Union of Concerned Scientists

Citizens and Scientists for Environmental Solutions

NUCLEAR POWER:

Still Not Viable without Subsidies

Executive Summary | February 2011

Conspicuously absent from industry press releases and briefing memos touting nuclear power's potential as a solution to global warming is any mention of the industry's long and expensive history of taxpayer subsidies and excessive charges to utility ratepayers. These subsidies not only enabled the nation's existing reactors to be built in the first place, but have also supported their operation for decades.

The industry and its allies are now pressuring all levels of government for large new subsidies to support the construction and operation of a new generation of reactors and fuel-cycle facilities. The substantial political support the industry has attracted thus far rests largely on an uncritical acceptance of the industry's economic claims and an incomplete understanding of the subsidies that made—and continue to make—the existing nuclear fleet possible.

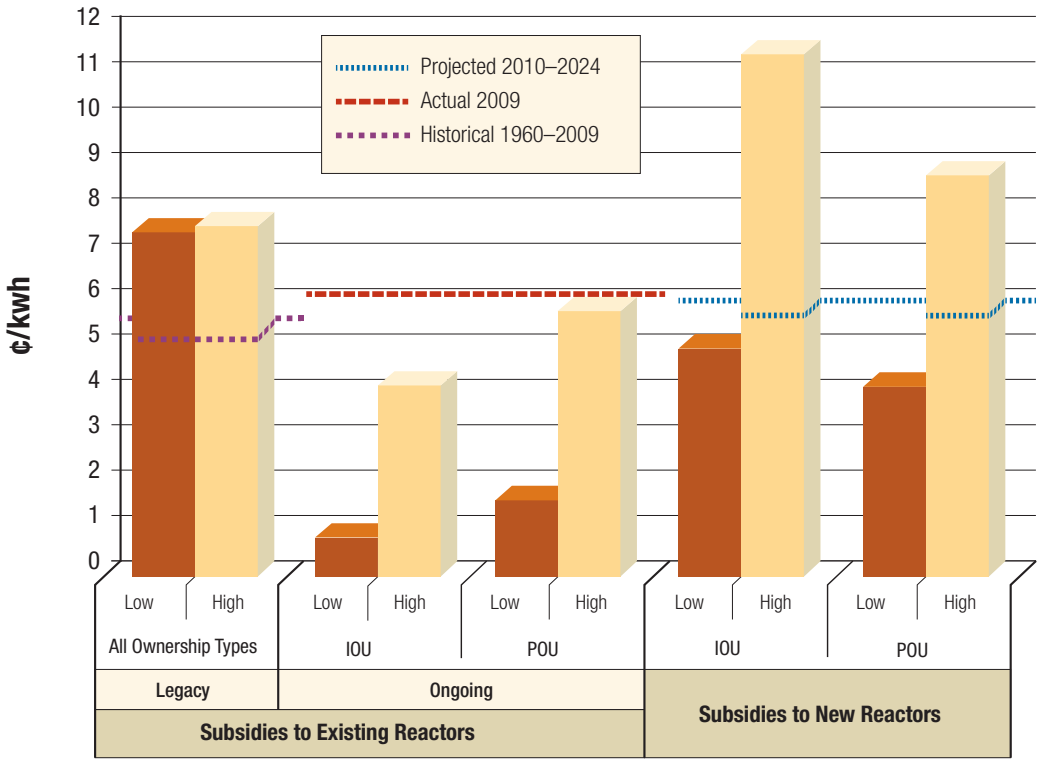
Such blind acceptance is an unwarranted, expensive leap of faith that could set back more cost-effective efforts to combat climate change. A fair comparison of the available options for reducing heat-trapping carbon emissions while generating electricity requires consideration not only of the private costs of building plants and their associated infrastructure but also of the public subsidies given to the industry. Moreover, nuclear power brings with it important economic, waste disposal, safety, and security risks unique among low-carbon energy sources. Shifting these risks and their associated costs onto the public is the major goal of the new subsidies sought by the industry (just as it was in the past), and by not incorporating these costs into its estimates, the industry presents a skewed economic picture of nuclear power's value compared with other low-carbon power sources.

SUBSIDIES OFTEN EXCEED THE VALUE OF THE ENERGY PRODUCED

This report catalogues in one place and for the first time the full range of subsidies that benefit the nuclear power sector. The findings are striking: since its inception more than 50 years ago, the nuclear power industry has benefited—and continues to benefit—from a vast array of preferential government subsidies. Indeed, as Figure ES-1 (p. 2) shows, subsidies to the nuclear fuel cycle have often exceeded the value of the power produced. This means that buying power on the open market and giving it away for free would have been less costly than subsidizing the construction and operation of nuclear power plants. Subsidies to new reactors are on a similar path.

Since its inception more than 50 years ago, the nuclear power industry has benefited—and continues to benefit—from a vast array of preferential government subsidies.

Figure ES-1. Nuclear Subsidies Compared to EIA Power Prices



Note: Legacy subsidies are compared to the Energy Information Administration (EIA) average 1960–2009 industrial power price (5.4 ¢/kWh). Ongoing subsidies are compared to EIA 2009 actual power prices for comparable busbar plant generation costs (5.9 ¢/kWh). Subsidies to new reactors are compared to EIA 2009 reference-case power prices for comparable busbar plant generation costs (5.7 ¢/kWh).

Throughout its history, the industry has argued that subsidies were only temporary, a short-term stimulus so the industry could work through early technical hurdles that prevented economical reactor operation. A 1954 advertisement from General Electric stated that, "In five years—certainly within ten," civilian reactors would be "privately financed, built without government subsidy." That day never arrived and, despite industry claims to the contrary, remains as elusive as ever.

The most important subsidies to the industry do not involve cash payments. Rather, they shift construction-cost and operating risks from investors to taxpayers and ratepayers, burdening taxpayers with an array of risks ranging from cost overruns and defaults to accidents and nuclear waste management. This approach, which has remained remarkably consistent throughout the industry's history, distorts market choices that would otherwise favor less risky investments. Although it may not involve direct cash payments, such favored treatment is nevertheless a subsidy, with a profound effect on the bottom line for the industry and taxpayers alike.

Reactor owners, therefore, have never been economically responsible for the full costs and risks of their operations. Instead, the public faces the prospect of severe losses in the event of any number of potential adverse scenarios, while private investors reap the rewards if nuclear plants are economically successful. For all practical purposes, nuclear power's economic gains are privatized, while its risks are socialized.

Recent experiences in the housing and financial markets amply

demonstrate the folly of arrangements that separate investor risk from reward. Indeed, massive new subsidies to nuclear power could encourage utilities to make similarly speculative, expensive investments in nuclear plants—investments that would never be tolerated if the actual risks were properly accounted for and allocated.

While the purpose of this report is to quantify the extent of past and existing subsidies, we are not blind to the context: the industry is calling for even more support from Congress. Though the value of these new subsidies is not quantified in this report, it is clear that they would only further increase the taxpayers' tab for nuclear power while shifting even more of the risks onto the public.

LOW-COST CLAIMS FOR EXISTING REACTORS IGNORE HISTORICAL SUBSIDIES

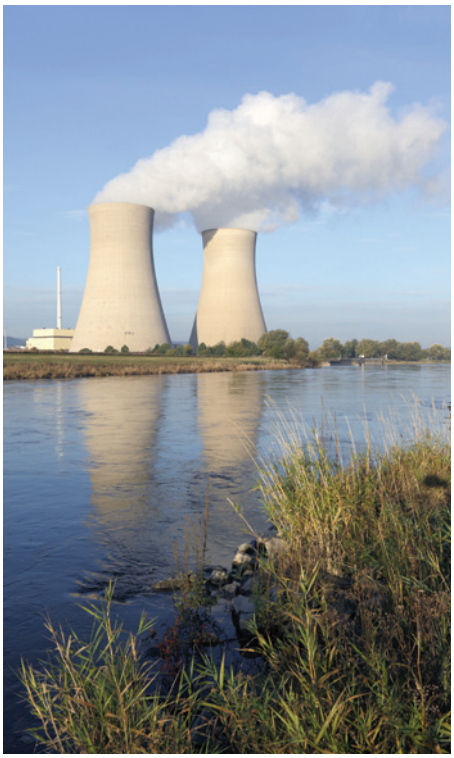
The nuclear industry is only able to portray itself as a low-cost power supplier today because of past government subsidies and write-offs. First, the industry received massive subsidies at its inception, reducing both the capital costs it needed to recover from ratepayers (the "legacy" subsidies that underwrote reactor construction through the 1980s) and its operating costs (through ongoing subsidies to inputs, waste management, and accident risks). Second, the industry wrote down tens of billions of dollars in capital costs after its first generation of reactors experienced large cost overruns, cancellations, and plant abandonments, further reducing the industry's capital-recovery requirements. Finally, when industry restructuring revealed that nuclear power costs were still too high to be competitive, so-called stranded costs were shifted to utility ratepayers, allowing the reactors to continue operating.

These legacy subsidies are estimated to exceed seven cents per kilowatt-hour (¢/kWh)—an amount equal to about 140 percent of the average wholesale price of power from 1960 to 2008, making the subsidies more valuable than the power produced by nuclear plants over that period. Without these subsidies, the industry would have faced a very different market reality—one in which many reactors would never have been built, and utilities that did build reactors would have been forced to charge consumers even higher rates.

ONGOING SUBSIDIES CONTRIBUTE TO NUCLEAR POWER'S PERCEIVED COST ADVANTAGE

In addition to legacy subsidies, the industry continues to benefit from subsidies that offset the costs of uranium, insurance and liability, plant security, cooling water, waste disposal, and plant decommissioning. The value of these subsidies is harder to pin down with specificity, with estimates ranging from a low of 13 percent of the value of the power produced to a high of 98 percent. The breadth of this range largely reflects three main factors: uncertainty over the dollar value of accident liability caps; the value to publicly owned utilities (POUs) of ongoing subsidies such as tax breaks and low return-on-investment requirements; and generous capital

Massive new subsidies to nuclear power could encourage speculative, expensive investments in nuclear plants that would never be tolerated if the actual risks were properly accounted for and allocated.



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Legacy and ongoing subsidies to existing reactors are not sufficient to attract new investment in nuclear infrastructure. Thus an array of new subsidies was rolled out during the past decade, targeting not only reactors but also other fuel-cycle facilities.

subsidies to investor-owned utilities (IOUs) that have declined as the aging, installed capacity base is fully written off.

Our low-end estimate for subsidies to existing reactors (in this case, investor-owned facilities) is 0.7 ¢/kWh, a figure that may seem relatively small at only 13 percent of the value of the power produced. However, it represents more than 35 percent of the nuclear production costs (operation and maintenance costs plus fuel costs, without capital recovery) often cited by the industry's main trade association as a core indicator of nuclear power's competitiveness; it also represents nearly 80 percent of the production-cost advantage of nuclear relative to coal. With ongoing subsidies to POUs nearly double those to IOUs, the impact on competitive viability is proportionally higher for publicly owned plants.

SUBSIDIES TO NEW REACTORS REPEAT PAST PATTERNS

Legacy and ongoing subsidies to existing reactors may be important factors in keeping facilities operating, but they are not sufficient to attract new investment in nuclear infrastructure. Thus an array of new subsidies was rolled out during the past decade, targeting not only reactors but also other fuel-cycle facilities. Despite the profoundly poor investment experience with taxpayer subsidies to nuclear plants over the past 50 years, the objectives of these new subsidies are precisely the same as the earlier subsidies: to reduce the private cost of capital for new nuclear reactors and to shift the long-term, often multi-generational risks of the nuclear fuel cycle away from investors. And once again, these subsidies to new reactors—whether publicly or privately owned—could end up exceeding the value of the power produced (4.2 to 11.4 ¢/kWh, or 70 to 200 percent of the projected value of the power).

It should be noted that certain subsidies to new reactors are currently capped at a specific dollar amount, limited to a specific number of reactors, or available only in specific states or localities. Therefore, although all the subsidies may not be available to each new reactor, the values shown in Figure ES-1 are reasonably representative of the subsidies that will be available to the first new plants to be built. Furthermore, it is far from clear whether existing caps will be binding. Recent legislative initiatives would expand eligibility for these subsidies to even more reactors and extend the period of eligibility during which these subsidies would be available.

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KEY SUBSIDY FINDINGS

Government subsidies have been directed to every part of the nuclear fuel cycle. The most significant forms of support have had four main goals: reducing the cost of

Methodology: How We Estimated Nuclear Subsidies

Identifying and valuing subsidies to the nuclear fuel cycle for this report involved a broad review of dozens of historical studies and program assessments, industry statements and presentations, and government documents. The result is an in-depth and comprehensive evaluation that groups nuclear subsidies by type of plant ownership (public or private), time frame of support (whether the subsidy is ongoing or has expired), and the specific attribute of nuclear power production the subsidy is intended to support.

Plant ownership

Subsidies available to investor-owned and publicly owned utilities are not identical, so were tracked separately.

Time frame of support

The data were organized into:

- **Legacy subsidies**, which were critical in helping nuclear power gain a solid foothold in the U.S. energy sector but no longer significantly affect pricing
- **Ongoing subsidies to existing reactors**, which continue to affect the cost of electricity produced by the 104 U.S. nuclear reactors operating today
- **Subsidies to new reactors**, which are generally provided in addition to the ongoing subsidies available to existing reactors

A further set of subsidies proposed for the nuclear sector but not presently in U.S. statutes is discussed qualitatively but not quantified.

Attribute of production

The following subcategories were modeled on the structure commonly used internationally (as by the Organisation for Economic Cooperation and Development):

- **Factors of production**—subsidies intended to offset the cost of capital, labor, and land
- **Intermediate inputs**—subsidies that alter the economics of key inputs such as uranium, enrichment services, and cooling water
- **Output-linked support**—subsidies commensurate with the quantity of power produced
- **Security and risk management**—subsidies that address the unique and substantial safety risks inherent in nuclear power
- **Decommissioning and waste management**—subsidies that offset the environmental or plant-closure costs unique to nuclear power

To enable appropriate comparisons with other energy options, the results are presented in terms of levelized cents per kilowatt-hour and as a share of the wholesale value of the power produced. Inclusion of industry and historical data sources for some component estimates means that some of the levelization inputs were not transparent. Where appropriate, a range of estimates was used to reflect variation in the available data or plausible assumptions.

capital, labor, and land (i.e., factors of production), masking the true costs of producing nuclear energy ("intermediate inputs"), shifting security and accident risks to the public, and shifting long-term operating risks (decommissioning and waste management) to the public. A new category of subsidy, "output-linked support," is directed at reducing the price of power produced. Table ES-1 (p. 6) shows the estimated value of these subsidies to existing and new reactors. The subsequent sections discuss each type of subsidy in more detail.

A. Reducing the Cost of Capital, Labor, and Land (Factors of Production)

Nuclear power is a capital-intensive industry with long and often uncertain build times that exacerbate both the cost of financing during construction and the market risks

of misjudging demand. Historically, investment tax credits, accelerated depreciation, and other capital subsidies have been the dominant type of government support for the industry, while subsidies associated with labor and land costs have provided lesser (though still relevant) support.

Legacy subsidies that reduced the costs of these inputs were high, estimated at 7.2 ¢/kWh. Ongoing subsidies to existing reactors are much lower but still significant, ranging from 0.06 to 1.94 ¢/kWh depending on ownership structure. For new reactors, accelerated depreciation has been supplemented with a variety of other capital subsidies to bring plant costs down by shifting a large portion of the capital risk from investors to taxpayers.

The total value of subsidies available to new reactors in this category is significant for both POUs and IOUs, ranging from 3.51 to 6.58 ¢/kWh. These include:

- **Federal loan guarantees.** Authorized under Title 17 of the Energy Policy Act (EPACT) of 2005, federal loan guarantees are the largest construction subsidy for new, investor-owned reactors, effectively shifting the costs and risks of financing and building a nuclear plant from investors to taxpayers. The industry's own estimates, which we have used despite large subsequent increases in expected plant costs, place the value of this program between 2.5 and 3.7 ¢/kWh. Total loan guarantees are currently limited to $22.5 billion for new plants and enrichment facilities, but the industry has been lobbying for much higher levels.

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Loan guarantees not only allow firms to obtain lower-cost debt, but enable them to use much more of it—up to 80 percent of the project's cost. For a

Table ES-1. Subsidies to Existing and New Reactors

	Subsidies to Existing Reactors (¢/kWh)			Subsidies to New Reactors (¢/kWh)	
	Legacy	Ongoing			
Subsidy Type	All Ownership Types	IOU	POU	IOU	POU
Factors of production	7.20	0.06	0.96–1.94	3.51–6.58	3.73–5.22
Intermediate inputs	0.10–0.24	0.29–0.51	0.16–0.18	0.21–0.42	0.21–0.42
Output-linked support	0.00	0.00	0.00	1.05–1.45	0.00
Security and risk management	0.21–0.22	0.10–2.50	0.10–2.50	0.10–2.50	0.10–2.50
Decommissioning and waste management	No data available	0.29–1.09	0.31–1.15	0.13–0.48	0.16–0.54
Total	**7.50–7.66**	**0.74–4.16**	**1.53–5.77**	**5.01–11.42**	**4.20–8.68**
Share of power price	139%–142%	13%–70%	26%–98%	84%–190% (high) 88%–200% (reference)	70%–145% (high) 74%–152% (reference)

Note: A range of subsidy values is used where there was a variance in available subsidy estimates. To determine the subsidy's share of the market value of the power produced, legacy subsidies are compared to the Energy Information Administration (EIA) average 1960–2009 industrial power price (5.4 ¢/kWh). Ongoing subsidies are compared to EIA 2009 power prices for comparable busbar plant generation costs (5.9 ¢/kWh). Subsidies to new reactors are compared to EIA 2009 high- and reference-case power prices for comparable busbar plant generation costs (6.0 and 5.7 ¢/kWh, respectively); using the low case would have resulted in even higher numbers.

single 1,600-megawatt (MW) reactor, the loan guarantee alone would generate subsidies of $495 million per year, or roughly $15 billion over the 30-year life of the guarantee.

- **Accelerated depreciation.** Allowing utilities to depreciate new reactors over 15 years instead of their typical asset life (between 40 and 60 years) will provide the typical plant with a tax break of approximately $40 million to $80 million per year at current construction cost estimates. Rising plant costs, longer service lives, and lower capacity factors would all increase the value of current accelerated depreciation rules to IOUs. This subsidy is not available to POUs because they pay no taxes.
- **Subsidized borrowing costs to POUs.** The most significant subsidy available to new publicly owned reactors is the reduced cost of borrowing made possible by municipal bonds and new Build America Bonds, which could be worth more than 3 ¢/kWh.

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- **Construction work in progress.** Many states allow utilities to charge ratepayers for construction work in progress (CWIP) by adding a surcharge to customers' bills. This shifts financing and construction risks (including the risk of cost escalations and/or plants being abandoned during construction) from investors to customers. CWIP benefits both POUs and IOUs and is estimated to be worth between 0.41 and 0.97 ¢/kWh for new reactors.
- **Property-tax abatements.** Support for new plants is also available through state and local governments, which provide a variety of plant-specific subsidies that vary by project.

B. Masking the True Costs of Producing Nuclear Energy (Intermediate Inputs)

A variety of subsidies masks the costs of the inputs used to produce nuclear power. Uranium fuel costs, for example, are not a major element in nuclear economics, but subsidies to mining and enrichment operations contribute to the perception of nuclear power as a low-cost energy source. In addition, the under-pricing of water used in bulk by nuclear reactors has significant cost implications. The value of such legacy subsidies to existing reactors is estimated between 0.10 and 0.24 ¢/kWh, and the value of ongoing subsidies is estimated between 0.16 and 0.51 ¢/kWh. The value of

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such subsidies to new reactors is estimated between 0.21 and 0.42 ¢/kWh. Subsidized inputs include:

- **Fuel.** The industry continues to receive a special depletion allowance for uranium mining equal to 22 percent of the ore's market value, and its deductions are allowed to exceed the gross investment in a given mine. In addition, uranium mining on public lands is governed by the antiquated Mining Law of 1872, which allows valuable ore to be taken with no royalties paid to taxpayers. Although no relevant data have been collected on the approximately 4,000 mines from which uranium has been extracted in the past, environmental remediation costs at some U.S. uranium milling sites actually exceeded the market value of the ore extracted.

- **Uranium enrichment.** Uranium enrichment, which turns mined ore into reactor fuel, has benefited from substantial legacy subsidies. New plants that add enrichment capacity will receive subsidies as well, in the form of federal loan guarantees. Congress has already authorized $2 billion in loan guarantees for a new U.S. enrichment facility, and the Department of Energy has allocated an additional $2 billion for this purpose. While we could not estimate the per-kilowatt-hour cost of this subsidy because it depends on how much enrichment capacity is built, the $4 billion represents a significant new subsidy to this stage of the fuel cycle.
- **Cooling water.** Under-priced cooling water is an often-ignored subsidy to nuclear power, which is the most water-intensive large-scale thermal energy technology in use. Even when the water is returned to its source, the large withdrawals alter stream flow and thermal patterns, causing environmental damage. Available data suggest that reactor owners pay little or nothing for the water consumed, and are often given priority access to water resources—including exemption from drought restrictions that affect other users. While we provide a low estimate of water subsidies (between $600 million and $700 million per year for existing reactors), more work is needed to accurately quantify this subsidy—particularly as water resources become more constrained in a warming climate.

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C. Reducing the Price of Power Produced (Output-Linked Support)

Until recently, subsidies linked to plant output were not a factor for nuclear power. That changed with the passage of EPACT in 2005, which granted new reactors an important subsidy in the form of:

- **Production tax credits (PTCs).** A PTC will be granted for each kilowatt-hour generated during a new reactor's first eight years of operation; at present, this credit is available only to the first plants to be built, up to a combined total capacity of six gigawatts. While EPACT provides a nominal PTC of 1.8 ¢/kWh, payments are time-limited. Over the full life of the plant, the PTC is worth between 1.05 and 1.45 ¢/kWh. Under current law, PTCs are not available to POUs (since POUs do not pay taxes), but there have been legislative efforts to enable POUs to capture the value of the tax credits by selling or transferring them to other project investors that do pay taxes.

D. Shifting Security and Accident Risks to the Public (Security and Risk Management)

Subsidies that shift long-term risks to the public have been in place for many years. The Price-Anderson Act, which caps the nuclear industry's liability for third-party damage to people and property, has been a central subsidy to the industry for more than half a century.

Plant security concerns have increased significantly since 9/11, and proliferation risks will increase in proportion to any expansion of the civilian nuclear sector (both in the United States and abroad). The complexity and lack of data in these areas made it impossible to quantify the magnitude of security subsidies for this analysis. But it is clear that as the magnitude of the threat increases, taxpayers will be forced to bear a greater share of the risk. Subsidies that shift these risks are associated with:

- **The Price-Anderson Act.** This law requires utilities to carry a pre-set amount of insurance for off-site damages caused by a nuclear plant accident, and to contribute to an additional

The Industry's Shopping List: New Subsidies Under Consideration

The following nuclear subsidies, as proposed in the American Power Act (APA) and the American Clean Energy Leadership Act (ACELA), would not necessarily be available to every new reactor, but their collective value to the industry would be significant:

- A clean-energy bank that could promote nuclear power through much larger loans, letters of credit, loan guarantees, and other credit instruments than is currently possible
- Tripling federal loan guarantees available to nuclear reactors through the Department of Energy, from $18.5 billion to $54 billion
- Reducing the depreciation period for new reactors from 15 years to five
- A 10 percent investment tax credit for private investors or federal grants in lieu of tax payments to publicly owned and cooperative utilities
- Expanding the existing production tax credit from 6,000 to 8,000 megawatts, and permitting tax-exempt entities to allocate their available credits to private partners
- Permitting tax-exempt bonds to be used for public-private partnerships, which would allow POUs to issue tax-free, low-cost bonds for nuclear plants developed jointly with private interests
- Expanding federal regulatory risk insurance coverage from $2 billion to $6 billion (up to $500 million per reactor), which would further shield plant developers from costs associated with regulatory or legal delays

pool of funds meant to cover a pre-set portion of the damages. However, the law limits total industry liability to a level much lower than would be needed in a variety of plausible accident scenarios. This constitutes a subsidy when compared with other energy sources that are required to carry full private liability insurance, and benefits both existing and new reactors.

Only a few analysts have attempted to determine the value of this subsidy over its existence, with widely divergent results: between 0.1 and 2.5 ¢/kWh. More work is therefore needed to determine how the liability cap affects plant economics, risk-control decisions, and risks to the adjacent population.

- **Plant security.** Reactor operators must provide security against terrorist attacks or other threats of a certain magnitude, referred to as the "design basis threat." For threats of a greater magnitude (a larger number of attackers, for example), the government assumes all financial responsibility, which constitutes another type of subsidy. It is difficult to quantify the value of this taxpayer-provided benefit because competing forms of energy do not carry similar risks. But it is important that plant security costs be reflected in the cost of power delivered to consumers, rather than supported by taxpayers in general.
- **Proliferation.** The link between an expanded civilian nuclear sector and proliferation of nuclear weapons or weapons technology is fairly widely accepted. It is also consistently ignored when assessing plant costs—much as investors in coal plants ignored the cost of carbon controls until recently. Though quantifying proliferation costs may be difficult, assuming they are zero is clearly wrong. These ancillary impacts should be fully assessed and integrated into the cost of nuclear power going forward.

E. Shifting Long-Term Operating Risks to the Public (Decommissioning and Waste Management)

The nuclear fuel cycle is unique in the types of long-term liabilities it creates. Reactors and fuel-cycle facilities have significant end-of-life liabilities associated with the proper closure, decommissioning, and decontamination of facilities, as well as the safe management of nuclear waste over thousands of years. The industry has little operational experience with such large and complex undertakings, greatly increasing the likelihood of dramatic cost overruns. In total, the subsidies that shift these long-term operating risks to the public amount to between 0.29 and 1.09 ¢/kWh for existing reactors and between 0.13 and 0.54 ¢/kWh for new reactors. The specific subsidies that do the shifting are associated with:

- **Nuclear waste management.** The federal Nuclear Waste Repository for spent fuel is expected to cost nearly $100 billion over its projected operating life, 80 percent of which is attributed to the power sector. A congressionally mandated fee on nuclear power consumers, earmarked for the repository, has collected roughly $31 billion in waste-disposal fees through 2009. There is no mechanism other than investment returns on collections to fully fund the repository once reactors close.

  The repository confers a variety of subsidies to the nuclear sector. First, despite its complexity and sizable investment, the repository is structured to operate on a break-even basis at best, with no required return on investment. Second, utilities do not have to pay any fee to secure repository capacity; in fact, they are allowed to defer payments for waste generated prior to the repository program's creation, at interest rates well below their cost of capital. Third, the significant risk of delays and cost overruns will be borne by taxpayers rather than the program's beneficiaries. Delays in the repository's opening have already triggered a rash of lawsuits and taxpayer-funded waste storage at reactor sites, at a cost between $12 billion and $50 billion.

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- **Plant decommissioning.** While funds are collected during plant operation for decommissioning once the plant's life span has ended, reduced tax rates on nuclear decommissioning trust funds provide an annual subsidy to existing reactors of between $450 million and $1.1 billion per year. Meanwhile, concerns persist about whether the funds accrued will be sufficient to cover the costs; in 2009, the Nuclear Regulatory Commission (NRC) notified the operators of roughly one-quarter of the nation's reactor fleet about the potential for insufficient funding. We did not quantify the cost of this potential shortfall.

CONCLUSIONS AND POLICY RECOMMENDATIONS

Historical subsidies to nuclear power have already resulted in hundreds of billions of dollars in costs paid by taxpayers and ratepayers. With escalating plant costs and more competitive power markets, the cost of repeating these failed policies will likely be even higher this time around. Of equal importance, however, is the fact that subsidies to nuclear power also carry significant opportunity costs for reducing global warming emissions because reactors are so expensive and require such long lead times to construct. In other words, massive subsidies designed to help underwrite the large-scale expansion of the nuclear industry will delay or diminish investments in less expensive abatement options.

Other energy technologies would be able to compete with nuclear power far more effectively if the government focused on creating an energy-neutral playing field rather than picking technology winners and losers. The policy choice to invest in nuclear also carries with it a risk unique to the nuclear fuel cycle: greatly exacerbating already thorny proliferation challenges as reactors and ancillary fuel-cycle facilities expand throughout the world.

As this report amply demonstrates, taxpayer subsidies to nuclear power have provided an indispensable foundation for the industry's existence, growth, and survival. But instead of reworking its business model to more effectively manage and internalize its operational and construction risks, the industry is pinning its hopes on a new wave of taxpayer subsidies to prop up a new generation of reactors.

Future choices about U.S. energy policy should be made with a full understanding of the hidden taxpayer costs now embedded in nuclear power. To accomplish this goal, we offer the following recommendations:

- **Reduce, not expand, subsidies to the nuclear power industry**. Federal involvement in energy markets should instead focus on encouraging firms involved in nuclear power—some of the largest corporations in the world—to create new models for internal risk pooling and to develop advanced power contracts that enable high-risk projects to move forward without additional taxpayer risk.
- **Award subsidies to low-carbon energy sources on the basis of a competitive bidding process across all competing technologies.** Subsidies should be awarded to those approaches able to achieve emissions reductions at the lowest possible cost per unit of abatement—not on the basis of congressional earmarks for specific types of energy.
- **Modernize liability systems for nuclear power.** Liability systems should reflect current options in risk syndication, more robust requirements for the private sector, and more extensive testing of the current rules for excess risk concentration and counterparty risks. These steps are necessary to ensure coverage will actually be available when needed, and to send more accurate risk-related price signals to investors and power consumers.
- **Establish proper regulation and fee structures for uranium mining.** Policy reforms are needed to eliminate outdated tax subsidies, adopt market-level royalties for uranium mines on public lands, and establish more appropriate bonding regimes for land reclamation.
- **Adopt a more market-oriented approach to financing the Nuclear Waste Repository.** The government should require sizeable waste management deposits by the industry, a repository fee structure that earns a return on investment at least comparable to other large utility projects,

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and more equitable sharing of financial risks if additional delays occur.

- **Incorporate water pricing to allocate limited resources among competing demands, and integrate associated damages from large withdrawals.** The government should establish appropriate benchmarks for setting water prices that will be paid by utilities and other consumers, using a strategy that incorporates ecosystem damage as well as consumption-based charges.
- **Repeal decommissioning tax breaks and ensure greater transparency of nuclear decommissioning trusts (NDTs).** Eliminating existing tax breaks for NDTs would put nuclear power on a similar footing with other energy sources. More detailed and timely information on NDT funding and performance should be collected and publicized by the NRC.
- **Ensure that publicly owned utilities adopt appropriate risk assessment and asset management procedures.** POUs and relevant state regulatory agencies should review their internal procedures to be sure the financial and delivery risks of nuclear investments are appropriately compared with other options.
- **Roll back state construction-work-in-progress allowances and protect ratepayers against cost overruns by establishing clear limits on customer exposure.** States should also establish a refund mechanism for instances in which plant construction is cancelled after it has already begun.
- **Nuclear power should not be eligible for inclusion in a renewable portfolio standard.** Nuclear power is an established, mature technology with a long history of government support. Furthermore, nuclear plants are unique in their potential to cause catastrophic damage (due to accidents, sabotage, or terrorism); to produce very long-lived radioactive wastes; and to exacerbate nuclear proliferation.
- **Evaluate proliferation and terrorism as an externality of nuclear power.** The costs of preventing nuclear proliferation and terrorism should be recognized as negative externalities of civilian nuclear power, thoroughly evaluated, and integrated into economic assessments—just as global warming emissions are increasingly identified as a cost in the economics of coal-fired electricity.
- **Credit support for the nuclear fuel cycle via export credit agencies should explicitly integrate proliferation risks and require project-based credit screening.** Such support should require higher interest rates than those extended to other, less risky power projects, and include conditions on fuel-cycle investments to ensure the lending does not contribute to proliferation risks in the recipient country.

The full text of this report is available on the UCS website at *www.ucsusa.org/nuclear_power*.

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