



PROTECTING THE CONSUMER: THE ECONOMICS OF NEW NUCLEAR ENERGY

A UniStar Issue Brief



Safe. Clean. Reliable. Secure.

Americans want the nation's electricity supply to be all of these things. And, when it comes to new nuclear energy, it's all true. However, there is still a critical missing element: affordability. For new nuclear energy investments to be fully embraced by the public, the cost must both be fair and be understood as fair.

What is fair? Put simply, it means ratepayers pay no more for electricity with a new nuclear energy facility in the generation mix than they would have paid with another alternative. Construction of a new nuclear energy facility is more expensive than many alternatives, because we value safety, reliability, and environmental protection. However, nuclear energy facilities are less expensive to operate, produce a large amount of power 24 hours a day, seven days a week, and run reliably for many decades. By telling the whole story we can show that new nuclear generation is one of the least expensive sources of electricity to the consumer.

CALCULATING THE COST OF ELECTRICITY

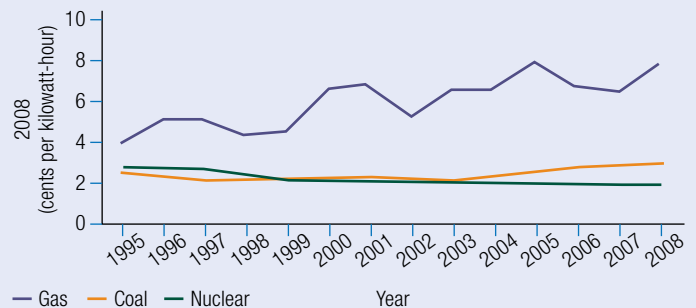
The cost of supplying electrical capacity to the grid has several components. The first is the cost of constructing the generation facility, including the costs of labor, equipment, materials, and owner's costs, plus interest to cover project financing. Construction costs are recovered over the projected life of the facility as a cost per unit of electricity generated.

However, the total cost of the electricity generated includes two additional costs: fuel, and operation and maintenance of the facility.

The present and future costs of fuel are major factors in predicting generating costs. For a nuclear facility, the fuel costs are only 20 percent of the total generation costs, but for coal and natural gas plants, fuel costs are 45 percent and 80 percent of the total generating costs, respectively.¹ The variability and predictability of fuel costs are critical considerations in predicting

U.S. Electricity Production Costs²

Excludes construction costs.



consumers' costs. In addition, when intermittent sources of generation are used, solar or wind for example, which only run when the sun is shining or the wind blowing, the customers must also bear the cost of additional backup capacity, such as natural gas with its high fuel costs.



Finding the Balance

Costs of electrical generation include the costs of construction and finance; operation and maintenance; and fuel appropriate to the facility.

Between high capital with low operating cost and low capital with high operating cost, the choice often depends on where you think the cost of fuel is headed in the long term.

After making assumptions about fuel prices, capacity factors, availability, and so forth, an estimate of the actual cost of electricity produced by the facility is made, usually expressed in \$/kWh (dollars per 1,000 watt hours).

New World Records

October 26, 2009: Three Mile Island Unit 1, near Harrisburg, Pa., achieves 705 days of continuous operation, passing Calvert Cliffs' previous record of 692 days.³

In 2008, U.S. nuclear energy facilities achieved half of the top 50 capacity factors among the world's 439 nuclear energy facilities.⁴

ALL MEGAWATTS ARE NOT CREATED EQUAL

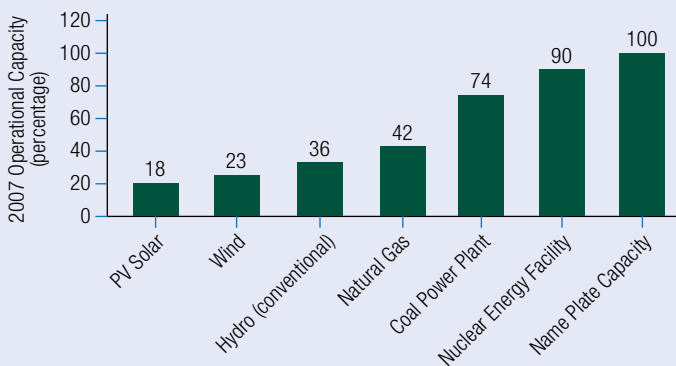
All generating facilities have a name plate capacity, the nominal maximum output of the facility. However, no electrical generating facility can produce power at 100 percent of its nameplate capacity indefinitely. A capacity factor accounts for this difference so that different types of generation can be fairly compared. The capacity factor is the total energy the facility produced over time divided by the energy the plant would have produced had it run at full capacity for the same period. Capacity factors vary widely for different sources of electrical power—from 90 percent for nuclear to 20 percent for wind turbines.

SETTING THE CONSUMER PRICE

Predicting the price to the customer is more complicated than just knowing the cost of generation.

Generating costs account for only 67 percent of the costs of supplying electricity to the final consumer. Distribution costs are another 26 percent, and transmission accounts for the final seven percent.⁵ These final two categories comprise the costs of operating the utilities and maintaining the electrical grid, the complex of transmissions lines and interconnections that move electricity from generator to user. New generation built far from where the power is needed will have added costs, if new or upgraded transmission lines are required.

Capacity Factors by Energy Source



The wholesale price of electricity varies continuously, depending on the generation sources available, the level of demand, fuel costs, changes in weather conditions, and the status of individual facilities. Rates differ by type of customer, quantity contracts, and the voltage at which the customer takes power from the grid, with most household consumers paying a seasonal rate.

Another important factor in determining the price paid for electricity is whether the supplier is a regulated or merchant utility. For a regulated utility, the rate is set by a Public Service Commission, which will consider the costs of supplying the

Source: "Average Capacity Factors by Energy Source, 1996 through 2007 (percent)," *Electric Power Annual 2007*. Energy Information Administration. January 2009.

electricity and a reasonable rate of return for the owner/investors. If a regulated utility wants to build new generating capacity, the costs for construction will usually not be added to the rate base for recovery until after the unit goes into operation. In some cases, financing costs for “construction work in progress” (CWIP) may be recovered during construction. Otherwise, interest and other financing costs are accumulated as “allowance for funds used during construction” (AFUDC). The AFUDC is then added to the rate base on facility completion, resulting in a large price increase and consumer rate shock at that time.⁶

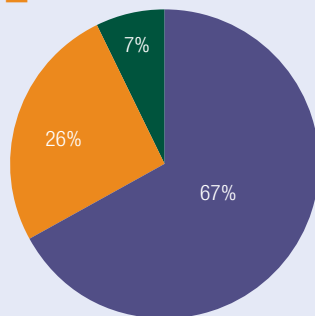
If a merchant utility builds new generating capacity, the costs and risk of constructing the facility are borne entirely by the owner/investors. They will not recover any of this investment until the completed unit goes into operation. Unless specified in a contract, the cost charged by a merchant utility for its electricity is determined by the incremental cost of adding electrical capacity to the grid at the time of the purchase.⁷ Since nuclear generation has a very low incremental cost for generation, it is usually placed on-line first.

Generating units brought on line to cover peak demand (“Peakers”) are usually the most expensive units per kilowatt generated. As generating facilities with increasingly higher incremental costs are brought on-line to meet demand, nuclear energy generation shows a higher and higher operating margin.

To accurately predict consumer prices in new generation scenarios, industry experts must apply complex models and assumptions.

U.S. Electricity Cost Components

■ Generation ■ Transmission
■ Distribution



Electricity Price Influencers

Supply Side Price Movers

- Type of Sources in Portfolio
- Type of Sources Available
- Wind and Sun Conditions
- Fuel Prices
- Need for Peakers



Other Price Movers

- Regulatory Rate Structure
- Contract Service Rates

Demand Side Price Movers

- Temperature Conditions
- Time of Day
- Day of Week
- Competition
- Locale

Average Retail Price of Electricity by State, 2007

State	Average Price (¢/kW-h)	State	Average Price (¢/kW-h)
AK	13.28	AL	7.57
AR	6.96	AZ	8.54
CA	12.80	CO	7.76
CT	16.45	DC	11.79
DE	11.35	FL	10.33
GA	7.86	HI	21.29
IA	6.83	ID	5.07
IL	8.46	IN	6.50
KS	6.84	KY	5.84
LA	8.39	MA	15.16
MD	11.50	ME	14.59
MI	8.53	MN	7.44
MO	6.56	MS	8.03
MT	7.13	NC	7.83
ND	6.42	NE	6.28
NJ	13.01	NM	7.44
NV	9.99	NY	15.22
OH	7.91	OK	7.29
PA	9.08	RI	3.12
SC	7.18	SD	6.89
TN	7.07	TX	10.11
UT	6.41	VA	7.12
VT	12.04	WA	6.37
WI	8.48	WV	5.34
WY	5.29		

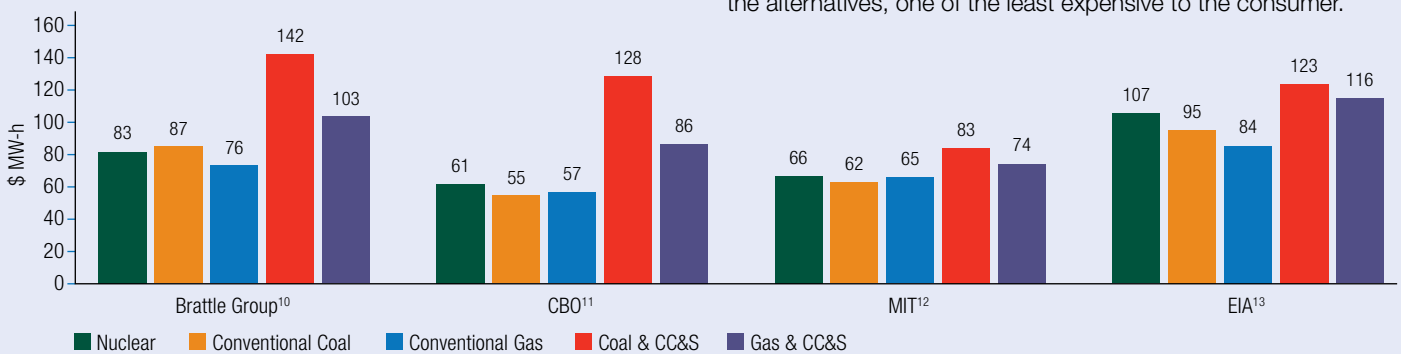
Source: Energy Information Administration, Form EIA-861. “Annual Electric Power Industry Report.”

BY THE NUMBERS

Nuclear energy is already cost competitive. It's true today, and will only become more so in the future. Compared to conventional fossil fuels, nuclear energy becomes more competitive as the probable costs for improving energy security, cutting harmful air pollution, and reducing carbon emissions from fossil fuel combustion sources are factored in.

Numerous studies comparing nuclear energy to coal and gas scenarios have been performed by utilities, the Nuclear Energy Institute (NEI), and independent entities such as the Congressional Budget Office and Massachusetts Institute of Technology (MIT). (See chart below.) All show similar results. Natural gas can have the lowest generating cost, if you assume high uranium prices, stable low gas prices, and no carbon reduction costs. All other scenarios show nuclear generation to be competitive or to have lowest cost.

Levelized Costs of New Baseload Generation (2008)



LOOKING TO THE FUTURE: CALVERT CLIFFS 3

In 2009 hearings before the Maryland Public Service Commission (PSC), independent experts hired by the PSC staff testified on the possible effects on BG&E ratepayers of building a third nuclear unit at Calvert Cliffs Nuclear Power Plant in Lusby, Md.

Looking only at reduced electricity cost to the consumer, these experts concluded that over the first eight years of operation, BG&E customers would save an average of \$141 million annually⁸ by purchasing electricity from a new Calvert Cliffs Unit 3 (CC3). Other experts testified that, over this same period, Maryland consumers would collectively realize between \$1.1 and \$1.6 billion in benefits if CC3 were built.⁹

In summary, yes, if you look only at construction costs, nuclear energy facilities look like a more expensive investment. But as a result, new nuclear energy is safe, clean, green, reliable and secure. And, as we can see from looking at the complete picture, nuclear energy is not just affordable. It's not just fair. It is exactly the kind of energy source Americans want—and compared to the alternatives, one of the least expensive to the consumer.



If you want to look closer at the research behind the information in this publication, please visit our web site at www.unistarnuclear.com. There you will find an annotated version of this Issue Brief with links to the original research and other data behind this publication as well as all of the other publications in the Issue Briefs series.

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This UniStar Issue Brief is a publication of UniStar Nuclear Energy, a joint venture of Constellation Energy and EDF Group. It is one in a series of Issue Briefs presenting information and interpretation on important issues surrounding the growth of electrical generation in the United States. UniStar and its partners are working to meet future energy needs with a new generation of nuclear generating facilities, the most effective combination of clean, reliable, and environmentally-friendly electrical production. We have confidence that an informed public armed with the facts behind our energy options will support increasing the role of nuclear generation for meeting the nation's future electricity demand. The Issue Briefs series is just one part of UniStar's efforts to keep the public fully informed. ©2009 UniStar Nuclear Energy. All rights reserved.

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