel. At $3,000 to $4,000 per kilowatt, he said, that would amount to significant savings over estimates of $4,000 to $6,000 per kilowatt for construction alone with traditional plant designs. To get a design ready to build, Sanders is urging a partnership between the government and the private sector. "If it's totally a government research program, labs can take 20 to 30 years" to finish such projects, he said. "If it becomes a research science project, it could go on forever." New approach, old debates So far, there is no sign that the government's nuclear gatekeeper, NRC, is wowed by the small-reactor designs. NRC's Office of New Reactors warned Babcock & Wilcox in June that the agency "will need to limit interactions with the designers of small power reactors to occasional meetings or other nonresource-intensive activities" over the next two years because of a crowded schedule of work on other proposals. Meanwhile, opponents of nuclear technologies are not convinced that small reactors are an improvement over traditional designs. Arjun Makhijani, who heads the Institute for Energy and Environmental Research, a think tank that advocates against nuclear power, sees disseminating the technology as incompatible with controlling it. "A lot of the proliferation issue is not linked to having or not having plutonium or highly enriched uranium, but who has the expertise to have or make bombs," Makhijani said. "In order to spread nuclear technologies, you have to have the people who have the expertise in nuclear engineering, who know about nuclear materials and chain reactions and things like that -- the same expertise for nuclear bombs. That doesn't suffice for you to make a bomb, but then if you clandestinely acquire the materials, then you can make a bomb." Peter Wilk, acting program director for safe energy with Physicians for Social Responsibility, an anti-nuclear group, argues that expanding nuclear power use runs counter to the goal of nonproliferation. "The whole proposition presupposes an ... international economy in which more and more fuel is produced and more and more waste must be dealt with, which only makes those problems that are still unsolved larger," he said. "It may or may not do a better job of preventing the host country from literally getting their hands on it, but it doesn't reduce the amount of fuel in the world or the amount of waste in the world," Wilk added. And then there is the issue of public opinion. "Imagine that Americans would agree to take the waste that is generated in other countries and deal with it here," Makhijani said. "At the present moment, it should be confined to the level of the fantastic, or even the surreal. If [the technology's backers] could come up with a plan for the waste, then we could talk about export." Makhijani pointed to a widely touted French process for recycling nuclear waste as a red herring (ClimateWire, May 18). "It's a mythology that it ameliorates the waste problem," he said. According to Makhijani's calculations, the French recycling process generates far more radioactive waste than it cleans up. One category of highly radioactive material, which ends up stored in glass "logs" for burial, is reduced, he said. But in processing the waste, about six times the original volume of waste is produced, he said. Much of that must be buried deep underground, and the discharge of contaminated wastewater used in recycling has angered neighboring countries, he said. Operational risk, of course, is another major concern. "One has reduced the amount of unnecessary risk," Wilke said, "but it's still unnecessary risk." He added, "I get the theory that smaller, newer, ought to be safer. The question is: Why pursue this when there are so many better alternatives?" To Sandia's Sanders, Wilke is asking the wrong question. With the governments of major economies like China, Russia and Japan putting support and cash into nuclear technologies, the power plants are here to stay, he believes. "There's going to be a thousand reactors built over the next 50 years," he said. "The question is: Are we building them, or are we just importing them?"

#### US development solves and gets modeled

Ferguson 10—President of the Federation of American Scientists. Adjunct Professor in the Security Studies Program at Georgetown University and an Adjunct Lecturer in the National Security Studies Program at the Johns Hopkins University. (Charles, Testimony before the House Committee on Science and Technology for the hearing on Charting the Course for American Nuclear Technology: Evaluating the Department of Energy’s Nuclear Energy Research and Development Roadmap, http://gop.science.house.gov/Media/hearings/full10/may19/Ferguson.pdf)

Given the differences in design philosophy among these vendors and the fact that none of these designs have penetrated the commercial market, it is too soon to tell which, if any, will emerge as market champions. Nonetheless, because of the early stage in development, the United States has an opportunity to state clearly the criteria for successful use of SMRs. But because of the head start of China and India, the United States should not procrastinate and should take a leadership role in setting the standards for safe, secure, and proliferation-resistant SMRs that can compete in the market. ¶ Several years ago, the United States sponsored assessments to determine these criteria. 9 While the Platonic ideal for small modular reactors will likely not be realized, it is worth specifying what such an SMR would be. N. W. Brown and J. A. Hasberger of the Lawrence Livermore National Laboratory assessed that reactors in developing countries must: ¶ “achieve reliably safe operation with a minimum of maintenance and supporting infrastructure; ¶ offer economic competitiveness with alternative energy sources available to the candidate sites; ¶ demonstrate significant improvements in proliferation resistance relative to existing reactor systems.”10¶ Pointing to the available technologies at that time from Argentina, China, and Russia, they determined that “these countries tend to focus on the development of the reactor without integrated considerations of the overall fuel cycle, proliferation, or waste issues.” They emphasized that what is required for successful development of an SMR is “a comprehensive systems approach that considers all aspects of manufacturing, transportation, operation, and ultimate disposal.”

#### SMRs are awesome---feasible, cheaper, safer and solve other nuclear downsides

Ringle 10 John, Professor Emeritus of Nuclear Engineering at Oregon State University, "Reintroduction of reactors in US a major win", November 13, robertmayer.wordpress.com/2010/11/21/reintroduction-of-reactors-in-us-a-major-win/

Small nuclear reactors will probably be the mechanism that ushers in nuclear power’s renaissance in the U.S.¶ Nuclear plants currently supply about 20 percent of the nation’s electricity and more than 70 percent of our carbon-free energy. But large nuclear plants cost $8 billion to $10 billion and utilities are having second thoughts about how to finance these plants.¶ A small modular reactor (SMR) has several advantages over the conventional 1,000-megawatt plant:¶ 1. It ranges in size from 25 to 140 megawatts, hence only costs about a tenth as much as a large plant.¶ 2. It uses a cookie-cutter standardized design to reduce construction costs and can be built in a factory and shipped to the site by truck, railroad or barge.¶ 3. The major parts can be built in U.S. factories, unlike some parts for the larger reactors that must be fabricated overseas.¶ 4. Because of the factory-line production, the SMR could be built in three years with one-third of the workforce of a large plant.¶ 5. More than one SMR could be clustered together to form a larger power plant complex. This provides versatility in operation, particularly in connection with large wind farms. With the variability of wind, one or more SMRs could be run or shut down to provide a constant base load supply of electricity.¶ 6. A cluster of SMRs should be very reliable. One unit could be taken out of service for maintenance or repair without affecting the operation of the other units. And since they are all of a common design, replacement parts could satisfy all units. France has already proved the reliability of standardized plants.¶ At least half a dozen companies are developing SMRs, including NuScale in Oregon. NuScale is American-owned and its 45-megawatt design has some unique features. It is inherently safe. It could be located partially or totally below ground, and with its natural convection cooling system, it does not rely on an elaborate system of pumps and valves to provide safety. There is no scenario in which a loss-of-coolant accident could occur.

### Solvency – LGs

#### This card ends the debate---the aff cannot solve---neg on presumption

Lovins 10 AMORY B. LOVINS is Chair and Chief Scientist of Rocky Mountain Institute "Nuclear Socialism" Weekly Standard, VOL. 16, NO. 06 Oct 25 www.weeklystandard.com/articles/nuclear-socialism\_508830.html?page=1

With such juicy incentives, why won’t private investors finance reactors? In 2005-08, with the strongest subsidies, capital markets, and nuclear politics in history, why couldn’t 34 proposed reactors raise any private capital? Because there’s no business case. As a recent study by Citibank U.K. is titled “New Nuclear—the Economics Say No.” That’s why central planners bought all 61 reactors now under construction worldwide. None were free-market transactions. Subsidies can’t reverse bleak fundamentals. A defibrillated corpse will jump but won’t revive.

American taxpayers already reimburse nuclear power developers for legal and regulatory delays. A unique law caps liability for accidents at a present value only one-third that of BP’s $20 billion trust fund for oil-spill costs; any bigger damages fall on citizens. Yet the competitive risks facing new reactors are uninsured, high, and escalating.

Since 2000, as nuclear power’s cost projections have more than tripled, its share of global electricity generation has fallen from 17 percent to 13 percent. That of cogeneration (making electricity together with useful heat in factories or buildings) and renewables (excluding big hydropower projects) rose from 13 percent to 18 percent.

These bite-sized, modular, quickly built projects—with financial risks, costs, and subsidies generally below nuclear’s and declining​—now dominate global power investments. Last year, renewables (wind, water, solar, geothermal), excluding large hydroelectric dams, attracted $131 billion of private capital and added 52 billion watts. Global nuclear output fell for the past three years, capacity for two.

#### Loan guarantees causes complacency and inefficiency undermining the tech

Loris 11 Nick Loris is an analyst at The Heritage Foundation. "Stop Picking Energy Winners and Losers with the Tax Code" www.heritage.org/research/commentary/2011/05/stop-picking-energy-winners-and-losers-with-the-tax-code

First, special tax credits for cherry-picked technologies artificially reduce the price for consumers. This makes them seem far more competitive than they actually are. Rather than increase competition, the artificial market distortion gives these technologies an unfair price advantage over other technologies. The more concentrated the subsidy or preferential treatment, the worse the policy is because the crowding-out effect for other technologies is larger.

If subsidized technologies are market viable, then the tax break merely offsets private-sector costs for investments that would have been made either way. This creates industry complacency and perpetuates economic inefficiency by disconnecting market success from production costs.

Furthermore, when the government becomes involved in the decision-making process, it increases the business incentive to send lobbyists to Capitol Hill to make their pitch why their industry needs those tax credits. Industries will plead that they need five years of tax credits then they’ll be good to go on their own. Five years later, they’re asking for five more years. These specific carve outs reduce the incentive for producers to be cost competitive with technologies that do not rely on help from the government.

#### The plans causes dependence and undermines incentives for innovation

Loris 11 Nicolas Loris is an analyst in the Heritage Foundation’s Roe Institute of Economic Policy Studies. "Power Down the Subsidies to Energy Producers" Aug 3 www.heritage.org/research/commentary/2011/08/power-down-the-subsidies-to-energy-producers

But the damage subsidies inflict on our economy extends well beyond direct costs. A special endorsement from the government artificially props up that technology. This reduces the incentive for the producer to become cost-competitive, stifles innovation and encourages government dependence.¶ The federal government has no business picking commercial winners and losers. That’s the job of the marketplace. Indeed, it’s doubly damaging when government decides to manipulate the market through subsidies, because government - almost invariably - picks losers. That’s not surprising, because companies that seek handouts most strenuously are those that cannot compete without them.

#### The distort market forces by driving capital away from competitive projects while undermining innovation incentives

Spencer 9 Jack Spencer, Research Fellow in Nuclear Energy in the Thomas A. Roe Institute for Economic Policy Studies @ The Heritage Foundation, “The Problem with Increasing Energy Loan Guarantees,” 2/6 http://www.heritage.org/Research/EnergyandEnvironment/wm2277.cfm

And that is the problem with loan guarantees: They distort normal market forces and encourage government dependence.¶ One problem with the larger national economic debate is the notion that money--or, more accurately, savings or capital--does not grow on trees. It comes from real people who have saved and invested and exists in finite amounts. By subsidizing a portion of the actual cost of a project through a loan guarantee, the government is actually distorting the allocation of resources by directing capital away from a more competitive project.¶ This signals to industry (be it nuclear, wind, clean coal, natural gas, or anything else) that it does not have to be competitive. It reduces incentives to manage risk and be independent, innovative, and efficient. The end result will be a new nuclear industry that is built for the short run and not sustainable.¶ While a loan guarantee may be good for the near-term interests of the individual guarantee recipient, it is not good for consumers, taxpayers, or long-term competitiveness.

#### That turns solvency

Spencer 9 Jack Spencer, Research Fellow in Nuclear Energy in the Thomas A. Roe Institute for Economic Policy Studies @ The Heritage Foundation, “The Problem with Increasing Energy Loan Guarantees,” 2/6 http://www.heritage.org/Research/EnergyandEnvironment/wm2277.cfm

They stifle competition and innovation both between sectors and within sectors. The loan guarantee artificially reduces the cost of capital, which allows a recipient to offer its product at below actual cost. This removes the incentive to look for less expensive or more competitive options. If a product is not competitive in a free market, then it should be allowed to adjust or fail. Part of the success of nuclear energy will depend on competition within the industry. While a utility might not be able to afford a single large reactor without subsidies, it might be able to afford multiple smaller rectors or a reactor based on some other technology. This would create competition, and the subsidized technologies would have to either reduce costs or lose market share. This competitive environment, with other energy sources and within the nuclear sector, would force the entire industry to become more efficient, innovative, and cost effective. They perpetuate the regulatory status quo. Nuclear energy could transform how the nation produces energy. But one of the big problems with the success of nuclear power in the United States is not that it lacks subsidies but that the regulatory environment for nuclear power does not promote growth, innovation, or competition.

#### Loan guarantees prop up a failing industry and result in rampant taxation and economic distortion

Nayak & Taylor 3 Navin Nayak is an environmental advocate with U.S. Public Interest Research Group. Jerry Taylor is director of natural resource studies at the Cato Institute.,“No Corporate Welfare for Nuclear Power,” June 21, http://www.cato.org/pub\_display.php?pub\_id=3134

The most egregious proposal in the energy bill has the federal government providing loan guarantees covering 50 percent of the cost of building 8,400 Megawatts of new nuclear power, the equivalent of six or seven new power plants. The Congressional Research Service estimated that these loan guarantees alone would cost taxpayers $14 to $16 billion. The Congressional Budget Office believes "the risk of default on such a loan guarantee to be very high -- well above 50 percent. The key factor accounting for the risk is that we expect that the plant would be uneconomic to operate because of its high construction costs, relative to other electricity generation sources." But that's not all. The bill also authorizes the federal government to enter into power purchase agreements wherein the federal government would buy back power from the newly built plants -- potentially at above market rates.

#### Nuclear is overwhelmingly uncompetitive even with loan guarantees

Lovins 10 AMORY B. LOVINS is Chair and Chief Scientist of Rocky Mountain Institute "Nuclear Socialism" Weekly Standard, VOL. 16, NO. 06 Oct 25 www.weeklystandard.com/articles/nuclear-socialism\_508830.html?page=1

Yet nuclear subsidies to some of the world’s largest corporations have become shockingly large. A Maryland reactor’s developer reckoned just its requested federal loan guarantee would transfer $14.8 billion of net present value, comparable to its construction cost, from American taxpayers to the project’s 50/50 owners—Électricité de France (EDF), 84 percent owned by the French government, and a private utility 9.5 percent owned by EDF. The project’s builder, AREVA, is 93 percent owned by the French state, yet has been promised a $2 billion U.S. loan guarantee for a fuel plant competing with an American one. EDF just booked a billion-euro loss provision, mainly over the Maryland plant’s deteriorating prospects. AREVA’s construction fiascoes in Finland and France have “seriously shaken” confidence, says EDF’s ex-chairman, and four nations’ safety regulators have criticized the design. Meanwhile, the chairman of Exelon, the top U.S. nuclear operator, says cheap natural gas will postpone new nuclear plants for a decade or two. Slack electricity demand and unpriced carbon emissions further weaken the nuclear case. Markets would therefore charge a risk premium. But U.S. nuclear power evades market discipline​—or did until October 8, 2010, when the Maryland promoter shelved the project because, for its $7.5 billion federal loan guarantee, it would have to have paid an “unworkable” $0.88 billion fee, or 11.6 percent, to cover the default risk to taxpayers.

#### Loan guarantees fail

Brailsford 12 BEATRICE BRAILSFORD is program director of the Snake River Alliance, “Nuclear Loan Guarantees: Good Energy Policy?” Aug 2012 http://snakeriveralliance.org/?p=2687

No nuclear loan guarantees have been finalized. Federal loan guarantees have not led to any new nuclear build. On the other hand, no nuclear project has been stopped solely because the DOE refused to guarantee a loan. Though nuclear power's economic survival continues because of a whole host of subsidies, the policy goal of the 2005 Energy Policy Act - innovative technologies producing low-carbon electricity - has not been met. But the program hasn't stalled because of the difficulties reaching agreement on loan terms, though those have clearly been substantial. Low natural gas prices and lower electricity demand have challenged all new generating capacity.

Nuclear power faces additional obstacles, and the nuclear road might just be too steep. We've spent decades trying to surmount some of nuclear power's endemic flaws: it has long project gestation time and high capital costs, its technology can lead to nuclear weapons proliferation, and nuclear pollution is very difficult to remediate. So far, no country on earth has fully resolved how to dispose of nuclear power's most dangerous waste. At the start of what nuclear proponents hoped would be a renaissance, a price on carbon seemed to be a realistic expectation. The Fukushima disaster shook confidence in nuclear power, as it should have. In the short term, at least, a recent court decision about waste disposal put new and renewing licenses on hold.

But the answer is not for the federal government to take a hands-off approach. What's at stake is too important: energy is a fundamental public good. But the answer isn't to make it easier to get nuclear loan guarantees, either. Though we've focused more here on the nuclear loan guarantee program, it's undeniable that the technology itself is the largest single challenge to renewed deployment of nuclear power. The answer may therefore be to back winning horses instead, technologies that reduce carbon and enhance US energy production.

General Electric promised subsidy-free nuclear power half a century ago. In July, its CEO, Jeff Immelt, acknowledged, "It's just hard to justify nuclear, really hard. Gas is so cheap and at some point, really, economics rule. So I think some combination of gas, and either wind or solar...that's where we see most countries around the world going."

### Solvency – Thorium = The Suck

#### All the benefits of thorium are far off and hypothetical—there’s a reason the industry isn’t investing.

NNL 12—National Nuclear Laboratory (UK), Comparison of thorium and uranium fuel cycles, NNL (11) 11593 Issue 5, A report prepared for and on behalf of Department of Energy and Climate Change, http://www.decc.gov.uk/assets/decc/11/meeting-energy-demand/nuclear/6300-comparison-fuel-cycles.pdf

Thorium fuel cycle R&D has a long history dating back to the very beginning of the nuclear industry. Though there are potential advantages, with the exception of India, it has failed to become established in commercial reactors for the reasons that have been explained in this report. Even in India, utilisation of thorium fuels still remains at relatively small scale. In recent years the thorium fuel cycle has been promoted by many research groups and technical companies such as Lightbridge and Thor Energy.¶ While the thorium fuel cycle has some benefits compared with the uranium-plutonium fuel cycle, these have yet to be demonstrated or substantiated, particularly in a commercial or regulatory environment. The U-Pu fuel cycle has the advantage of being fully mature and of having used in three generations of reactor designs. In contrast, the thorium fuel cycle is disadvantaged because all the supporting infrastructure would have to be established from scratch.¶ This is very relevant to the UK, especially at the present time in view of plans to start a new build programme in the UK based on LWRs. It could be argued that the main priority for the UK is to ensure the momentum that the new build programme currently has built up is maintained, in order that the new build plants will be available in good time to meet the projected shortfalls of low carbon electrical capacity. This only permits existing reactor designs with the uranium-plutonium fuel cycle. Innovative thorium fuelled reactors will not be a viable alternative for at least 20 to 30 years and definitely cannot meet the new build timescales. A limited role for thorium fuels in new build LWRs might be possible at a later date, with perhaps a partial transition to thorium-U233 fuels later in their lifetimes and any major shift towards the thorium fuel cycle would only be realistic in a follow-on programme of reactor construction.¶ Thorium fuelled reactors have already been advocated as being inherently safer than LWRs [18], but the basis of these claims is not sufficiently substantiated and will not be for many years, if at all. Suggesting that the UK should consider thorium reactors as a safer alternative to LWRs is not a viable option at this time as the UK energy shortfall and demand is on much shorzter timescales than thorium fuelled reactors could respond to. Furthermore, since the energy market is driven by private investment and with none of the utility companies investing or currently developing either thorium fuels or thorium fuelled reactor concepts, it is clear that there is little appetite or belief in the safety or performance claims.

#### Thorium supporters are conspiratorial and distort the truth.

Shahan 12—Zachary Shahan, Director of CleanTechnica, 9/11/12, <http://cleantechnica.com/2012/09/11/why-thorium-nuclear-isnt-featured-on-cleantechnica/>

I had a reader email me recently asking why we don’t feature thorium nuclear technology on CleanTechnica. To many good-intentioned folks, thorium is an energy panacea that seems perfect. People I respect have asked me the same thing in the past year or so. But thorium is far from perfect. In fact, it’s pretty darn lame, as I think you will see below (if you read this with an open mind).¶ Now, before I get into the details of why thorium is anything but awesome, I want to say a few things about the culture that surrounds the “thorium will solve all our problems!” idea. Thorium enthusiasts are often willing to make claims like, “if it weren’t for the government, we would have switched to thorium nuclear energy decades ago.” Or, “thorium nuclear will solve all our problems, but it’s been suppressed by big government for decades.”¶ I have to admit that I’ve gotten into far too many discussions with conspiracy theorists in the past several years (mostly regarding the topic of global warming). Two things I’ve learned are that 1) they think nearly everything wrong in the world is due to governmental conspiracy; 2) you cannot expect to have a logical conversation with them — presenting facts does not matter at all.¶Believe me, I understand that most if not all governments have a lot of corrupt politicians and leaders in them, that rich, entrenched energy industries have far too much control, and do suppress new technologies that could threaten their livelihood. That said, everything is not a conspiracy, and there are legitimate reasons why wind and solar energy are blowing up in use and popularity but thorium is not. There’s a good reason (or many good reasons) why wind turbines and solar panels are in place all over the world, but there isn’t a single commercial thorium reactor in operation. It’s not because every government in the world is suppressing thorium. It’s most likely because thorium simply isn’t what its proponents say it is.¶Now, many or most of the commenters and bloggers who are into thorium come into the discussion in a very conspiratorial way, from my experience, which immediately throws up a yellow flag (note: not a red flag, but a yellow one). As I said, I’ve spent way too much time unsuccessfully trying to bring science and logic into discussions with conspiracy theorists.¶ Conspiracy theorists aren’t the only ones getting behind thorium, though. I know some very intelligent people not obsessed with conspiracy who think it could be awesome. But the thing is, nuclear technology and science is very technical. While hearing a handful of nice things about thorium in what sounds like technical or scientific language might get some people excited, it really shouldn’t. Unless you have a ton of time on your hands to very scientifically study the matter (not read blogs about the topic), you should probably defer to independent experts who have studied the matter, and have carefully studied the claims of the thorium fan club.¶ You might also consider that some governments (i.e. India) have been trying to get thorium off the ground for decades, with apparently no success, and many others have researched it (including world-leading countries such as Germany, Japan, the UK, Russia, and the US). Do you really think that every government that looks into the matter doesn’t want cheap, safe energy?

#### Thorium doesn’t solve—multiple reasons

Rees ’11 – the Ecologist's acting Green Living Editor (Eifion, “Don't believe the spin on thorium being a ‘greener’ nuclear option,” June 23, The Ecologist, <http://www.theecologist.org/News/news_analysis/952238/dont_believe_the_spin_on_thorium_being_a_greener_nuclear_option.html>

And yet the nuclear industry itself is also sceptical, with none of the big players backing what should be – in PR terms and in a post-Fukushima world – its radioactive holy grail: safe reactors producing more energy for less and cheaper fuel.  ¶ In fact, a 2010 National Nuclear Laboratory (NNL) report concluded the thorium fuel cycle ‘does not currently have a role to play in the UK context [and] is likely to have only a limited role internationally for some years ahead’ – in short, it concluded, the claims for thorium were ‘overstated’.¶ Proponents counter that the NNL paper fails to address the question of MSR technology, evidence of its bias towards an industry wedded to PWRs. Reliant on diverse uranium/plutonium revenue streams – fuel packages and fuel reprocessing, for example – the nuclear energy giants will never give thorium a fair hearing, they say.¶ But even were its commercial viability established, given 2010’s soaring greenhouse gas levels, thorium is one magic bullet that is years off target. Those who support renewables say they will have come so far in cost and efficiency terms by the time the technology is perfected and upscaled that thorium reactors will already be uneconomic. Indeed, if renewables had a fraction of nuclear’s current subsidies they could already be light years ahead.   ¶ Extra radioactive waste¶ All other issues aside, thorium is still nuclear energy, say environmentalists, its reactors disgorging the same toxic byproducts and fissile waste with the same millennial half-lives. Oliver Tickell, author of Kyoto2, says the fission materials produced from thorium are of a different spectrum to those from uranium-235, but ‘include many dangerous-to-health alpha and beta emitters’.¶ Tickell says thorium reactors would not reduce the volume of waste from uranium reactors. ‘It will create a whole new volume of radioactive waste, on top of the waste from uranium reactors. Looked at in these terms, it’s a way of multiplying the volume of radioactive waste humanity can create several times over.’¶ Putative waste benefits – such as the impressive claims made by former Nasa scientist Kirk Sorensen, one of thorium’s staunchest advocates – have the potential to be outweighed by a proliferating number of MSRs. There are already 442 traditional reactors already in operation globally, according to the International Atomic Energy Agency. The by-products of thousands of smaller, ostensibly less wasteful reactors would soon add up.¶ Anti-nuclear campaigner Peter Karamoskos goes further, dismissing a ‘dishonest fantasy’ perpetuated by the pro-nuclear lobby.¶ Thorium cannot in itself power a reactor; unlike natural uranium, it does not contain enough fissile material to initiate a nuclear chain reaction. As a result it must first be bombarded with neutrons to produce the highly radioactive isotope uranium-233 – ‘so these are really U-233 reactors,’ says Karamoskos.   ¶ This isotope is more hazardous than the U-235 used in conventional reactors, he adds, because it produces U-232 as a side effect (half life: 160,000 years), on top of familiar fission by-products such as technetium-99 (half life: up to 300,000 years) and iodine-129 (half life: 15.7 million years).  Add in actinides such as protactinium-231 (half life: 33,000 years) and it soon becomes apparent that thorium’s superficial cleanliness will still depend on digging some pretty deep holes to bury the highly radioactive waste. ¶ Thorium for the UK?¶ With billions of pounds already spent on nuclear research, reactor construction and decommissioning costs – dwarfing commitments to renewables – and proposed reform of the UK electricity markets apparently hiding subsidies to the nuclear industry, the thorium dream is considered by many to be a dangerous diversion.¶ Energy consultant and former Friends of the Earth anti-nuclear campaigner Neil Crumpton says the government would be better deferring all decisions about its new nuclear building plans and fuel reprocessing until the early 2020s: ‘By that time much more will be known about Generation IV technologies including LFTRs and their waste-consuming capability.’¶ In the meantime, says Jean McSorley, senior consultant for Greenpeace’s nuclear campaign, the pressing issue is to reduce energy demand and implement a major renewables programme in the UK and internationally – after all, even conventional nuclear reactors will not deliver what the world needs in terms of safe, affordable electricity, let alone a whole raft of new ones.¶ ‘Even if thorium technology does progress to the point where it might be commercially viable, it will face the same problems as conventional nuclear: it is not renewable or sustainable and cannot effectively connect to smart grids. The technology is not tried and tested, and none of the main players is interested. Thorium reactors are no more than a distraction.’

#### Takes FOREVER to come online

Tickell ’12 – British journalist, author and campaigner on health and environment issues, and author of the Kyoto2 climate initiative (Oliver, “Thorium: Not Green, Not Viable and Not Likely,” Nuclear Pledge, June, http://www.nuclearpledge.com/reports/thorium\_briefing\_2012.pdf)

3.8 Timescale¶ Claim: Thorium and the LFTR offer a solution to current and medium-term energy supply deficits.¶ Response: The thorium fuel cycle is immature. Estimates from the UK’s National Nuclear Laboratory and the Chinese Academy of Sciences (see 4.2 below) suggest that 10-15 years of research will be needed before thorium fuels are ready to be deployed in existing reactor designs. Production LFTRs will not be deployable on any significant scale for 40-70 years.

#### Not viable—

#### A—Fuel fabrication

Katusa 12—Marin Katusa, Contributor, Forbes, 2/16/12, http://www.forbes.com/sites/energysource/2012/02/16/the-thing-about-thorium-why-the-better-nuclear-fuel-may-not-get-a-chance/2/

Well, maybe quite a bit of support. One of the biggest challenges in developing a thorium reactor is finding a way to fabricate the fuel economically. Making thorium dioxide is expensive, in part because its melting point is the highest of all oxides, at 3,300° C. The options for generating the barrage of neutrons needed to kick-start the reaction regularly come down to uranium or plutonium, bringing at least part of the problem full circle.

#### B—Key parts of the technology are purely theoretical.

TEI 9—Thorium Energy Alliance, <http://energyfromthorium.com/lftradsrisks.html>

While LFTRs offer much promise, several economic and engineering issues need to be addressed before this technology can become a reality.¶ Thorium as a Fuel--Thorium has never actually been continually processed for fuel in a fully operational liquid fluoride reactor. The MSRE used U233 as a fuel, but the U233 was generated in another reactor. A follow-on reactor design was planned to do the full-system tests, which the MSRE was too cost-constrained to perform, but it was never funded. A prototype reactor based on the ORNL design work would need to be built and the continuous thorium cycle processing validated as the fuel source in an operational LFTR.¶ Turbine System--The gas turbo-machinery is similar engineering to the well-developed open-cycle turbine (e.g., jet aircraft engine). However, this kind of closed-cycle electric generation system has never been built. A new triple-reheat closed-cycle Brayton system would need to be built and tested along with the LFTR. However, this is a minimal engineering risk in obtaining the overall efficiency of the electricity generation system. If the close cycle turbine system proves not to be economically viable, a steam system can be used.

#### C—No commercial scale

Sims 12—David Sims, Industry Market Trends, 9/5/12, Can Thorium Provide a Safer Nuclear Future? http://news.thomasnet.com/IMT/2012/09/05/can-thorium-provide-a-safer-nuclear-future/

However, critics of the thorium alternative point out that it’s more expensive than uranium because it can’t sustain a reaction by itself and must be bombarded with neutrons. Uranium can be left alone in a reaction, while thorium must be constantly prodded to keep reacting. Although this allows for safer reactions (if the power goes out it simply deactivates), it’s a more expensive process.¶ Thorium is a popular academic alternative: in the lab it works well, but it hasn’t been successfully – or profitably – used on a commercial scale yet.

#### Tech isn’t ready

Howarth ’10 – Managing Director of the UK National Nuclear Laboratory (Paul, “The Thorium Fuel Cycle,” August, UK National Nuclear Laboratory, http://ripassetseu.s3.amazonaws.com/www.nnl.co.uk/\_files/documents/aug\_11/NNL\_\_1314092891\_Thorium\_Cycle\_Position\_Paper.pdf)

In the event of thorium fuel cycles being adopted commercially in existing LWRs, the technology can be considered to be well understood, but not fully demonstrated. The historic experience in the Shippingport PWR cannot now be considered adequate to cover modern operating regimes and discharge burnups. Demonstration of thorium/U-233 fuels in commercial LWRs will therefore demand small scale testing in research reactors, followed by large scale tests in commercial reactors. Based on NNL’s knowledge and experience of introducing new fuels into modern reactors, it is estimated that this is likely to take 10 to 15 years even with a concerted R&D effort and investment before the thorium fuel cycle could be established in current reactors and much longer for any future reactor systems. Therefore it is not envisaged that thorium fuel in LWRs will be established in the next decade, but could be feasible in the following ten years if the market conditions are conducive.

### Thorium🡪Prolif

#### Claims of proliferation resistance are false—thorium reactors produce U-233 which can be used for nukes – trust the IAEA not industry hacks.

NNL 12—National Nuclear Laboratory (UK), Comparison of thorium and uranium fuel cycles, NNL (11) 11593 Issue 5, A report prepared for and on behalf of Department of Energy and Climate Change, http://www.decc.gov.uk/assets/decc/11/meeting-energy-demand/nuclear/6300-comparison-fuel-cycles.pdf

The absence of plutonium is in the thorium fuel cycle is claimed to reduce the risk of nuclear weapons proliferation, though Reference [1] questions whether is this is completely valid, given that there were a number of U-233 nuclear tests (the “Teapot tests”) in the US in the 1950s. U-233 is in many respects very well suited for weapons use, because it has a low critical mass, a low spontaneous neutron source and low heat output. It has been stated [eg Wikipedia entry on U-233] that because U-233 has a higher spontaneous neutron source than Pu-239, then this makes it more of a technical challenge. However, this is erroneous, because even in weapons grade plutonium the main neutron source is from Pu-240. A further consideration is that the U-233 produced in thorium fuel is isotopically very pure, with only trace quantities of U-232 and U-234 produced. Although the U-232 presents problems with radiological protection during fuel fabrication, the fissile quality does not degrade with irradiation. Therefore, if it is accepted that U-233 is weapons useable, this remains the case at all burnups and there is no degradation in weapons attractiveness with burnup, unlike the U-Pu cycle.¶ The presence of trace amounts of U-232 is beneficial in that it provides a significant gamma dose field that would complicate weapons fabrication and this has been claimed to make U-233 proliferation resistant. However, there are mitigating strategies can be conceived and the U-232 dose rate cannot be regarded as a completely effective barrier to proliferation. As such, U-233 should be considered weapons usable in the same way as HEU and plutonium. This is also the position taken by the IAEA, which under the Convention on the Physical Protection of Nuclear Materials [16] categorises U-233 in the same way as plutonium. Under the IAEA classification, 2 kg or more of U-233 or plutonium are designated as Category I Nuclear Material and as such are subject to appropriate controls. By way of comparison, the mass of U-235 for Category I material is 5 kg. Attempts to lower the fissile content of uranium by adding U-238 are considered to offer only weak protection, as the U-233 could be separated relatively easily in a centrifuge cascade in the same way that U-235 is separated from U-238 in the standard uranium fuel cycle.¶ The overall conclusion is that while there may be some justification for the thorium fuel cycle posing a reduced proliferation risk, the justification is not very strong and, as noted in Section 3.5, this is not a major factor for utilities. Regardless of the details, those safeguards and security measures in place for the U-Pu cycle will have to remain in place for the thorium fuel cycle and there is no overall benefit.

#### Prefer our ev

Boyd 9—Michele Boyd, Director of the Safe Energy Program at Physicians for Social Responsibility, and Arjun Makhijani, electrical and nuclear engineer who is President of the Institute for Energy and Environmental Research, 2009, A Fact Sheet Produced by Physicians for Social Responsibility and the Institute for Energy and Environmental Research, http://ieer.org/resource/factsheets/thorium-fuel-panacea-nuclear-power/

Thorium is not actually a “fuel” because it is not fissile and therefore cannot be used to start or sustain a nuclear chain reaction. A fissile material, such as uranium-235 (U-235) or plutonium-239 (which is made in reactors from uranium-238), is required to kick-start the reaction. The enriched uranium fuel or plutonium fuel also maintains the chain reaction until enough of the thorium target material has been converted into fissile uranium-233 (U-233) to take over much or most of the job.¶ The use of enriched uranium or plutonium in thorium fuel has proliferation implications. Although U-235 is found in nature, it is only 0.7% of natural uranium, so the proportion of U-235 must be industrially increased to make “enriched uranium” for use in reactors. Highly enriched uranium and separated plutonium are nuclear weapons materials.¶ In addition, U-233 is as effective as plutonium-239 for making nuclear bombs. In most proposed thorium fuel cycles, reprocessing is required to separate out the U-233 for use in fresh fuel. This means that, like uranium fuel with reprocessing, bomb-making material is separated out, making it vulnerable to theft or diversion. Some proposed thorium fuel cycles even require 20% enriched uranium in order to get the chain reaction started in existing reactors using thorium fuel. It takes 90% enrichment to make weapons-usable uranium, but very little work is needed to move from 20% enrichment to 90% enrichment.¶ It has been claimed that thorium fuel cycles with reprocessing would be much less of a proliferation risk because the thorium can be mixed with uranium-238. In this case, fissile uranium-233 is also mixed with non-fissile uranium-238. The claim is that if the U-238 content is high enough, the mixture cannot be used to make bombs without a complex uranium enrichment plant. This is misleading. More uranium-238 does dilute the uranium-233, but it also results in the production of more plutonium-239 as the reactor operates. So the proliferation problem remains – either bomb-usable uranium-233 or bomb-usable plutonium is created and can be separated out. Even if the mixture of U-238 and U-233 contains so much U-238 that it cannot be used for making weapons, the U-233 proportion can be increased by enrichment – the same process used to enrich natural uranium in U-235. The enrichment of U-233 is easier than the enrichment of U-235 because U-233 is much lighter than U-235 relative to U-238 (five atomic weight units lighter compared to three).¶ There is just no way to avoid proliferation problems associated with thorium fuel cycles that involve reprocessing. Thorium fuel cycles without reprocessing would offer the same temptation to reprocess as today’s once-through uranium fuel cycles.

#### Thorium causes prolif and terrorism.

Beste 10—Steven Den Beste, former software engineer at Qualcomm, Hot Air, 8/31/10, Nuclear Weapons for the Masses! http://hotair.com/greenroom/archives/2010/08/31/nuclear-weapons-for-the-masses/

Glenn Reynolds tends to get hyped on certain kinds of high-tech. His latest “faster please” is thorium reactors.¶ ¶ And yeah, there’s a lot to like about them. But there’s a really huge gotcha which is enough to kill the idea stone dead.¶ ¶ Thorium reactors use natural thorium, which is isotope 232. There are a lot of neutrons running around in there; it’s how reactors work. If an atom of thorium 232 absorbs a neutron, it becomes isotope 233. Some will fission, but some won’t.¶ ¶ Thorium 233 beta decays (HL 22 minutes) to proactinium 233, which beta decays (HL 27 days) to uranium 233.¶ ¶ Uranium 233 is fissionable, and you can make bombs out of it. And the best part of all is that it can be purified chemically out of the spent fuel of the thorium reactor. You don’t have to mess around with gas diffusion or centrifuges.¶ ¶ If, as some propose, there’s a thorium reactor buried in every backyard, you could face the possibility of pretty much any dedicated extremist being able to build nuclear weapons.¶ ¶ Is that a “faster please”?

### 1NC DA

#### US won’t cave to South Korea on reprocessing now

Yonhap, 3-8-2012, “U.S. unlikely to allow S. Korea to reprocess nuclear fuel,” http://english.yonhapnews.co.kr/national/2012/03/08/23/0301000000AEN20120308007100315F.HTML

The United States is unlikely to allow South Korea to adopt its indigenous technology aimed at reprocessing highly radioactive spent nuclear fuel in their negotiations to revise a bilateral nuclear accord, a senior Seoul diplomat involved in the talks said Thursday. The refusal by U.S. negotiators stemmed from a "deep-rooted distrust" of South Korea, which had once authorized a clandestine nuclear weapons program in the early 1970s under former president Park Jung-hee but shut it down under pressure from Washington, the diplomat said on the condition of anonymity. Rather than pressing the U.S. to allow South Korea to adopt the proliferation-resistant reprocessing technology, called "pyroprocessing," Seoul is focusing on revising the nuclear accord to make it easier to export nuclear power plants, the diplomat said.

#### Failure to maintain a hardline on domestic reprocessing shatters the norm against ENR and makes credible US diplomatic pressure impossible – ensures South Korean ENR

Scott Sagan, poly sci prof @ Stanford, co-chair Global Nuclear Future Initiative, 4-18-2011, “The International Security Implications of U.S. Domestic Nuclear Power Decisions,” http://cybercemetery.unt.edu/archive/brc/20120621005012/http://brc.gov/sites/default/files/documents/sagan\_brc\_paper\_final.pdf

A similar phenomenon occurs when policy makers and scholars underestimate the international effect of the U.S. decision to abandon plutonium reprocessing in the 1970s. Skeptics claim that the fact that France and Japan, especially, went forward with their ambitious plutonium reprocessing efforts somehow demonstrates that U.S. efforts to constrain the global growth were a failure. But a more appropriate standard (but again more difficult to measure) for assessing our influence would estimate the number of states that would have developed plutonium reprocessing capabilities if the U.S. had not actively discouraged such fuel cycle activities after Jimmy Carter’s April 1997 order to cancel construction of commercial breeder reactors that employed a closed fuel cycle with plutonium reprocessing. The primary motivation behind the decision to postpone the development of this technology was a concern for the proliferation implications of the U.S. use of a closed fuel cycle. 17 The Carter administration reasoned that the decision to end reprocessing in the U.S. would have two effects: first, the U.S. could no longer act as an exporter of related technologies, limiting their availability; and second, it would create a normative change that would redefine the behavior of a responsible nuclear power state. Because we are estimating a counterfactual condition, it is not possible to measure definitively the effects of the Carter policy on the actual spread of reprocessing facilities around the world. Of the twenty-one countries that at some point in their history pursued plutonium reprocessing, ten have finished large-scale facilities and use them today: U.S., China, Israel, France, UK, India, Japan, Pakistan, Russia, and North Korea. 18 Algeria and the Czech Republic have a pilot-scale reprocessing plants, but have not moved towards further industrial development. 19 Nine countries abandoned their reprocessing programs: South Korea, Taiwan, Germany, Iraq, Italy, Argentina, Brazil, Belgium, and Yugoslavia. 20 The causes of these reversal decisions were complex, but in many of the cases U.S. diplomatic pressure was an important factor and that pressure was made more credible and acceptable because the U.S had given up its own civilian plutonium reprocessing programs. This “credibility” factor continues to be important today. South Korea is lobbying to renegotiate its agreements with the U.S. to be able to develop “pyro-processing,” a form of spent fuel reprocessing that supporters claim poses fewer proliferation risks than standard PUREX acqueous reprocessing. While this appears a challenge to the claim that the U.S. policy has had a positive influence, the very fact that the South Koreans are actively arguing that pyro-processing – unlike the PUREX process – does not separate out plutonium shows their awareness of the power of the norm against developing such technologies. While the U.S. government initially cooperated with South Korea on pyroprocessing research, Richard Stratford (Director of the Office of Nuclear Energy Affairs in the Bureau of Nonproliferation, U. S. Department of State) recently stated that the technology “moved to the point that the product is dangerous from a proliferation point of view,” and that the DOE now “states frankly and positively that pyro-processing is reprocessing.” The U.S. government position against pyro-processing in South Korea today is made more credible by the fact that the U.S. does not reprocess spend fuel for commercial purposes. 21

#### South Korean ENR causes South Korean prolif and undermines US nonprolif efforts with Iran, North Korea, and Southeast Asia

Zachary Keck 12, Assistant Editor of The Diplomat, “Rough Waters? The State of the ROK-U.S. Alliance,” The Diplomat, 8-22-12, http://thediplomat.com/flashpoints-blog/2012/08/22/rough-waters-the-state-of-the-rok-u-s-alliance/

Washington’s concerns over South Korean’s nuclear ambitions have only been heightened by Seoul’s latest campaign to acquire indigenous enrichment and reprocessing facilities, which it is proscribed from doing under a nuclear pact it signed with Washington in 1974. In contrast, the U.S. has signed agreements recognizing Japan’s reprocessing and enrichment rights as well as India’s de facto reprocessing capability. Now, with the U.S. and South Korea renegotiating the 1974 nuclear pact that will expire in 2014, South Korea has demanded that Washington acquiesce to Seoul building enrichment and processing facilities. South Korea’s immediate interest in acquiring these capabilities is not nuclear weapons but rather further expanding its nuclear energy industry at home and abroad. Nonetheless, the U.S. has rejected South Korea’s request thus far, with President Obama’s top proliferation adviser, Garry Samore, telling South Korean reporters last month, “There is no danger that Korean industry will not be able to get access to low enriched uranium," Washington has a number of reasons to oppose South Korea’s request, many of which have nothing to do with Seoul. For instance, a key component of President Obama’s nuclear security agenda is the goal of securing all nuclear materials worldwide within four years. Allowing South Korea to begin producing its own fissile materials would run counter to this goal and undercut the administration’s important successes in reducing the number of countries that possess and produce these materials. Allowing South Korea to build these facilities would also undermine the current U.S.-led campaign to persuade Iran to abandon its own enrichment facilities. It would also adversely affect a number of U.S. objectives in the Asia-Pacific, including persuading Pyongyang to surrender its own nuclear program, according Japan a heightened status among U.S. allies, and keeping Southeast Asia’s budding nuclear energy programs on their current peaceful trajectories. Under the surface, however, Washington’s opposition is likely due in part to its uncertainty over South Korea’s long-term nuclear intentions. As noted above, South Korea already has a history of covertly seeking nuclear arms. That this took place before Seoul became a democracy is cold comfort to the U.S given that South Koreans have at times been overwhelming in favor of their country acquiring nuclear weapons. In other words, at a time when the region is undergoing sweeping changes, the U.S. is increasingly less confident that South Korea will continue to rely on Washington for its security indefinitely. Indeed, there are already a number of signs that Seoul is seeking greater autonomy. These come at a time when the U.S. will need South Korea more than ever in order to properly rebalance its forces in the region.

#### New Asian prolif ensures widespread nuclear conflict --- asymmetries

Lyon 9 (December, Program Director, Strategy and International, with Australian Strategic Policy Institute, previously a Senior Lecturer in International Relations at the University of Queensland, “A delicate issue, Asia’s nuclear future”)

Deterrence relationships in Asia won’t look like East–West deterrence. They won’t be relationships of mutual assured destruction (MAD), and there will be many asymmetries among them. Regional nuclear-weapon states will articulate a spectrum of strategies ranging from existential deterrence to minimum deterrence to assured retaliation; and sometimes doctrinal statements will outrun capabilities. The smaller arsenals of Asia and the absence of severe confrontations will help to keep doctrines at the level of generalised deterrence. Extended nuclear deterrence will continue to be important to US allies in East Asia, although it is hard to imagine other Asian nuclear weapon states ‘extending’ deterrence to their clients or allies. Alagappa’s propositions contain a ‘picture’ of what a more proliferated Asia might look like. It could well remain a region where deterrence dominates, and where arsenals are typically constrained: an Asia, in fact, that falls some way short of a ‘nuclear chaos’ model of unrestrained proliferation and mushrooming nuclear dangers. An order in flux? Notwithstanding Alagappa’s more reassuring view, we shouldn’t understate the extent of the looming change from a nuclear relationship based on bipolar symmetry to a set of relationships based on multiplayer asymmetries. As one observer has noted, when you add to that change the relatively constrained size of nuclear arsenals in Asia, the likelihood of further nuclear reductions by the US and Russia, and ballistic missile defences of uncertain effectiveness, the world is about to enter uncharted territory (Ford 2009:125). Some factors certainly act as stabilising influences on the current nuclear order, not least that nuclear weapons (here as elsewhere) typically induce caution, that the regional great powers tend to get along reasonably well with each other and that the region enters its era of nuclear pre-eminence inheriting a strong set of robust norms and regimes from the earlier nuclear era. But other factors imply a period of looming change: geopolitical dynamism is rearranging strategic relationships; the number of risk-tolerant adversaries seems to be increasing; most nuclear weapons states are modernising their arsenals; the American arsenal is ageing; and the US’s position of primacy is increasingly contested in Asia. Indeed, it may be that dynamism which could most seriously undermine the Solingen model of East Asian nonproliferation. Solingen, after all, has not attempted to produce a general theory about proliferation; she has attempted to explain only proliferation in the post-NPT age (see Solingen 2007:3), when the P-5 of the UN Security Council already had nuclear weapons. In essence, though, it’s exactly that broader geopolitical order that might be shifting. It isn’t yet clear how the Asian nuclear order will evolve. It’s one of those uncertainties that define Australia’s shifting strategic environment. It’s not too hard to imagine an order that’s more competitive than the one we see now. The ‘managed system of deterrence’ The second approach to thinking about the Asian nuclear order is to attempt to superimpose upon it William Walker’s two key mechanisms of the first nuclear age: the ‘managed system of deterrence’ and the ‘managed system of abstinence’. What might those ‘systems’ look like in Asia? In Walker’s model, the managed system of deterrence included: the deployment of military hardware under increasingly sophisticated command and control; the development of strategic doctrines to ensure mutual vulnerability and restraint; and the establishment of arms control processes through which policy elites engaged in dialogue and negotiated binding agreements. (Walker 2007:436) It isn’t obvious that those core aspects of the ‘managed’ system are all central features of Asian nuclear relationships. Perhaps most importantly, it isn’t obvious that the world even has a good model for how deterrence works in asymmetric relationships. Within the US, there’s been something of a revival of interest in matters nuclear as strategic analysts attempt to reconceptualise how nuclear relationships might work in the future. Recent work on the problems of exercising deterrence across asymmetrical strategic contests, for example, suggests a number of problems: ‘In asymmetric conflict situations, deterrence may not only be unable to prevent violence but may also help foment it’ (Adler 2009:103). Some of the problems arise precisely because weaker players seem increasingly likely to ‘test’ stronger players’ threats—as part of a pattern of conflict that has emerged over recent centuries, in which weaker players have often prevailed against stronger opponents.3 If we were to look at the case study of the India–Pakistan nuclear relationship—which is grounded in an enduring strategic rivalry, and therefore not ‘typical’ of the broader nuclear relationships in Asia—it’s a moot point whether Pakistani behaviour has been much altered by the ‘deterrence’ policies of India. Indeed, the case seems to show that Pakistan doesn’t even accept a long-term condition of strategic asymmetry with India, and that it intends to use its nuclear weapons as an ‘equaliser’ against India’s larger conventional forces by building a nuclear arsenal larger than the Indian arsenal arrayed against it. That would imply, more broadly, that increasing strategic rivalries across Asia could be accompanied by efforts to minimise asymmetrical disadvantages between a much wider range of players. In short, in a more competitive Asian strategic environment, nuclear asymmetries that are tolerable now might well become less tolerable. Furthermore, we need to think about how we might ‘codify’ deterrence in Asia. In the Cold War days, the MAD doctrine tended to be reflected in arms control accords that limited wasteful spending and corralled the competition. As Walker acknowledges, the agreements were important ‘stabilisers’ of the broader nuclear relationship, but to what extent can they be replicated in conditions of asymmetry? It might be possible to codify crisis management procedures, but designing (and verifying) limitations on weapons numbers would seem to be much more difficult when the arsenals are of uneven size, and when the weaker party (perhaps both parties) would probably be relying on secrecy about the numbers and locations of weapons to minimise the vulnerability of their arsenals.

#### Extinction

Hayes 10 Peter Hayes, \*Executive Director of the Nautilus Institute for Security and Sustainable Development, AND, Michael Hamel-Green, \*\* Executive Dean of the Faculty of Arts, Education and Human Development act Victoria University (1/5/10, Executive Dean at Victoria, “The Path Not Taken, the Way Still Open: Denuclearizing the Korean Peninsula and Northeast Asia,” http://www.nautilus.org/fora/security/10001HayesHamalGreen.pdf

But the catastrophe within the region would not be the only outcome. New research indicates that even a limited nuclear war in the region would rearrange our global climate far more quickly than global warming. Westberg draws attention to new studies modelling the effects of even a limited nuclear exchange involving approximately 100 Hiroshima-sized 15 kt bombs2 (by comparison it should be noted that the United States currently deploys warheads in the range 100 to 477 kt, that is, individual warheads equivalent in yield to a range of 6 to 32 Hiroshimas).The studies indicate that the soot from the fires produced would lead to a decrease in global temperature by 1.25 degrees Celsius for a period of 6-8 years.3 In Westberg’s view:  That is not global winter, but the nuclear darkness will cause a deeper drop in temperature than at any time during the last 1000 years. The temperature over the continents would decrease substantially more than the global average. A decrease in rainfall over the continents would also follow…The period of nuclear darkness will cause much greater decrease in grain production than 5% and it will continue for many years...hundreds of millions of people will die from hunger…To make matters even worse, such amounts of smoke injected into the stratosphere would cause a huge reduction in the Earth’s protective ozone.4 These, of course, are not the only consequences. Reactors might also be targeted, causing further mayhem and downwind radiation effects, superimposed on a smoking, radiating ruin left by nuclear next-use. Millions of refugees would flee the affected regions. The direct impacts, and the follow-on impacts on the global economy via ecological and food insecurity, could make the present global financial crisis pale by comparison. How the great powers, especially the nuclear weapons states respond to such a crisis, and in particular, whether nuclear weapons are used in response to nuclear first-use, could make or break the global non proliferation and disarmament regimes. There could be many unanticipated impacts on regional and global security relationships5, with subsequent nuclear breakout and geopolitical turbulence, including possible loss-of-control over fissile material or warheads in the chaos of nuclear war, and aftermath chain-reaction affects involving other potential proliferant states. The Korean nuclear proliferation issue is not just a regional threat but a global one that warrants priority consideration from the international community.

### LFTRs=Reprocess

#### There should be a very low threshold for this link argument – the 1AC explicitly made the argument that LFTRs would be used for reprocessing. The tags to their Bengelsdorf, Donohue, and Rhodes evidence are all about how the plan solves the fuel cycle and reduces plutonium stockpiles. Just one example:

Rhodes, 12 [February, Professor Chris Rhodes is a writer and researcher. He studied chemistry at Sussex University, earning both a B.Sc and a Doctoral degree (D.Phil.); rising to become the youngest professor of physical chemistry in the U.K. at the age of 34. A prolific author, Chris has published more than 400 research and popular science articles (some in national newspapers: The Independent and The Daily Telegraph) He has recently published his first novel, "University Shambles" was published in April 2009 (Melrose Books), “Hopes Build for Thorium Nuclear Energy”, <http://oilprice.com/Alternative-Energy/Nuclear-Power/Hopes-Build-for-Thorium-Nuclear-Energy.html>]

An alternative technology to the ADS is the "Liquid Fluoride Reactor" (LFR), which is described and discussed in considerable detail on the <http://thoriumenergy.blogspot.com/> blog, and reading this has convinced me that the LFR may provide the best means to achieve our future nuclear energy programme. Thorium exists naturally as thorium-232, which is not of itself a viable nuclear fuel. However, by absorption of relatively low energy "slow" neutrons, it is converted to protactinium 233, which must be removed from the reactor (otherwise it absorbs another neutron and becomes protactinium 234) and allowed to decay over about 28 days to uranium 233, which is fissile, and can be returned to the reactor as a fuel, and to breed more uranium 233 from thorium. The "breeding" cycle can be kicked-off using plutonium say, to provide the initial supply of neutrons, and indeed the LFR would be a useful way of disposing of weapons grade plutonium and uranium from the world's stockpiles while converting it into useful energy.¶ The LFR makes in-situ reprocessing possible, much more easily than is the case for solid-fuel based reactors. I believe there have been two working LFR's to date, and if implemented, the technology would avoid using uranium-plutonium fast breeder reactors, which need high energy "fast" neutrons to convert uranium 238 which is not fissile to plutonium 239 which is. The LFR is inherently safer and does not require liquid sodium as a coolant, while it also avoids the risk of plutonium getting into the hands of terrorists. It is worth noting that while uranium 235 and plutonium 239 could be shielded to avoid detection as a "bomb in a suitcase", uranium 233 could not, because it is always contaminated with uranium 232, which is a strong gamma-ray emitter, and is far less easily concealed

#### LFTR’s rely on reprocessing and produce plutonium

Tickell ’12 – British journalist, author and campaigner on health and environment issues, and author of the Kyoto2 climate initiative (Oliver, “Thorium: Not Green, Not Viable and Not Likely,” Nuclear Pledge, June, http://www.nuclearpledge.com/reports/thorium\_briefing\_2012.pdf)

3.6 Nuclear waste¶ Claim: LFTRs produce far less nuclear waste than conventional solid fuel reactors.¶ Response: LFTRs are theoretically capable of a high fuel burn-up rate, but while this may indeed reduce the volume of waste, the waste is more radioactive due to the higher volume of radioactive fission products. The continuous fuel reprocessing that is characteristic of LFTRs will also produce hazardous chemical and radioactive waste streams, and releases to the environment will be unavoidable.¶ Claim: Liquid fluoride thorium reactors generate no high-level waste material.¶ Response: This claim, although made in the report from the House of Lords, has no basis in fact. High-level waste is an unavoidable product of nuclear fission. Spent fuel from any LFTR will be intensely radioactive and constitute high level waste. The reactor itself, at the end of its lifetime, will constitute high level waste.¶ Claim: the waste from LFTRs contains very few long-lived isotopes, in particular transuranic actinides such as plutonium.¶ Response: the thorium fuel cycle does indeed produce very low volumes of plutonium and other long-lived actinides so long as only thorium and 233U are used as fuel. However, the waste contains many radioactive fission products and will remain dangerous for many hundreds of years. A particular hazard is the production of 232U, with its highly radio-toxic decay chain.¶ Claim: LFTRs can 'burn up' high level waste from conventional nuclear reactors, and stockpiles of plutonium.¶ Response: if LFTRs are used to 'burn up' waste from conventional reactors, their fuel now comprises 238U, 235U, 239Pu, 240Pu and other actinides. Operated in this way, what is now a mixed-fuel molten salt reactor will breed plutonium (from 238U) and other long lived actinides, perpetuating the plutonium cycle.

#### Even if thorium theoretically doesn’t require reprocessing, economics will force it

NNL 10—The Thorium Fuel Cycle, An independent assessment by the UK National Nuclear Laboratory, August 2010, http://www.nnl.co.uk/media/27860/nnl\_\_1314092891\_thorium\_cycle\_position\_paper.pdf

While the thorium fuel cycle is theoretically capable of being¶ self-sustainable, this is only achievable with full recycle. This¶ would involve the implementation of THOREX reprocessing and¶ a remote fabrication plant for the U-233 fuel due to the high¶ gamma dose from the feed material, both of which present very¶ large technological, commercial and risk barriers, each with a¶ significant cost component.¶ The use of thorium in place of U-238 as a fertile material in a¶ once-through fuel cycle is much less difficult technically, but¶ only yields a very small benefit over the conventional U-Pu fuel¶ cycle. For example it is estimated that the approach of using¶ seed-blanket assemblies (the blanket being the surrounding¶ fertile thorium material) in a once-through thorium cycle in¶ PWRs, will only reduce uranium ore demand by 10%. This is¶ considered too marginal to justify investment in the thorium¶ cycle on its own.

#### Thorium would cause reprocessing – the fuel cycle doesn’t make sense without it

M. Lung, European Commission on Nuclear Science and Technology, 1997, “A present review of the thorium nuclear fuel cycles,” http://paulstudier.com/thorium/T%20fuel%20cycle.pdf

Another interesting feature of the thorium fuel cycle is that, due to the lower

position of thorium on the Mendeleiev’s Table, the production of long-lived minor actinides” will be noticeably lower, and if uranium + protactinium are removed by reprocessing, the fission products plus minor actinides left as waste will have a long-term (up to 10 000 years) radiotoxicity considerably decreased compared to a U-Pu fuel cycle (if not for the very long term of i05 + years). Grossly speaking, it is claimed that the radiotoxicity presented by a High Level Waste repository would be quite small much sooner than for a corresponding U-Pu system (for example in about 10 000 years against 100 000 years). Whether this is a really important issue, as it is presented these days, remains to be seen. From all this, it is clear that to take full advantage of the thorium fuel cycle, it is mandatory to retrieve the fissile U-233 formed, by reprocessing, and to regenerate it, as much as possible, in a self\_sustainedu type of reactor in which thorium will breed at least as much fissile U-233 material as will be consumed. Which means that reprocessing is a necessary step, with a risk to divert the pure U-233 produced for proliferation purposes.

#### Thorium requires reprocessing and isn’t prolif resistant.

Carlson 9—John Carlson, Director General, Australian Safeguards and Non-Proliferation Office, Introduction to the Concept of Proliferation Resistance, Excerpt from: ICNND Research Paper No. 8, Revised, 3 June 2009, http://foe.org.au/anti-nuclear/issues/nfc/power-weapons/thorium

In principle, another route for avoiding the need for enrichment is the thorium fuel cycle, but as will be discussed in section 5.C, a thorium reactor requires enriched uranium or plutonium for the initial operating cycles, and current thorium reactor types also require reprocessing. Although reprocessing is for recovery of uranium-233 rather than plutonium, U-233 can also be used in nuclear weapons. A liquid fuel reactor concept is being considered which would avoid the need for U-233 separation.¶ 5.C Thorium fuel cycle¶ The thorium fuel cycle has similarities to the fast neutron fuel cycle – it depends on breeding fissile material (U-233) in the reactor, and reprocessing to recover this fissile material for recycle.¶ Thorium is not a fissile material, so cannot be used as reactor fuel. The basis of the thorium fuel cycle is irradiation of the fertile thorium isotope, Th-232, to produce the fissile material U-233 through neutron capture (rather like production of plutonium from U‑238). The thorium fuel cycle requires separation – i.e. reprocessing – of U-233 produced in the fuel, and the recycle of U‑233 as fresh fuel.¶ Proponents argue that the thorium fuel cycle is proliferation resistant because it does not produce plutonium. Proponents claim that it is not practicable to use U-233 for nuclear weapons.¶ There is no doubt that use of U-233 for nuclear weapons would present significant technical difficulties, due to the high gamma radiation and heat output arising from decay of U-232 which is unavoidably produced with U-233. Heat levels would become excessive within a few weeks, degrading the high explosive and electronic components of a weapon and making use of U‑233 impracticable for stockpiled weapons. However, it would be possible to develop strategies to deal with these drawbacks, e.g. designing weapons where the fissile “pit” (the core of the nuclear nuclear weapon) is not inserted until required, and where ongoing production and treatment of U-233 allows for pits to be continually replaced. This might not be practical for a large arsenal, but could certainly be done on a small scale.¶In addition, there are other considerations. A thorium reactor requires initial core fuel – LEU or plutonium – until it reaches the point where it is producing sufficient U-233 for self-sustainability, so the cycle is not entirely free of issues applying to the uranium fuel cycle (i.e. requirement for enrichment or reprocessing). Further, while the thorium cycle can be self-sustaining on produced U‑233, it is much more efficient if the U-233 is supplemented by additional “driver” fuel, such as LEU or plutonium. For example, India, which has spent some decades developing a comprehensive thorium fuel cycle concept, is proposing production of weapons grade plutonium in fast breeder reactors specifically for use as driver fuel for thorium reactors. This approach has obvious problems in terms of proliferation and terrorism risks.

#### LFTR’s use pyroprocessing and allows plutonium separation

Wikipedia, 2012, “Liquid fluoride thorium reactor,” http://en.wikipedia.org/wiki/Liquid\_fluoride\_thorium\_reactor#Reprocessing

Reprocessing of conventional uranium based fuels is usually done with PUREX, a water solvent extraction method. This is expensive due to the many stages and poor separation factors achievable, the poor radiation resistance of the solvents, criticality concerns due to the use of water, all of this resulting in a large complex industrial reprocessing facility. The pyroprocesses involved in LFTR reprocessing could be much cheaper, because of more compact equipment, higher separation factors, less or no secondary wastes, passive cooling for the reprocessing due to high operating temperature, the liquid nature of the fuel that allows processing without changing it to another chemical form, and the physically and chemically simple nature of the processes employed such as distillation and fluorination. On the other hand, the reprocessing of thorium necessary in the single fluid LFTRs is more difficult. Thorium is chemically similar to rare earth fission products and plutonium. The rare earth fission products are strong neutron poisons and must be removed for a reactor to achieve break-even breeding of thorium into uranium fuel. In 1 fluid or 1.5 fluid designs, thorium recovery is required, or the thorium will be lost when the rare earth fission products are removed by the processing. The reactor better resists diversion of fuel to bombs if the bred plutonium 238 is kept in the reactor, or separated for use in radiothermal generators used to power satellites (Pu-238 is the best material for such RTGs). New techniques have recently been developed for separating thorium and plutonium from fission products.[33]

### Links

#### Spillover - Even if they win their tech is prolif resistant, it still links – any perception of support for reprocessing will spillover to other tech, undermines US credibility, and builds international expertise that causes prolif

Thomas B. Cochran, dir. Nuclear Program @ Nat. Resources Defense Council, 3-26-2004, “Critique of “The Future of Nuclear Power: An Interdisciplinary MIT Study””, http://www.c2es.org/docUploads/10-50\_Cochran.pdf

In addition, the MIT Study recognizes that the closed fuel cycle represents a serious proliferation threat when undertaken in any number of non-weapon states, e.g., Iraq, Iran, North Korea, and even Russia. Despite the acknowledgement of poor economic prospects, no significant waste management advantages and high proliferation risks associated with closed fuel cycles, the MIT Study unfortunately leaves the door open to develop new reprocessing technologies. On the other hand, we [the MIT Study group] support modest laboratory scale research and analysis on new separation methods with the objective to learn about separation methods that are less costly and more proliferation resistant. There has been little exploration in the United States of alternatives to PUREX and pyro-processing since their invention decades ago with entirely different purposes in mind: obtaining weapons usable material and reprocessing metal fuel, respectively. We note however that there is considerable skepticism for even this modest approach, because some see any U.S. work on reprocessing sending the wrong signal to other nations about the credibility of our expressed attitude toward the proliferation risks of reprocessing, and the concern that DOE will move from analysis and research to development before the technical basis for such action has been developed. We propose that this program begin at a modest scale, reaching $10 million per year in about five years. (MIT Study, p. 92) Instead of curbing DOE’s appetite for promoting technologies that are both dangerous and uneconomical, this MIT Study recommendation likely will be used by DOE to justify its Advanced Fuel Cycle Initiative (AFCI). The DOE FY 2004 budget for the AFCI is $63 million—over six times what the MIT recommends be spent in five years. The AFCI is coordinated with DOE’s Generation IV program to develop new reactor concepts for possible introduction in the 2030 to 2050 time period. Last year DOE organized the Generation-IV International Forum, an effort by 10 countries to jointly develop six nuclear energy systems, including several fast reactor concepts that require closed fuel cycles. The countries included five non-weapon states that formerly had clandestine nuclear weapon programs, namely, South Africa, Argentina, Brazil, South Korea and Switzerland. Although the MIT Study recommends that “[t]he DOE R&D program should be realigned to focus on the open, once-through fuel cycle” (MIT Study, p. x), I fear the recommendation to engage in modest R&D on closed fuel cycles will be used to bolster the DOE AFCI effort. This will promote in non-weapon states, including states that in the past had clandestine nuclear weapon programs, the construction of hot cells for reprocessing R&D and training of cadres of experts in plutonium chemistry and metallurgy. This DOE effort is clearly a threat to U.S. national security. Because closed fuel cycles are so uneconomical, U.S. government sponsored research on closed fuel cycles is not likely to lead to their adoption. Consequently, in the next fifty years I believe U.S. nuclear plants will stick with the open fuel cycle.

#### Plutonium link – even if LFTR’s don’t actually reprocess, even using them to eliminate plutonium stockpiles would be perceived as general US acceptance of ALL reprocessing

Carah Ong, Nuclear Age Peace Foundation’s Advocacy and Research Director, May 2005, “Reprocessing and Proliferation Dangers,” http://www.wagingpeace.org/articles/2005/05/00\_ong\_reprocessing-proliferation-dangers.pdf

Reprocessing is contrary to national and international efforts to prevent the proliferation of nuclear materials to other countries or terrorists that could use them to make nuclear weapons or “dirty bombs.” If the US pursues reprocessing, it will undermine international efforts to discourage other countries – including Iran and other states of proliferation concern – from building their own reprocessing and enrichment facilities. As a 1994 report by the National Academy of Sciences (NAS) states, “[P]olicymakers will have to take into account the fact that choosing to use weapons plutonium in reactors would be perceived by some as representing generalized U.S. approval of separated plutonium fuel cycles, thereby compromising the ability of the U.S. government to oppose such fuel cycles elsewhere.” 2 Reprocessing is the only way of producing plutonium for use in nuclear weapons. Now nuclear weapons states, India and Pakistan both pursued plutonium programs that they justified as a legitimate part of their civil nuclear programs. North Korea also claimed for years that its reprocessing plant at Yongbyon was intended to separate plutonium for use in Mixed Oxide fuel for civilian nuclear power reactors. Today, experts believe North Korea has enough plutonium for some six to eight nuclear warheads. At the end of 2003, the world’s stockpiles of separated civilian plutonium stood at 235 metric tons, enough to make some 30,000 nuclear weapons, each with the destructive power comparable to the Hiroshima and Nagasaki bombs. Despite assertions to the contrary, terrorists could use civil plutonium to make potent nuclear weapons with a destructive power equivalent to at least 1,000 tons of TNT. Respected voices within the UK have warned of the dangers from Britain’s growing stockpile of separated plutonium. Perhaps most notably, in 1998, Britain’s Royal Society warned that “the chance that the stocks of plutonium might, at some stage, be accessed for illicit weapons production is of extreme concern.” 3 As a Rand Corporation report states, “It is critical that countries pay attention to the proliferation threat from the civilian side if they want to maximize the non-proliferation value of dismantling U.S. nuclear weapons and those of the FSRs (former Soviet republics). If countries ignore the civilian threat, they can compound the problem by making wrong choices in how to deal with military materials.” 4 Reprocessing is not proliferation resistant. The US is currently researching and developing a technology known as Uranium Extraction Plus or UREX Plus. In a testimony on March 17, 2005 before the Energy and Water Appropriations Subcommittee, Bill Magwood, the Director of the Office of Nuclear Energy, Science and Technology at the US Department of Energy, stated, “One test that it [UREX Plus] has not yet passed is the proliferation resistance test.” In the same testimony, Magwood also stated, “[W]e're not sure that it's possible to use this chemical technology to separate the plutonium in combination with a few other things, in a fashion that will make it both proliferation resistant and economically viable.” Recommendation Taking into account the previous Bush administration’s decision to phase out reprocessing, rather than taking a do-as-I-say-not-as-I-do approach to managing nuclear materials, the US should take the lead in demonstrating to the world that nuclear materials can be safely managed without separating weapons-usable materials as a critical step in curtailing the spread of nuclear weapons.

#### Clear Signal – US hardline on domestic reprocessing is key to send a clear signal that checks ENR spread

Harrell ’11 – research associate at the Project on Managing the Atom at Harvard University's Belfer Center for Science and International Affairs (Eben, “Bury Our Nuclear Waste — Before It Buries Us,” August 15, Time Magazine, http://www.time.com/time/health/article/0,8599,2086917,00.html)

The Blue Ribbon Commission doesn't reach a conclusion on whether the U.S. should pursue reprocessing, arguing that consensus on the issue would be "premature." That is a mistake. Reprocessing is a manifestly dangerous technology. In the 1970s, the U.S. renounced commercial reprocessing at home and the spread of the technology abroad because of concerns that it would lead to weapons proliferation. It should not reverse this policy. The spread of reprocessing to countries in unstable or nuclear-armed regions gives them the infrastructure and expertise needed to quickly develop a bomb should they choose to do so. (And don't think safeguards imposed by the International Atomic Energy Agency can stop them. Commercial-scale reprocessing facilities handle so much plutonium that it is almost impossible for inspectors to keep track of it all.) The U.S. must send a message: if the country with the world's largest number of nuclear reactors renounces reprocessing, it delivers a clear signal to countries newly interested in nuclear power that the process is not necessary for the future of the nuclear industry.

#### Credibility – any form of US reprocessing crushes US credibility on ENR

UCS ’11 – Union of Concerned Scientists (“Nuclear Reprocessing: Dangerous, Dirty, and Expensive,” April 5, http://www.ucsusa.org/nuclear\_power/nuclear\_power\_risk/nuclear\_proliferation\_and\_terrorism/nuclear-reprocessing.html)

Reprocessing would increase the ease of nuclear proliferation.¶ U.S. reprocessing would undermine the U.S. goal of halting the spread of fuel cycle technologies that are permitted under the Nuclear Non-Proliferation Treaty but can be used to make nuclear weapons materials. The United States cannot credibly persuade other countries to forgo a technology it has newly embraced for its own use. Although some reprocessing advocates claim that new reprocessing technologies under development will be "proliferation resistant," they would actually be more difficult for international inspectors to safeguard because it would be harder to make precise measurements of the weapon-usable materials during and after processing. Moreover, all reprocessing technologies are far more proliferation-prone than direct disposal.

#### Political Cover – Thorium gives countries a rationale to continue ENR or create plutonium – can’t control how the technology is used----developing countries WILL CHOOSE THE CHEAPER OPTION---crucial distinction

FOE Australia, 2012, “Thorium and WMD proliferation risks,” http://foe.org.au/anti-nuclear/issues/nfc/power-weapons/thorium

Thorium fuel cycles are promoted on the grounds that they pose less of a proliferation risk compared to conventional reactors. However, whether there is any significant non-proliferation advantage depends on the design of the various thorium-based systems. No thorium system would negate proliferation risks altogether. Neutron bombardment of thorium (indirectly) produces uranium-233, a fissile material which can be used in nuclear weapons (1 Significant Quantity of U-233 = 8kg). The USA has successfully tested weapon/s using uranium-233 cores. India may be interested in the military potential of thorium/uranium-233 in addition to civil applications. India is refusing to allow safeguards to apply to its entire 'advanced' thorium/plutonium fuel cycle, stongly suggesting a military dimension. The possible use of highly enriched uranium (HEU) or plutonium to initiate a thorium-232/uranium-233 reaction, or proposed systems using thorium in conjunction with HEU or plutonium as fuel, present risks of diversion of HEU or plutonium for weapons production as well as providing a rationale for the ongoing operation of dual-use enrichment and reprocessing plants. Thorium fuelled reactors could also be used to irradiate uranium to produce weapon grade plutonium. Kang and von Hippel conclude that "the proliferation resistance of thorium fuel cycles depends very much upon how they are implemented". For example, the co-production of uranium-232 complicates weapons production but, as Kang and von Hippel note, "just as it is possible to produce weapon-grade plutonium in low-burnup fuel, it is also practical to use heavy-water reactors to produce U-233 containing only a few ppm of U-232 if the thorium is segregated in "target" channels and discharged a few times more frequently than the natural-uranium "driver" fuel." (Kang, Jungmin, and Frank N. von Hippel, 2001, "U-232 and the Proliferation-Resistance of U-233 in Spent Fuel", Science & Global Security, Volume 9, pp 1-32, <www.princeton.edu/~globsec/publications/pdf/9\_1kang.pdf>.)

#### ENR Key – US lack of reprocessing is the most valuable signal

Lyman ’12 – senior staff scientist at the Union of Concerned Scientists’ Global Security Program (Dr. Edwin, “Recommendations of the Blue Ribbon Commission on America’s Nuclear Future,” February 1, Testimony Before the Subcommittee on Environment and the Economy Committee, on Energy and Commerce, U.S. House of Representatives, http://www.ucsusa.org/assets/documents/nwgs/lyman-energy-commerce-statement-brc-20112.pdf)

Finally, UCS agrees with Recommendation 8 that U.S. leadership is an important factor in promoting safety, nonproliferation and security, and believes that the best approach is for the United States to lead by example. With regard to the nuclear fuel cycle, the most valuable signal the United States could send to the rest of the world is the demonstration that direct disposal of spent fuel in a nation with a very large nuclear power program is both politically and technically feasible. In addition, this would show the rest of the world that reprocessing spent fuel as a waste management strategy is neither necessary nor desirable.

#### India Link –

#### a) Thorium was explicitly abandoned because of post-India prolif fears

Eric Niller, 2-21-2012, “Alternative nuclear fuel energizes its proponents,” Washington Post, ln

Half a century ago, however, the United States was taking a serious look at thorium as a nuclear fuel. It was used at a molten-salt reactor that government scientists built and ran from 1965 to 1969 at Oak Ridge. But after India detonated a nuclear bomb in 1974 with plutonium extracted from a reactor designed for non-weapons use, fears of proliferation convinced successive U.S. administrations to cut back on experimental nuclear programs. The thorium-fuel project was mostly forgotten. Instead, all subsequent nuclear plants were designed to use uranium, the fuel that powers all 104 reactors operating in the United States today.

#### b) Those concerns are about reprocessing – proves Thorium triggers our perception links

Nuclear Energy Institute, January 2003, “Plutonium and Uranium Reprocessing,” http://www.acamedia.info/politics/nonproliferation/references/nei\_2003.htm

Until the mid-1970s, the United States had planned to use separated plutonium, generated by reprocessing, as a commercial fuel source. But in May 1974, India detonated a nuclear device made from plutonium separated at its reprocessing facility, prompting the United States to revise its policy on reprocessing to reflect proliferation threats it perceived to be the result of separated plutonium. In a 1976 policy statement, President Gerald Ford declared, “The avoidance of proliferation must take precedence over economic interests.” He also stated that U.S. domestic policies must be changed to defer “the commercialization of chemical reprocessing of nuclear fuel which results in the separation of plutonium.” In 1977, President Jimmy Carter deferred indefinitely commercial reprocessing of plutonium produced in commercial U.S. nuclear plants, citing concerns about the consequences of proliferation.