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**Testimony prepared for the
Committee on Energy, Utilities and Telecommunications, Minnesota State Senate,
in support of maintaining the moratorium on new nuclear reactors**

By Arjun Makhijani, Ph.D., President of the Institute for Energy and Environmental Research
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My name is Arjun Makhijani. I am President of the Institute for Energy and Environmental Research (IEER). IEER is a non-profit technical institute that provides the public and policy-makers with thoughtful, clear, and sound scientific and technical studies on a wide range of issues including energy, nuclear waste, and nuclear non-proliferation. I mention a few items of interest in my background here. I was the principal author of the first study on the efficiency potential of the U.S. economy, published in 1971, two years before the first energy crisis. I have consulted with utilities and as well as non-government groups on energy-related issues. My record of doing studies on energy issues and more generally of doing public interest work on energy and environmental issues was recognized in 2007, when I was elected a Fellow of the American Physical Society, an honor accorded to at most one-half of one percent of its members.

Chair Rosen, members of the committee, thank you for the opportunity to speak to you today on the issue of lifting Minnesota's current protections against new nuclear power reactors. Much of what I will say here today will not be news to some of you since we have still not solved the many troubles and uncertainties that the nuclear industry has faced for decades. I will focus my remarks on nuclear power's economic and waste considerations and I hope that they will inform your vote on the bill before you.

Nothing currently prevents utilities from discussing or even studying the potential for new nuclear power in the state. Nuclear cost estimates are widely available, and Minnesota utilities can easily use such information in their resource plans without significant added expense. Such an exercise would inevitably show that such projects have much higher risks than others and that they would need large infusions of money from ratepayers and probably loan guarantees from taxpayers. That is the best case. The worst case, amply exemplified by the experience after the first energy crisis, will be a waste of ratepayer money, added risks and losses to investors, and no additional electricity. Every single nuclear power reactor ordered after the

energy crisis began in October 1973 was cancelled. Evidence, some of which I detail below, shows that the current track of building new nuclear power reactors, is likely to lead to a similar result in most cases.

Nuclear power is too expensive and too risky

In 2007, Jeffrey Immelt, the CEO of General Electric was quoted in the *Financial Times*:

"If you were a utility CEO and looked at your world today, you would just do gas and wind. You would say [they are] easier to site, digestible today [and] I don't have to bet my company on any of this stuff. You would never do nuclear. The economics are overwhelming."¹

This statement illustrates why Wall Street won't touch nuclear projects with a ten-foot pole - you have to bet the entire company and often more on the project. Nuclear projects remind Wall Street of the sorry history of cost overruns, rate hikes, and bond defaults of the 1980s that led *Forbes* to call nuclear power "the largest managerial disaster in business history, a disaster on a monumental scale." The title of the article, in a magazine that is emblematic of free-market capitalism, was "Nuclear Follies."²

There are three ways that, in combination, make the economics of nuclear reactor projects so "overwhelming" that they become a "bet the company" or "bet the farm" risk. First, the capital cost per kilowatt is high. But nuclear power is not alone in that. It is the combination with the other two factors that makes nuclear power a huge risk. The second factor is the size of reactor projects; they are so large that the total cost of a single project is often comparable to or larger than the market capitalization of the company. The third factor is the long lead time for nuclear projects – six or seven years in the best case for licensing, engineering and construction; it has often been a decade or more. That is a decade of financial outflows and interest payments before a single dollar returns as revenue. This requires projections of electricity demand at least six or seven years out into the future, and more realistically a decade. For a variety of reasons, this has been difficult since 1973 and continues to be so. In contrast, onshore wind projects can typically be built in two years, and combined cycle natural gas plants in three. All this makes it eminently understandable why Mr. Immelt, whose company sells all three types of power plants (nuclear, gas, and wind), said that for a utility CEO to decide to build a nuclear power reactor is to decide to "bet my company...." He, like other nuclear reactor proponents, was arguing for government loan guarantees when he gave his interview.

Since Wall Street won't finance these "bet the company" projects, utilities have turned to taxpayers and ratepayers to do so. The nuclear industry has repeatedly stated that it needs

¹ As quoted in Sheila McNulty and Ed Crooks, "US utilities are sceptical over nuclear energy revival," *Financial Times*, November 18, 2007. Accessed January 21, 2011, via <http://www.ft.com/cms/s/0/8975e03c-9601-11dc-b7ec-0000779fd2ac.html#axzz1BbujzDOX>. Emphasis added.

² James Cook, "Nuclear Follies," *Forbes*, February 11, 1985.

such guarantees because private investors are unwilling to risk their money. Betting the taxpayer's dollar is evidently more attractive than betting the investor's dollar, at least for the investors.

But even massive loan guarantees alone have not proved enough by themselves so far. In October 2010, the U.S. government offered a loan guarantee to a merchant plant proposed to be built by a consortium of Constellation Energy and Electricité de France. But Constellation found the cost of the guarantee of \$880 million too onerous. Reportedly, the government was ready to lower the fee if the company could find customers willing to sign up in advance to buy most of the electricity,³ but that also has gone nowhere. Moreover, Constellation Energy reported that the drop in power prices and lack of a carbon price made justification of the construction costs difficult.⁴ It backed out of the project. Yet, the cost of the loan guarantee was reasonable, given that the amount of the loan was \$7.5 billion for a project that had not specified whether there would be a market for most of its product.

Despite more than five years of talk of a nuclear renaissance and billions in expenditures, the few nuclear projects that seem to be on a possible (though far from certain) course to completion are those that ratepayers are financing through a charge on their monthly bills – a charge known as “construction work in progress” or CWIP, for short. One of the projects, the Vogtle reactor project in Georgia, has a loan guarantee. A review of the current status of proposed nuclear reactors provides ample warning signs for what might happen to Minnesotans if the moratorium is repealed.

In Florida, Progress Energy has plans for a two-reactor nuclear project. Progress Energy's market capitalization on January 20, 2011, at 3 pm was \$13.16 billion.⁵ The price tag for its two-reactor nuclear project is now estimated at \$22 billion – a \$5 billion increase over the original \$17 billion price tag a year ago,⁶ which means the cost of the project is about two-thirds more than the market value of the company. This is more than betting the company on a single project. It means that bond holders could not recover the value of their investment even if they took over all the common stock of the entire company in the event of project failure.⁷

³ Steve Mufson, “Constellation Energy Shelves Plant for Calvert Cliffs Reactor,” *Washington Post*, October 13, 2010, on the web at <http://www.washingtonpost.com/wp-dyn/content/article/2010/10/08/AR2010100807370.html>, accessed on January 23, 2011.

⁴ Naureen S. Malik, “UPDATE: Constellation Ready To Transfer Nuclear JV Stake To EDF,” *Wall Street Journal*, October 15, 2010. Accessed Jan. 21, 2011 via <http://online.wsj.com/article/BT-CO-20101015-710567.html>

⁵ Progress Energy Inc. (PGN), at <http://finance.yahoo.com/q?s=PgN>, viewed at 3:00 pm, January 20, 2011. All market capitalization values are common stock totals.

⁶ Fred Hiers, “PSC approves Progress Energy fee for Levy nuclear plant,” *Gainesville Sun*, October 26, 2010, on the web at <http://www.gainesville.com/article/20101026/articles/101029590?p=all&tc=pgall>.

⁷ Progress Energy may merge with Duke Energy to increase its market heft. But both Progress and Duke have plans for four more reactors (for six reactors in all), so even a merger will not solve the problem of nuclear reactors being a “bet the company risk.” Duke Energy had a market capitalization of about \$24 billion on January 21, 2011. The combined market cap of the two companies (about \$37 billion) would still be considerably less than the cost of the six reactors (\$22 billion for the Florida project plus four AP1000 reactors at \$7,000 per kW amounts to over \$50 billion. Even a comparable total cost is a great risk since it puts the entire company at the mercy of a few nuclear

The Florida state legislature has allowed utilities to collect money in advance from ratepayers for such projects without any promise in return that the projects will be completed or that ratepayers will get any electricity. This is like giving an advance to a builder for a house without any assurance that he will build the house and give you the keys. Florida ratepayers began their revolt soon after the utilities started collecting money for these projects. However, the stance of utilities is clear. According to a Progress Energy spokesperson, “[w]ithout this legislation [allowing collection of advance payments from ratepayers], we would not be considering building new nuclear generation in Florida.”⁸ Both the Progress Energy reactor project and the Florida Power & Light project are facing delays. Florida Power & Light estimated (in 2007) that a one year delay in its project would cost between \$800 million and \$1.2 billion.⁹ Progress Energy has reportedly delayed the project by five years to 2021.¹⁰ Given rising costs and electricity demand uncertainties, it is unclear whether it will finish the plant.

Florida Power & Light is also collecting money from ratepayers but has suspended work at the site. It is still pursuing a license and does not plan to resume onsite work until it gets one.¹¹ Given the cost of the project, it may also pursue loan guarantees, but there are others in line before it. The utility may delay the reactors.

In Georgia ratepayers are paying an additional \$3.73 per month for a proposed two-reactor expansion at Southern Company’s current Vogtle facility – and the proposed reactor design hasn’t even been approved by the NRC yet.¹² The amount paid by ratepayers is anticipated to

reactors amounting to about 7,000 megawatts of capacity, which is far lower than the combined total generating capacity of the two companies of over 56,000 megawatts. A merger would simply mean betting a larger company. For data on Duke Energy generating capacity see the company website at <http://www.duke-energy.com/about-us/power-plants.asp>; for Progress Energy see <http://progress-energy.com/aboutenergy/powerplants/2008generatingplants.pdf>.

⁸ Steven Mufson, “Nuclear Projects Face New Hurdle,” *The Washington Post*, March 2, 2010, on the web at http://www.washingtonpost.com/wp-dyn/content/article/2010/03/01/AR2010030103975_2.html, viewed on Jan 21, 2011.

⁹ Direct Testimony of Steven D. Scroggs, Florida Power & Light Company, before the Florida Public Service Commission, Docket No. 07 ____-EI, October 16, 2007, at <http://www.psc.state.fl.us/dockets/cms/docketFilings2.aspx?docket=070650>, document number 09467-07. p. 52.

¹⁰ Beth Kassab, “Utilities need to accept nuclear risk,” *Orlando Sentinel*, October 31, 2010, on the web at http://articles.orlandosentinel.com/2010-10-31/business/os-cfb-kassab-nuclear-11012010-20101031_1_first-new-reactor-nuclear-plants-nuclear-power, accessed on January 25, 2011.

¹¹ Florida Power & Light 10-Q statement to the Securities and Exchange Commission for the quarterly period ended September 30, 2010, on the web at <http://www.sec.gov/Archives/edgar/data/37634/000075330810000116/form10q093010.htm>, accessed on January 25, 2011.

¹² Melissa Stiers, “More Hearings for Plant Vogtle Expansion,” *GPB News* (Georgia Public Broadcasting, Atlanta), November 22, 2010. Accessed Jan 21, 2011 via <http://www.gpb.org/news/2010/11/22/more-hearings-for-plant-vogtle-expansion>.

increase in the coming years to almost \$11/month, prompting concerns of such an action in the midst of the deepest recession since the 1930s and continued high unemployment.¹³

Even large businesses and industries – in Florida and Georgia – are opposed to these advance payments, according to an article in *The Washington Post*:

The utilities' gains [advance payments] are the consumers' losses -- and businesses such as the Georgia Industrial Group and the Georgia Textile Manufacturing Association have joined consumer and environmental groups in combating the state laws and higher rates.

In Florida, PCS Phosphate, which has a fertilizer plant that uses about 1 percent of Progress Energy's output, told the Public Service Commission that new rate increases "will substantially affect" the company "by directly increasing the cost of power."¹⁴

A similar story is unfolding in San Antonio, Texas. There, the municipal utility, CPS Energy, took a 50 percent stake in a two-reactor project. CPS Energy spent \$370 million of ratepayer money¹⁵ without needing legislation to collect it. The cost of the project has already jumped from an initially stated \$5.4 billion in 2007 to over \$18 billion as of the end of 2009.¹⁶ Such escalations were not hard to foresee. In March 2008, when the company that initiated the project, NRG Energy, put it at \$6 billion to \$7 billion, I estimated that the cost would be much higher – \$12 billion to \$17.5 billion, even in the absence of cost escalations and delays. There was no magic in my estimate; it was based on widely available industry information. The nuclear cost increases and associated controversies have caused a scandal and the resignation of the utility's Board's Chair. CPS Energy is now on a course to stop spending any more money on the project and has reduced its share from 50 percent to 7.625 percent, which is the share corresponding to the money it has already spent.¹⁷

The San Antonio example illustrates that you pursue all options at your peril. CPS is now increasing rates, and it is saddled with overcapacity even without the nuclear plant. It is far from clear that the project will be completed. It has no loan guarantees as yet. NRG, the majority owner of this proposed two-reactor merchant project now needs to sell capacity; it is approaching other utilities, including cooperative and municipal utilities. Like CPS Energy, such

¹³ Gloria Tatum, "Georgia Power, PSC Sticks it to Ratepayers," *Atlanta Progressive News*, December 12, 2010. Accessed Jan 21, 2011 via <http://www.atlantaprogressivenews.com/interspire/news/2010/12/12/georgia-power-psc-sticks-it-to-ratepayers-%28update-2%29.html>.

¹⁴ Steven Mufson, "Nuclear Projects Face New Hurdle," *The Washington Post*, March 2, 2010. Accessed Jan. 21, 2011 via http://www.washingtonpost.com/wp-dyn/content/article/2010/03/01/AR2010030103975_2.html.

¹⁵ "San Antonio utility settles over nuke plant expansion," *San Antonio Express-News*, Feb. 18, 2010. Accessed Jan. 21, 2011 via www.chron.com/disp/story.mpl/business/6872806.html.

¹⁶ Anton Caputo. "Nuclear expansion could cost \$18.2 billion," *San Antonio Express-News*, 12/23/2009. Accessed Jan 21, 2011 via http://www.uraniumwatch.org/dwr_greenriverhearings_2010/uw_exhibitN_acaputo.pdf.

¹⁷ "Decision time on South Texas Project," *World Nuclear News*, 05 January 2010. Accessed Jan. 21, 2011 via http://www.world-nuclear-news.org/C_Decision_time_on_South_Texas_Project_0501101.html,

utilities generally do not need state legislation or permission from the utility commissions to enable them to spend ratepayer money.

Nuclear will not create the jobs that are needed today

The prospects of any nuclear renaissance beginning have been further dimmed by low natural gas prices. Rising reserves raise the prospect that prices will remain low. Utilities are now building combined cycle natural gas plants and secondarily, wind power plants; both types are lower in cost than nuclear reactors.

Consider the May 2010 statement of John Rowe, past Chairman of the Nuclear Energy Institute and CEO of Exelon, the largest nuclear operator in the U.S., said that lower natural gas prices in 2009 led to a new perspective: “new nuclear plants started to look very expensive” and “wind began to look more attractive”. In fact Mr. Rowe stated that a carbon dioxide emissions price of \$100 per metric ton would be necessary to make new nuclear construction a break-even investment.¹⁸ There is no prospect in the foreseeable future (a decade and probably more) of a CO₂ price anywhere near \$100 per metric ton. Note that the European price of CO₂ has been roughly \$20 per metric ton for the last several months,¹⁹ even though European Union countries have mandates to reduce CO₂ emissions under the 1997 Kyoto Protocol, unlike the United States.

When coupled with the slowdown in the electricity sector and the difficulties of estimating demand eight or ten years in the future, there is no prospect that overturning the nuclear moratorium will create jobs in Minnesota. Minnesota lost 22,400 jobs in December, according to a recent report by the Minnesota Dept. of Employment and Economic Development – the largest employment decline since 1990.²⁰ As I said earlier, in the most optimistic scenario for a new nuclear plant, it will take many years to finance and get the necessary permits. There is no prospect that a utility will order a nuclear power plant in Minnesota unless it has construction work in progress, which would unleash the kinds of economic and political problems that have cropped up in Florida. Indeed, given the sentiment against new taxes, I cannot see how the Minnesota legislature or Public Utilities Commission could sanction CWIP funds amounting to billions of dollars for a new nuclear reactor. Moreover, a commitment to a new nuclear reactor would marginalize investments in renewable energy and even efficiency, since substantial

¹⁸ John W. Rowe (Exelon Corporation). “*Fixing the Carbon Problem Without Breaking the Economy*,” [presented at the] Resources for the Future Policy Leadership Forum, National Association of Home Builders, Washington, D.C., May 12, 2010, 12:45 p.m., on the web at http://www.exeloncorp.com/assets/newsroom/speeches/docs/Rowe_RFF_Remarks_Slides_FINAL%2020100512.pdf, p. 6. “Remarks as Prepared”

¹⁹ See Bloomberg website at <http://www.bloomberg.com/apps/quote?ticker=EUETSYR1:IND>, accessed on January 23, 2011.

²⁰ Annie Baxter, “Minnesota loses more than 22k jobs in Dec., though jobless rate falls to 7pct.,” *Minnesota Public Radio*, 20 January 2011. Accessed Jan. 21, 2011 via <http://minnesota.publicradio.org/display/web/2011/01/20/minnesota-jobs-report/>

investments in these areas would risk creating a large amount of overcapacity when the nuclear power plant comes on line.

A similar situation is evolving now, but more rapidly. The ratio of electricity growth per unit of economic growth continues to fall. Before 1973, the ratio of electricity growth to gross domestic product growth was about 2 to 1; between 1973 and 1993 it was about one to one. From 1993 to 2000, it was about two-thirds to one. In the past decade, before the onset of the present recession in 2008, it was only 0.55 to one. The declining trend is reflected in the most recent Integrated Resource Plans filed by Minnesota utilities - not one demonstrates a need for a new baseload generation facility during the planning forecast.

In this context, a long-lead time, capital intensive power plant can be ruinous. While wind turbines and solar panels are capital intensive; they can be built quickly – within 1-2 years. If a wind farm is half-complete, you get half the electricity from the completed turbines. If a nuclear power plant is half complete, typically you get nothing but the bills. Even twin reactor projects are phased so that they are completed close on one-another's heels.

There is some sentiment that small modular reactors could address these issues. This is highly unlikely. U.S. utility projects involving small reactors are unlikely to be small. Each unit will be smaller, but there will be several units per project. For instance, the Tennessee Valley Authority is considering construction of such reactors. The following is based on a set of TVA slides dated November 16, 2010.²¹ One possible project would have four reactors 250 to 280 megawatts, each costing \$1.4 billion to \$1.8 billion, which amounts to about the same total cost (\$5 billion to \$7 billion) of a single reactor with 1,100 to 1,200 megawatts capacity.

One might imagine that the modular nature of the project would reduce the risk. Yet, in one way it actually increases the risk, because the cost of the first unit will be “high,” according to the TVA.²² This is because much of the infrastructure for the larger number of reactors must be built with the first one. So unless the full project is completed, small reactors would actually cost more, robbing the project of most of the benefits of modularity. Note also that the TVA estimates it would take about eight years to bring the first reactor on line, with the overall four-reactor 1,100 megawatt project taking over ten years. So a closer look at small modular reactors is showing that they are not going to lead to a low-cost nuclear nirvana. It should also be noted that Minnesota is not going to derive any benefits from such reactors for a long time. No small modular reactor has been certified as yet or a design even submitted for certification.

Finally, even the TVA admits that they are also not the cheapest generation technology. Natural gas combined cycle plants would be lower in cost than even the lowest SMR estimate,

²¹ *SMRs and Impact on Financing*, Tennessee Valley Authority, November 16, 2010

²² *SMRs and Impact on Financing*, Tennessee Valley Authority, November 16, 2010, Slide 13.

even when a price of \$50 per metric ton of CO₂ is added to the natural gas plant.²³ The prospects for such a price of CO₂ are remote.

Nuclear waste management – a big unknown

Finally, let me say a few words about nuclear spent fuel, a problem with which Minnesota is very familiar; indeed, it was the issue that triggered the nuclear moratorium. Spent fuel is now being stored in 34 dry-cask storage units at Minnesota's two nuclear power plants, with additional amounts in the reactors' spent fuel pools. It is uncertain when Minnesota's nuclear waste will leave the state, if ever. Yucca Mountain has been de-funded and the Dept. of Energy has withdrawn its application for the site. The Blue Ribbon Commission (BRC) is considering the issue but Congress is not obliged to incorporate its recommendations into law. And the BRC is not going to recommend any specific sites for disposal. Local communities are faced the potential for an indefinite storage timeline, increased costs, and increased security risks. It is not well known, but a Brookhaven National Laboratory study estimated the costs of severe accidents in spent fuel pools at closed nuclear power plants as ranging from a few billion dollars to hundreds of billions of dollars, plus excess cancer deaths ranging up to the tens of thousands, depending on the severity of the accident, the amount of spent fuel in the pool, population density around the plant, and other factors.²⁴ Why would Minnesota want to add to its liabilities without any realistic prospect that there will be any jobs, electricity generation, or any benefits whatsoever even if the moratorium were lifted.

I have studied the French nuclear program extensively, specifically focusing on the French reprocessing and repository programs. Reprocessing would increase the volume of waste to be disposed of in a repository by about six times, even though the high-level waste volume is somewhat decreased.²⁵ This counterintuitive result derives from the large increase in plutonium-contaminated waste generated in reprocessing operations and plutonium fuel fabrication that must be disposed of in a deep geologic repository.

The French pay more for their electricity because of reprocessing. Further, they have no geologic repository. I can assure you that the French no more like nuclear waste in their backyard than people in any other country, including the United States. French reprocessing operations discharge about 100 million liters of liquid radioactive waste into the English Channel every year which, together with British reprocessing discharges, have contaminated the ocean all the way to the Arctic. Twelve European countries have asked the French and British to stop but they refuse.

²³ *SMRs and Impact on Financing*, Tennessee Valley Authority, November 16, 2010, Slide 8. The price of natural gas assumed in this TVA calculation was \$5 per million Btu.

²⁴ R.J. Travis, R.E. Davis, E.J. Grove, M.A. Azarm, *A Safety and Regulatory Assessment of Generic BWR and PWR Permanently Shutdown Nuclear Power Plants*, Brookhaven National Laboratory, 1997. See Tables 4.1, 4.2, and 4.3.

²⁵ U.S. Department of Energy, Office of Nuclear Energy, *Draft Global Nuclear Energy Partnership Programmatic Environmental Impact Statement*, GNEP PEIS, (DOE/EIS-0396) October 2008.

Reprocessing increases nuclear power's costs by about two cents per kilowatt hour above the cost of uranium fuel resulting in nearly \$1 billion *extra* fuel costs each year for reprocessed fuel for less than ten percent reduction in uranium requirements.²⁶

Overall, even repeated reprocessing and re-enrichment of the recovered uranium would result in only about 6 percent of the uranium in the original fresh fuel from being used for energy generation, of which over 4 percent occurs without any reprocessing at all. Overall, France only increases its use of the material in the fuel by only about one percent due to reprocessing. The much cited number that France is recycling 90 or 95 percent of its spent fuel is incorrect.

The Minnesota Moratorium

Nothing presently prevents discussion of nuclear energy in Minnesota. The function of the moratorium is not to prevent debate, which is already occurring, but to protect Minnesota businesses and households from the kinds of problems that have already emerged in other places before a single new nuclear reactor construction and operating license has been granted.

I am quite confident that there will be no nuclear reactor built in Minnesota without CWIP, particularly since a federal loan guarantee is not in the cards. One very interesting and important feature of CWIP is that it is not like an advance payment for a piece of an investment, but rather more like a tax. The utility receiving the money makes no commitment to complete the project and deliver the electricity. There is no commitment to refund the money if the project is cancelled, much less do it with interest. And, like a tax, ratepayers are required to pay up by law. Actually CWIP is worse than a tax, because taxes do provide public benefits like public safety and education and roads, though there is a legitimate debate about how the extent of those benefits and the amount of taxes should be balanced. There is no assurance of any benefits with CWIP. Indeed, all the ratepayer money that went into reactors that were ordered after October 1973 provided no benefits whatsoever to the public. In sum, there will be no new jobs in Minnesota from repealing the nuclear moratorium unless there is a new tax on ratepayers in the form of CWIP.

This is likely to be Minnesota's nuclear reality. Does the Minnesota legislature really want to go in a direction where a de facto tax will be imposed on ratepayers to build baseload power that is not needed? And that without any guarantee that the public will get anything for their money but higher costs? There will be political turmoil in the energy sector, which will divert attention and focus from the efficiency and renewable energy efforts that Minnesota has been making.

If costs are going to be imposed on ratepayers, why not go in directions where the benefits accrue to the public in the form of reduced costs? Efficiency projects in public buildings are an important example. If there were to be new costs imposed on ratepayers, they should be

²⁶ Arjun Makhijani, "Carbon-Free and Nuclear-Free: A Roadmap for U.S. Energy Policy," slide presentation for Minnesota Joint Meeting of the Legislative Energy Commission, 24 March 2009, Slide 6. Accessed Jan. 21, 2011 at www.house.leg.state.mn.us/comm/docs/032509ArjunMakhijani.ppt.

designed so the benefits and jobs are created in the short term and only after the benefits start flowing not before. This is more important in the present severe crisis. Public investments should also reduce public energy bills and, hence, state and local energy expenditures in the long-term.

Minnesota is already a leader in renewable energy and continuation on this course will create a large number of jobs today and in the coming years - not only for the in-state energy sector, but for export. Minnesota loses nothing by keeping the moratorium in place and simply waiting for a few years to see how the so-called "nuclear renaissance," which relies largely on payments from ratepayers to utilities, plays out elsewhere. If you do proceed in the direction of a repeal, my recommendations are as follows:

- Please take more time to deliberate. A rush to pass a bill in the name of jobs will not result in jobs. A deliberate consideration of the matter would be highly beneficial to a fact-based discourse on the realities that have caused the so-called nuclear renaissance to sputter despite many years of effort, paperwork, and expenditure.
- I strongly recommend that a provision banning ratepayer charges for construction work in progress be added to your legislation, whether you pass a repeal of the moratorium in the near or far future.

Thank you very much for inviting me and I would be happy to answer your questions.