House Public Utilities Committee

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TESTIMONY OF JANINE L. MIGDEN-OSTRANDER
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BEFORE THE HOUSE PUBLIC UTILITIES COMMITTEE
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Good morning. I am Janine Migden-Ostrander, the Consumers' Counsel for the State of Ohio, representing all of Ohio's 4.5 million residential households. As the representative of the largest stakeholder in this process, I would like to thank Chairman Hagan and the Public Utilities Committee for having a series of panels to explore the views and expertise of stakeholders as Ohio's energy policy legislation is considered.

The energy future for The United States at large and Ohio specifically is the "Sleeping Giant." The decisions made today will impact the affordability and availability of reliable supplies of energy in a global marketplace to meet our growing needs. Creating an environment that not only fosters, but *requires* the development of energy efficiency and renewable energy is the single most important aspect of this legislative debate. My clients are your constituents. We hear that they are very concerned about their cost of living issues: providing for their families, keeping their jobs, managing health care costs, maintaining a home and having reliable and affordable utility services. We also hear a growing concern about global warming, the environment and the desire for an energy policy that balances the needs of Ohioans with responsible stewardship.

As you are making decisions on energy policy and look toward ways to achieve the lowest rate with reliable service through renewable energy, energy efficiency, and other methods, I want to remind you of a few statistics to help demonstrate the predicament facing our state and the nation.

- There are approximately 67 years of economically recoverable supplies of natural gas left in North America. Nevertheless, the reliance on natural gas to fuel power plants is increasing – projected at 24 percent regionally by 2010 as opposed to 11 percent in 2000.

- Natural gas prices have more than doubled in the last several years and as the United States seeks supplies of natural gas from overseas, we will be competing with Europe and emerging countries like China and India for supplies from countries like Venezuela, Algeria and Nigeria. Even absent the competition for natural gas itself, it must be recognized that shipping liquefied natural gas across the ocean to the United States is not an inexpensive proposition.

- Worldwide demand for electricity is expected to double by 2030. The growth in electricity demand in the United States is projected to increase by 40 percent by 2030.Just as the cost of natural gas will continue to rise as more countries compete for diminishing supplies, the cost for coal fired plants will increase dramatically as well, due to environmental compliance with some form of Greenhouse Gas (GHG) regulation and other existing regulations. We are already

seeing significant increases in the cost of electricity to comply with the Clean Air Interstate Regulations (CAIR) and the Clean Air Mercury Regulations (CAMR) that are well into the billions of dollars for Ohio utilities.

- The price of new nuclear plants is estimated at or around $3.2 billion at 800 MW – a high price tag; however, that may very well be an optimistic projection. Remember when they said that nuclear would be too cheap to meter? Also recall the cost of First Energy's Beaver Valley and Perry Nuclear Power Plants that came in at a cost of $4.6 billion and $6.0 billion respectively back in the 1980's. Nor should we forget the construction history of the Zimmer Nuclear Power Plant that was 97% complete and had to be converted to a coal-fired plant. That plant, which came on line eighteen years behind schedule, cost customers $3.7 billion, not to mention over $800 million in write-offs by the three utilities, Cincinnati Gas and Electric Company (now Duke-Ohio) Columbus Southern Ohio Electric Company (now Columbus Southern Power) and Dayton Power and Light Company. Moreover, these costs do not factor in the cost of disposal and that nationally, we have been wrestling with nuclear disposal issues for a long time with no resolution at hand.

- The price of oil has continued to rise reaching over $100 per barrel, approximately twice the cost of just a few years ago.

Beyond all these statistics, we are faced with a political reality in Washington that makes addressing renewable energy and energy efficiency at the state level crucial. It is all but certain that carbon regulations will be adopted that will disproportionately impact states like Ohio due to our reliance on fossil fuels, particularly coal.

OCC has serious concerns regarding the specter of increasing residential electricity bills due to future distribution infrastructure upgrades; generation capital cost inflation,[1] existing and future environmental regulations and increasing fuel costs and is therefore very interested in promoting programs and policies that mitigate those increases. Duke Energy Chairman James Rogers highlighted this concern recently when he stated that his company's analysis of the Lieberman-Warner carbon mitigation bill indicates that if signed into law, it "would raise rates from 20 to 50 percent in Duke's Ohio service territory." [2] This is in addition to current electricity generation cost increases to meet the mercury and sulfur dioxide (SO_2) and nitrogen oxides (NO_X) limits in the Clean Air Interstate Rules and Clean Air Mercury Rule.[3]

Ohio is not alone in having to deal with this reality, but – candidly – we are late to arrive at taking action steps. Half of the states have a renewable portfolio standard, while approximately a third of the states are regulating carbon emissions. When it comes to energy efficiency, Ohio is also lacking as indicated in **Attachment 1**.

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[1] The Handy-Whitman Index, which tracks the costs of steam-generation plant, transmission projects and distribution equipment rose by 25 percent to 35 percent (compared to an 8 percent increase in the GDP deflator) between the years 2004 - 2007. See M. W. Chupka and G. Basheda, "Rising Utility Construction Costs: Sources and Impacts", September 2007, The Brattle Group, page 2.

[2] Comment in response to Representative Question on December 12, 2007, before the House Public Utilities Subcommittee concerning substitute Senate Bill 221.

[3] See http://www.ncsl.org/programs/environ/air/EPAairrule.htm for a summary of the rules.

Meanwhile, research has shown that the alternatives we can pursue – especially over the next 15 years – position energy efficiency and renewable energy as attractive options and a necessary way to diversify how we produce electricity.

Some utilities have decided to go down the path of an Integrated Gasification Combined Cycle (IGCC) project to turn coal into gas, which is then used to produce electricity. The Office of the Ohio Consumers' Counsel (OCC) supports clean coal technology and specifically believes that this technology has long-term potential. However, a significant number of IGCC projects have been shelved or stalled in recent months (See **Attachment 2**).

Developers and utilities have been unable to justify IGCC investments in the context of spiraling capital costs, lack of satisfactory technology performance guarantees, unavailability of lump sum turnkey contracts, and an uncertain carbon policy environment.

The price tag associated with IGCC projects is escalating. IGCC plants have seen a 100% increase in capital cost estimates since 2004, making current estimates unreliable. In 2004 capital cost estimates for building next generation full-scale IGCC plants were coming in around $1,600 per kilowatt. In 2007, estimates for utility-scale IGCC plants in development are ranging between $3,200 and $3,400 per kilowatt. We saw this same phenomenon here in Ohio when AEP proposed an IGCC at $1.2 billion and in a year's time, the price tag had doubled. This is without the Carbon Capture and Sequestration which is vital for addressing the carbon dioxide emissions.

Moreover, the National Coal Council – of which I am a member – has researched the coal-based alternatives such as IGCC, including the factor of carbon emission restrictions. According to a June report by the Council, the ability for carbon capture and storage (CCS) to be utilized will take 15 to 25 years to mature. Comparing carbon sequestration with the technology developed for reducing SO_2 and NO_X, the report found,

> "A maturation curve for CCS technologies will similarly take time. Although some CCS technologies are commercial at a smaller scale in other industries, these require substantial re-engineering and scale-up for power applications. Other promising novel CCS technologies are in their infancy. Based on advances to date, however, accelerated technical and financial support could make a suite of these technologies available within the next 15 years. Commercial maturity could take an additional decade. CCS technology development can be expedited, but not willed into existence overnight by changes in policy[4]."

Due to these factors, the OCC suggests that energy efficiency and renewable energy projects be put on the front burner, which would provide time for the ongoing research to

[4] National Coal Council, Technologies to Reduce or Capture and Store Carbon Dioxide Emissions. June 2007

bring large-scale carbon sequestration from theory to reality. There is an abundance of "low hanging fruit" when it comes to energy efficiency since this state has done little over the last decade to capture all the benefits and savings that can accrue. Therefore, a sensible – and least cost plan – for meeting our energy needs would be to embark on extensive energy efficiency and renewable energy development and defer construction of new IGCC's until the CCS technology is available. Coupled with this, would be to implement interconnection, net-metering and standby rates that will foster the development of self-generation.

In November 2007, Ohio addressed both renewable energy and energy efficiency when Governor Strickland signed onto the Midwest Governors Association's Energy Security and Climate Change Platform.

For renewable electricity, the platform pledges to ensure that by 2030, 30 percent of electricity consumption in the region will be from renewable resources.

Realizing our potential, Ohio and the other Midwest states have taken on the challenge of setting goals for renewable energy and energy efficiency. Policymakers should keep this regional commitment in mind and ensure that Ohio does its part to meet these goals.

The OCC has several recommendations that I believe would enhance the future of renewable energy and energy efficiency in Ohio.

Achieving comprehensive renewable portfolio standards

For several years, our agency has been advocating for renewable portfolio standards. By using solar, wind, biomass and other sources of renewable energy, less dependence is created for fossil fuels and other forms of energy that can generate pollution and create other waste that must be dealt with because of the environmental impact. Carbon dioxide and nuclear waste, by-products of most of the energy used today, is costly to clean up and reduce. The cost for using renewable energy is less in the long run than having to reduce or dispose of the traditional by-products nor are there the safety or security issues associated with nuclear power that concern many consumers. Moreover, as noted above, while the cost of fuel for fossil fuel generation continues to rise, the cost of fuel to power renewable energy facilities is free.

In August, Illinois became one of the most recent states to sign a renewable standard into law. The Illinois standard requires utilities to produce 25 percent of its power from renewable resources by 2025.

Contrary to what others have testified before this committee, many states have even deemed it necessary to increase their renewable portfolio standards as they have met or exceeded what was originally signed into law. As of August 2007, as many as seven states had expanded their previous renewable portfolio standard. These states include

Connecticut, Delaware, Maryland, New Jersey, Nevada, Texas and Wisconsin. See **Attachment 3**.

With respect to Sub. S.B. 221, the OCC recommends increased standards, benchmarks, and penalties. Improvements to the legislation are necessary to ensure that Ohio begins to tap into its potential for producing energy from the wind and sun as well as through biomass.

Imagine if we were able to turn our ever-increasing landfills into positive benefits for our state. In fact, it is estimated that six megawatts of electricity can be produced from the typical landfill, with high reliability and availability.

With regard to solar power, an important element is the storage potential. Traditionally, electricity is thought of as a commodity that needs to be used right away, or it is lost. Gains are being made that allow electricity to be stored for later use, meaning that we will soon be able to take full advantage of those days when the sun is shining.[5]

As an example of how one community has tapped into its renewable potential, let's take a closer look at Bowling Green's wind projects.

Bowling Green is home to Ohio's first utility-sized wind farm. There are four turbines that are 257 feet tall. These turbines, which are as tall as a 30-story building, (approximately the height of the Riffe tower) generate up to 7.2 megawatts of power – enough to supply electricity for some 3,000 residents. Located about six miles from the city, the turbines have become a local attraction. Wind generating capacity nearly seven times that amount located at the Wood County Landfill could be a reality near Bowling Green by the end of 2009. [6]

It is important that we recognize that renewable power projects can be a "triple play" because they avoid environmental risks, provide among the lowest cost electricity options and produce economic development benefits.

All methods to produce electricity have their "pros" and "cons," their costs and their benefits. (See **Attachment 4** for a matrix of the different attributes of generation fuels). That is the reason why Ohio must diversify its production methods in order to mitigate the risks and put us on solid ground for the future. Our state's geography and its wind currents vary throughout the state, so we can site wind projects where studies have already shown there is tremendous untapped energy potential. Just as we drill where we know there is coal, we can build turbines where we know the winds will help generate the most power.

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[5] For distribution support and improved reliability AEP has committed to have at least 25 megawatts of sodium sulfur battery capacity in place by the end of this decade and the company hopes to add another 1,000 megawatts of advanced storage technology in the next 10 years. See "Betting on Batteries", Energy Biz Insider, 12/26/07, http://www.energycentral.com/site/newsletters/ebi.cfm?id=437.

[6] See "More Wind Turbines near BS Planned", Bowling Green Sentinel-Tribune, May 11, 2007.

There are also some myths about renewable power that should be explained. For example, although wind turbines may be idle due to a lack of wind at times of a utility's peak demand, there is a statistical probability that they will be available, especially if there are multiple turbines dispersed geographically. Early integration studies were overly cautious on maximum penetration levels partly because they assumed that all wind turbines would experience the same wind velocity at the same time. See **Attachment 5**. Another important thing to keep in mind is that since wind is primarily an energy – not a capacity – source, no additional generation needs to be added to provide back-up capability provided that wind capacity is properly discounted in the determination of generation capacity adequacy. Moreover, the December 5, 2007 Stanford report suggests that interconnecting wind farms within a geographic area can result in an average of 33 percent and a maximum of 47 percent of yearly averaged wind power which can be used as reliable baseload electric power.

There has been talk of wind energy supply chain and delivery bottlenecks. A recent analysis does suggest a near-term deficit in renewable electricity supplies. However, the study results do not necessarily portend a long-term shortage as it is likely that, with continuing federal and state support, the renewable energy industry can greatly ramp up deployment and production over the medium and long term. [7]

Another myth I want to dispel is that renewables, including wind energy with its production tax credit, are the only beneficiaries of electricity subsidies. In fact, a report from the Government Accountability Office (GAO) comparing electric subsidies by fuel types shows that renewables such as wind get only a small share of the overall subsidies awarded to energy supplies. For example, total research and development expenditures from fiscal year 2002 to fiscal year 2007 were $11.5 billion, which was distributed among nuclear ($6.2 billion), fossil fuels ($3.1 billion) and renewable energy ($1.4 billion). Total tax expenditures for the energy sector over the same years were $18.2 billion, with fossil fuel receiving $13.7 billion and renewable energy receiving $2.8 billion. [8] See graph in **Attachment 6**.

Focusing on wind power again, an additional benefit of using turbines to generate electricity comes in the form of the power it is meant to replace. Nearly all of the recent power plants built in Ohio are fueled by natural gas, which we know is an expensive commodity in a volatile pricing market.

Wind power is used as an intermediate type of power, supplementing the costly use of existing natural gas fired plants. If we bring more wind power on line in Ohio, we can

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[7] See L. Bird et al. "A Preliminary Examination of the Supply and Demand Balance for Renewable Electricity, NREL, October 2007. "One thing about the analysis that is important to note is that it is very short term - it only looks out to 2010. So I don't think it necessarily has relevance to longer term policies that ramp up over time. It shows that a short term shortage is possible, but the industry would likely ramp up in the mid and long term to meet demand." From author L. Bird email received by OCC, 10/9/2007.

[8] "Federal Electricity Subsidies", GAO, October 2007.

decrease the demand placed on the limited amounts of natural gas left in the country, not to mention the money saved by not having to purchase as much of this fuel for electricity production. [9]

The many witnesses who have testified before the Senate spoke eloquently about the benefits of renewable energy, and they supported their positions with facts, figures, and information.

On the other side of this renewable discussion are the detractors who have vaguely spoken of higher costs associated with renewable energy. I ask: Where are their numbers to back their claims? As the statutory representative of residential consumers, my task and my responsibility is to seek affordable solutions regarding energy services, now and in the future. That is exactly what renewable energy can provide.

In order to make an apples-to-apples comparison, I have attached to my testimony an updated chart which sets forth the costs of new construction using various technologies. It is important to point out here that the appropriate comparison is what it will cost to build our next source of generation because that is the decision in front of us as we plan for the future. Building new renewable energy plants are clearly competitive with and less costly than building a project using advanced technology such as IGCC or nuclear power. Moreover, the costs of renewables have been decreasing over time. (See **Attachment 7**) Yet I have heard no opposition from the utilities with respect to the cost of advanced energy. Why is that? I can only conclude that our Ohio utilities believe that they have a better opportunity to increase their profits by building massive coal or nuclear plants than they have from providing renewable energy.

A report released by Environment Ohio, "Energizing Ohio's Economy; Creating Jobs and Reducing Pollution with Wind Power," found that meeting Ohio's increasing energy demand with renewable energy would provide significant economic benefits for Ohio. Benefits would be seen by all Ohioans by diversifying Ohio's electricity mix. See **Attachment 8**.

To quote an article from Cleveland's Plain Dealer, "Europe's largest solar-panel manufacturer (Isofoton) is interested in establishing its North American headquarters in Ohio. However they prefer a state with a renewable portfolio standard to set up a manufacturing site in the United States. Another company (IBC Solar) is already committed in principle to creating a U.S. headquarters in Cleveland. But whether Ohio reaps the jobs from solar manufacturing will depend in part on whether state lawmakers approve the Governor's bill. Governor Strickland said the first question wind and solar manufacturing companies ask a state development official is whether the state has such a rule [RPS] – already in place in about 25 states." These are the types of economic

[9] These savings are significant. For example, in a recent analysis of the federal 25% RPS, annual consumer expenditures on electricity are very close to those in the Reference Case through 2022, as the reduction in fuel prices caused by lower fossil fuel use for electric power generation outweighs the increased capital costs of new renewable generation capacity. "Energy and Economic Impacts of Implementing Both a 25-Percent RPS and a 25-Percent Renewable Fuel Standard by 2025," August 2007, EIA.

benefits renewable energy can bring to Ohio and we can not let these opportunities pass us by.

The bottom line is that the numbers speak, quite simply, for themselves. Demand for electricity is projected to grow by 40 percent by 2030. This means that over the next 18 years we will need to add additional capacity to meet Ohio's electric needs. We are fortunate to have options. As we compare these options, it makes good economic sense to push for the least cost options in order to manage our utility rates – to keep them affordable for both residential consumers and businesses. The good news is that renewables are not only the least cost supply option, but they also provide many other societal benefits.

To this end, I urge this Committee to fully consider and adopt the amendments proposed by OCC that increase the renewable portfolio standard and include benchmarks and penalties. (See **Attachment 9** for a table of the different renewable proposals)

The OCC believes the renewable energy portion of the advanced energy standard should be set at one percent of a utility's supply each year.

As adopted by the Senate, the proposed law has removed even the most modest of oversight possibilities and imposed conditions that could allow the utilities to avoid any responsibility to supply renewable energy. As I reported to the Senate on October 29, the result is an energy portfolio standard in name only.

For example, based on the wording of a three-percent cap on costs for advanced energy, a utility could build an IGCC plant, hit the cap, and then never have to provide ***any*** renewable energy.

Further, there is no oversight until 2025, and the PUCO can simply give the utility a new schedule if the utility fails to meet the benchmark. This hardly holds any utility's feet to the fire. Moreover, a utility can decide to do nothing for the next ten years and still be in compliance, because the proposed legislation only requires that they be at 12.5% in the year 2025. Theoretically, a utility could do nothing until then and in the year 2025 bid out for 12.5% of its energy from renewables.

OCC also believes that the renewable energy portfolio should apply to all suppliers including certified retail energy suppliers (CRES) so that there is an even playing field.

Consistent with OCC's goal of providing the lowest cost electricity option to consumers, we believe that if benchmarks cannot be met efficiently, the PUCO can determine that no penalty be assessed. For example, if the price of renewable energy in a particular year skyrockets, such that the utility can not meet all or a part of its requirements or cannot do so without significant cost, the utility can file for a waiver at the Commission to release them from the obligation in that particular year provided they can demonstrate that they acted in good faith to procure the renewable energy supply.

Another area that I would like this Committee to consider deals with the ability for consumers to produce part of their own electricity and receive credits for what is able to be put on the grid, known as "net metering." Ohio's electric restructuring legislation from 1999 limits the ability to net meter to one percent of a utility's peak load. Specifically, this restriction is found in Ohio Revised Code section 4928.67 (A). It would be a benefit to all classes of customers – residential, commercial and industrial – if this cap were removed.

Bringing energy efficiency technologies to Ohio

Just as Ohio is ripe for taking advantage of its untapped renewable power potential, we are also able to lower consumers' demand for electricity through energy efficiency.

As mentioned previously, the Midwest Governors Association's Energy Security and Climate Change Platform addressed both renewable energy and energy efficiency.

The platform's energy efficiency goal includes producing energy efficiency improvements equal to at least 2 percent of the region's annual retail electric and natural gas sales by 2015, and an additional 2 percent in efficiency improvements every year thereafter.

In accordance with the chart that is attached to my testimony, energy efficiency remains the least cost of all options. No supply option is less costly. It makes sense, therefore, to maximize this opportunity.

Importantly, and to the best of OCC's knowledge, unlike renewable energy, no one testified in the Senate that energy efficiency is not a good idea. OCC would welcome an increase in the energy efficiency standards so that more energy would be saved. Regarding the energy efficiency standard, Sub. S.B. 221 would produce approximately 0.3 percent average annual reductions in energy usage.

While the OCC believe that the energy efficiency requirements outlined in this bill are a good start, more needs to be added to provide the maximum benefit for residential consumers. For example, on the gas side, OCC has just negotiated a settlement with Columbia Gas of Ohio in which they are to meet targeted reductions in demand of .75 to percent over the next three years. The same can be said of the outlook for peak demand. The amended language recommended is meant to align with the Energy Security and Climate Stewardship Platform for the Midwest (MESCSP)[10] that Governor Strickland just signed on to. OCC's and the MESCSP recommended requirements both end up at

[10] The energy efficiency commitment is as follows: "Meet at least 2 percent of regional annual retail sales of natural gas and electricity through energy efficiency improvements by 2015, and continue to achieve an additional 2 percent in efficiency improvements every year thereafter." See http://www.midwesterngovernors.org/resolutions/Platform.pdf.

22% energy efficiency by 2025 with OCC's rollout having an earlier and smoother ramp up period.

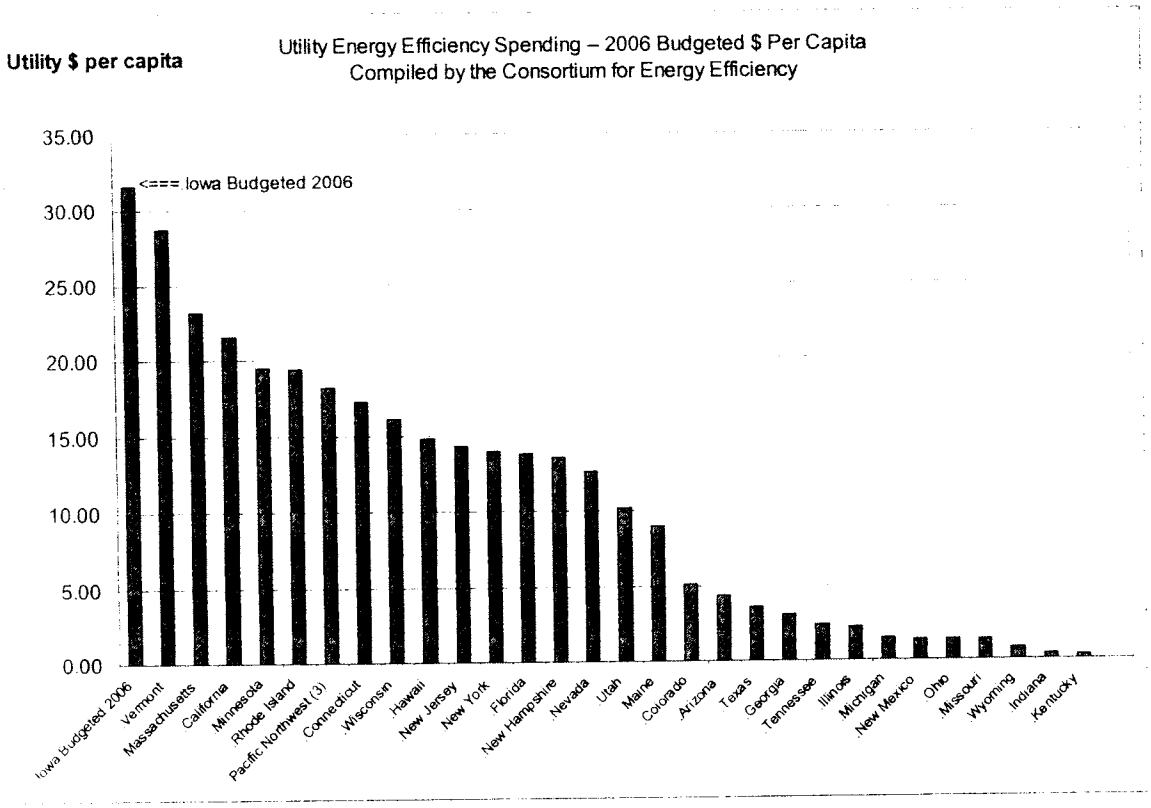
Attachment 10 contains a comparison of what energy efficiency and peak demand requirements are that the OCC is advocating as compared with H.B. 357, Sub. S.B. 221 and the Illinois legislation. OCC's approach is a little more modest than the Illinois approach, however, OCC supports both. I am also supplying **Attachment 11** that highlights the cost advantage that energy efficiency has over all new supply sources.

Another area that needs to be addressed with respect to advanced energy is the inclusion of a law that requires the utilities to provide standby rates for cogeneration based upon the market price at the time the power is needed. Cogeneration, a process under the Public Utilities Regulatory Policy Act (PURPA), refers to the use of renewable sources or a process whereby a manufacturer or farmer uses a waste product – like steam in the case of manufacturing – to produce electricity (a.k.a. combined heat and power or CHP). This has the potential to cut the energy costs of a manufacturer and is a benefit to all because it is twice as efficient as a utility centralized facility. Moreover, because the energy source is located at the load site, it can reduce transmission costs and bottlenecks. As it now stands, utilities charge a monthly fee based upon the worst case scenario – that the cogenerator will not be available during a peak period. When doing the economics of building a cogenerator, the large majority of manufacturers have not proceeded because the cost to do so – based on the standby rates – would exceed the high utility rates they were hoping to avoid. Among Midwest states, Ohio has been ranked at the bottom in terms of its attention to this issue.[11] A major obstacle for cogeneration in Ohio is the standby rates placed on cogeneration applications by the electric utilities. If this could be removed, market conditions in Ohio suggest significant cogeneration opportunities.

I thank you for the opportunity to present testimony to you today on behalf of Ohio's 4.5 million residential utility customers. In closing, I believe that Sub. S.B. 221 needs the modifications that we proposed to meet the goals of greater energy efficiency and renewable energy. Again we appreciate the efforts of Chairman Hagan and the members of this Committee in holding a set of valuable hearings. Thank you and I would be pleased to answer any questions you may have.

[11] Clifford P. Haefke and John J. Cuttica,: CHP Market Entry Status in the Midwest: A State by State Analysis", Midwest CHP Application Center, December 2005, page 7.

Ohio at bottom in terms of energy efficiency spending



Source:

Consortium for Energy Efficiency, *U.S. Energy-Efficiency Programs: A $2.6 Billion Industry, 2006 Report*

IGCC and Rising Costs

IGCC Plants have seen a 100% increase in capital costs estimates since 2004 making current estimates for IGCC unreliable. In 2004 capital cost estimates for building next generation full-scale IGCC plants were estimated at approximately $1600/kW. In 2007, estimates for utility-scale IGCC plants in development are ranging between $3200-$3400/kW[1].

These capital costs are estimated to be 20-47% higher than traditional coal plants. In 2004, Indeck Energy Services testified before the Illinois State EPA that IGCC's "capital costs are 30% higher." On top of this, construction costs in general (concrete, steel, and labor) have risen 100-300% in recent years, also driving up the costs of all sorts of power plants. The Department of Energy reports that IGCC is seen as too risky for private investors, and requires large subsidies from the federal, state and local governments. Also, in 2006, EPA estimated that capturing 90% of CO_2 emissions from IGCC plants would increase capital costs 47%; and the total cost of electricity by 38%.[2]

While the U.S. remains the most active global IGCC development market, with over 17,000 MW[3] actively in planning, the last year has seen significant numbers of IGCC projects shelved or stalled as developers and utilities have been unable to justify IGCC investments in the context of spiraling capital costs, lack of satisfactory technology performance guarantees, unavailability of lump sum turnkey contracts, and an uncertain carbon policy environment.

Developer	US State	Status	Reasons for Stalling
NRG	Connecticut	Canceled	Could not meet RFP timeline for delivery
TECO	Florida	Canceled	State carbon policy uncertainty, rising costs
Tondu Corp	Texas	Canceled	Rising costs, limited technology guarantees
Bowie Power	Arizona	Canceled	Delayed local planning process, environmental opposition
Buffalo Energy Partners	Wyoming	Canceled	Transmission constraints, rising costs, limited available technology guarantees and unsuccessful bid for funding
Mesaba	Minnesota	On Hold	Increased costs have caused regulators to force renegotiation of costs
Madison Power	Illinois	On Hold	Construction of a nearby supercritical coal plants has hindered power demand and tied up transmission and coal transport infrastructure
Tenaska, ERORA	Illinois	On Hold	Local opposition to IGCC without carbon capture hampering regulatory proceedings
NRG	New York	On Hold	Must find cost reductions to maintain state-awarded financial support

In Edwardsport, Indiana an IGCC plant has recently been approved to result in an average electric rate increase of approximately 16% to be phased in from 2008 through 2012[4]. Indiana Utility Regulators were also supportive of Duke studying capture and sequestration of a portion of the plant emissions. If this study is successful, carbon dioxide capture and sequestration equipment could be added to the plant. This plant is estimated at this time to cost around $2B to construct, which will be offset by more than $460M in local, state, and federal tax incentives.

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[1] Emerging Energy Research, *TECO, Nuon Cancellations Underscore IGCC's Woes*, October 5, 2007
[2] EnergyJustice.net, *Fact Sheet, "Clean coal" Power Plants (IGCC)*, April 24, 2007
[3] Emerging Energy Research, *TECO, Nuon Cancellations Underscore IGCC's Woes*, October 5, 2007
[4] CNNMoney.com, *Indiana Utility Regulators Approve Duke Energy Clean Coal Plant*, November 20, 2007

A plant proposed in West Virginia by Appalachian Power (an AEP subsidiary) will, upon approval, phase in rates over approximately five years. To recover anticipated costs of the IGCC plant, Appalachian Power estimates that it will need to increase West Virginia rates by approximately 12 percent by 2012 when the plant goes into service[5]. AEP's Mountaineer Plant in New Haven, WV, is also the site of a $4.2-million carbon sequestration research project through which scientists from Battelle Memorial Institute are seeking to better understand the capability of deep saline aquifers for permanent and ecologically safe storage of carbon dioxide emissions from power plants.[6]

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[5] PR Newswire, *IGCC Plant in West Virginia Could Be Online in 2012 if Plan Filed by AEP's Appalachian Power Gains Approvals*, June 18, 2007

[6] AEP.com, *AEP receives top score for electric utilities in ranking of global companies on climate change strategies*, March 21, 2006

States with Expanded Renewable Portfolio Standards

Some of the efforts made on renewable portfolio standards have been particularly successful. For example, Connecticut increased its RPS in 2003, extending the standard to all utilities in the state; Iowa met its standard in 1999. Many states allow utilities to comply with the RPS through tradeable renewable energy credits. While the success of state efforts to increase renewable energy production will depend in part on federal policies such as production tax credits, states have shown their considerable efficacy in encouraging clean energy generation.

CT: On June 4, 2007, Governor M. Jodi Rell signed House Bill 7432, which expanded the state's previous renewable portfolio standard. HB 7432 requires that 27 percent of the state's electricity come from renewable sources by 2020. The law includes standards for three classes of renewables. By 2020, 20 percent of the renewables must be from Class I, 3 percent must be from Class I or II, and 4 percent must be from Class III. Class I sources include solar, wind, new sustainable biomass, landfill gas, fuel cells (using renewable or non-renewable fuels), ocean thermal power, wave or tidal power, low-emission advanced renewable energy conversion technologies, and new run-of-the-river hydropower facilities with a maximum capacity of five megawatts. Class II sources include trash-to-energy facilities, biomass facilities not included in Class I, and certain hydropower facilities. Class III sources include customer-sited combined heat and power systems with a minimum operating efficiency of 50 percent installed at commercial or industrial facilities on or after January 1, 2006; electricity savings from conservation and load management programs that started on or after January 1, 2006; and systems that recover waste heat or pressure from commercial and industrial processes installed on or after April 1, 2007.

DE: On July 24, 2007, Governor Ruth Ann Minner signed Senate Bill 19, which expanded the state's previous renewable portfolio standard to require that 2 percent of the state's electricity supply come from solar photovoltaics by 2019, in addition to 18 percent from other renewable sources by the same date. Sources of energy that count toward the standard include wind, ocean tidal, ocean thermal, fuel cells powered by renewable fuels, hydroelectric facilities with a maximum capacity of 30 megawatts, sustainable biomass, anaerobic digestion, and landfill gas.

MD: On April 24, 2007, Governor Martin O'Malley signed Senate Bill 595, which expanded Maryland's existing renewable portfolio standard to require that 2 percent of the state's electricity supply come from solar sources by 2022, in addition to 7.5 percent from other renewable sources by the same date. Sources of energy that count toward the standard include wind, qualifying biomass, methane from the anaerobic decomposition of organic materials in a landfill or wastewater treatment plant, geothermal, ocean, including energy from waves, tides, currents, and thermal differences, a fuel cell that produces electricity from qualifying biomass or methane, and small hydroelectric power plants.

NJ: On April 12, 2006, the New Jersey Board of Public Utilities (BPU) approved new regulations that expanded the state's renewable portfolio standard. The BPU decision requires utilities produce 22.5 percent of their electricity from renewable sources, at least 2 percent of which must come from solar sources. Sources of energy that count toward the remainder of the standard include solar, wind, wave, tidal, geothermal, methane gas captured from a landfill, fuel cells powered by renewable fuels, electricity generated by the combustion of gas from the anaerobic digestion of food waste and sewage sludge at a biomass generating facility, and hydropower.

NV: On June 7, 2005 the Nevada Governor Kenny Guinn signed into law Assembly Bill 3, expanding Nevada's previous renewable portfolio standard. The updated standard requires that 20 percent of the state's electricity come from renewable energy sources by 2015, and for each year thereafter. Of the 20 percent, not less than 5 percent must be generated from solar renewable energy systems. Utilities can also earn credit for up to 25 percent of the standard through energy efficiency measures. Sources of energy that count toward the standard include biomass, fuel cells, geothermal, solar, waterpower, and wind.

TX: On August 1, 2005, Governor Rick Perry signed a bill increasing the amount of renewable generation required in the state. The law requires that 5,880 MW of new renewable generation be built in the state by 2015, which will meet about 5 percent of the state's projected electricity demand. The legislation also sets a cumulative target of installing 10,000 MW of renewable generation capacity by 2025. In an effort to diversify the state's renewable generation portfolio, the measure also includes a requirement that the state must meet 500 MW of the 2025 target with non-wind renewable generation.

WI: On March 17, 2006, Governor Jim Doyle signed Senate Bill 459, the Energy Efficiency and Renewables Act, which increased the state's previous renewable portfolio standard. The revised standard requires utilities to produce 10 percent of their electricity from renewable energy sources by 2015. Sources of energy that count toward the standard include solar, wind, water power, biomass, geothermal technology, tidal or wave action, and fuel cell technology that uses qualified renewable fuels.

Source: http://www.pewclimate.org/what_s_being_done/in_the_states/rps.cfm, States with Renewable Portfolio Standards, Updated August 2007

Table 24: Evaluating Fuels Against National Consumer Priorities

	Environmental Protection	Sustainable Economic Development	Affordable and Predictable Energy Services	Reliable and High Quality Energy Services	Public Safety	System Security
Coal	Requires control technologies for NOx, SO_2, and mercury emissions, which add to cost Major source of carbon emissions Requires significant amounts of water	Large resource base Technology innovation focusing on emission reductions and alternative uses Market for coal derived fuels Developing country demand expanding	Coal prices have historically been low and stable. International competition could make prices more volatile. Cost of electricity among the lowest.	With 250 years of domestic reserves, coal is a reliable source of electricity. Good source of baseload electricity.	No unique public safety issues.	Domestic resource with large reserves.
Natural Gas	Significantly lower atmospheric emissions than other fossil energy electricity sources	Domestic resource supply constraints LNG and nonconventional supply required constraints LNG and nonconventional supply required	Natural gas prices among the most volatile Rising prices affect consumers in electricity and heating/ cooling, as well as key industries	Price increases have mothballed a significant amount of generation and reduced capacity factors or others Good for peak power generation	LNG safety concerns Pipeline safety Local explosion hazard	Increasing reliance on imports
Oil	Low-sulfur content in heating oil should reduce this issue Storage tanks subject to leak inspections	Regionally significant Refinery capacity constraints Northeast Home Heating Oil Reserve is designed to dampen price spikes	Phasing out as a source of electricity Heating oil prices follow crude oil and thus are affecting consumers	Phasing out as a source of electricity Established distribution system for heating oil Northeast Home Heating Oil Reserve can ensure supply during disruptions	No unique public safety issues	Increasing reliance on imports
Nuclear	Only thermal atmospheric emissions Carbon friendly technology Long term waste management issues remain	Plentiful fuel availability New technologies designed to reduce cost, improve safety, and reduce spent fuel Significant activity in Asia and Europe	Wide range of estimates for new nuclear plant costs thus, significant uncertainty on cost of electricity to consumers	Capacity factor increases have meant more electricity from existing plants Good source of baseload electricity	Concerns over spent fuel transportation Public concerns over uncontrolled releases and related evacuation plans	Proliferation and related terrorist concerns

	Environmental Protection	Sustainable Economic Development	Affordable and Predictable Energy Services	Reliable and High Quality Energy Services	Public Safety	System Security
Hydroelectric	No atmospheric emissions Carbon friendly technology Conflicts with fish management	Regionally significant Expansion availability limited	Most inexpensive source of electricity Susceptible to drought or low water conditions	Low water periods can reduce production	Dam safety Dams designated as one of four key resources by DHS to ensure adequate safety and security measures in place	No unique system security issues
Biomass	Used with coal to reduce NOx emissions MSW and animal waste biomass reduces waste management costs Methane captured from MSW reduces greenhouse gas emissions Carbon neutral	Use of dedicated energy crops holds promise of large energy resource base Could be a new income source for farmers	Not widely used as electricity source Cost of electricity is high Used for process heat, particularly by forest and paper products industry	Not a major source of electricity other than as an additive with coal Generally small scale or demonstration efforts to date	No unique public safety issues	No unique system security issues
Wind	No atmospheric emissions Carbon friendly technology New technology reduces bird kills and noise issues Visual impacts are of concern	Regional resource Fastest growing energy source Significant overseas markets	Cost of electricity is competitive only in high wind areas. Intermittent nature of wind requires backup generation	Intermittent nature of wind requires backup generation Best wind areas are distant from electricity needs	No unique public safety issues	No unique system security issues
Solar	No atmospheric emissions Carbon friendly technology Central station power requires large areas	Regional resource Another fast growing energy source Nanotechnology holds promise of reduced cost Innovative technology development	Cost of electricity is high Best for niche applications	Best in niche uses Individual PV applications would benefit from net metering	No unique public safety issues	No unique system security issues

	Environmental Protection	Sustainable Economic Development	Affordable and Predictable Energy Services	Reliable and High Quality Energy Services	Public Safety	System Security
Geothermal	No atmospheric emissions (except in open loop where there are small amounts of hydrogen sulfide) Carbon friendly technology Produced fluids is a concern	Regional resource Reservoirs must be managed to avoid depletion Technology developments in areas such as geothermal heat pumps hold promise	Competitive cost of electricity	Good source of baseload electricity	No unique public safety issues	No unique system security issues
Energy Efficiency	No atmospheric emissions Carbon friendly technology	Energy intensity reductions have reduced energy costs by billions of dollars	Low cost for meeting energy needs Best when energy costs are high	Reduces need for electricity	No unique public safety issues	No unique system security issues

Source:

Consumer Energy Council of America, *Fueling the Future: Better Ways to Use America's Fuel Options*, May 206

Wind Energy's Capacity Contribution and Generation Redundancy

It is correct that in normal electric grids (without energy storage – e.g. batteries, flywheels etc), a wind farm could not function around the clock as a stand-alone unit and would require back-up at times from conventional energy sources. The same applies to the conventional energy sources, especially nuclear, whose response time is so slow that they must have a fast responding generation system in parallel. It is also true that due to the large sizes of modern generators in conventional systems (e.g. 500 MW or greater per generator), to allow for maintenance and breakdowns, it is necessary to have another source ready to take over when another stops working (for whatever reason). This is the reason utilities have planned reserve margins of approximately 15%. It is to ensure that there is always reliable power. In the unlikely event that a particular utility does not have sufficient back-up due to several plant outages, or if the utility's source of back-up power is very expensive, the utility can also purchase power from another utility through the Regional Transmission Organization (RTO).

Although wind turbines may be idle due to a lack of wind at times of a utility's peak demand, there is a statistical probability that they will be available, especially if there are multiple turbines dispersed geographically. In this, wind turbines are no different from conventional power plants. No generating plant operates 100% of the time, and no power plant is 100% dependable during peak loads. Moreover, for utilities with winter peaks, this is less of an issue during that season when wind can be a benefit.

The firm power of wind energy per kilowatt-hour generated is remarkably similar to that of conventional sources. The question then becomes not if there is any capacity value in wind energy, but what its value is in offsetting the construction of conventional power plants. Each kilowatt-hour generated by a wind turbine offsets a kilowatt-hour that would have been otherwise generated.

Early integration studies were overly cautious on maximum penetration because they assumed 1) that all wind turbines would experience the same wind velocity at the same time, 2) that the turbine generators were driving fixed-speed induction generators directly connected to the power grid, and 3) that the conventional generators in the system are coal or nuclear and are therefore unable to respond quickly to changes in wind speed.

In practice, there is usually sufficient variation in the wind speeds at each turbine, so that the average output power of the wind farm does not vary nearly as much as the power output of individual turbines. With the advent of large, variable-speed generators for wind turbines and inverter connection to the grid, the turbine control system is able to respond to the grid's needs and actively support it to produce voltage and power flow stability. Fast responding conventional generators include hydro, gas turbines and diesel gensets. These are well able to compensate for variations in the power output of a wind farm.

Sources:

Paul Gipe, Wind Energy Comes of Age, Part III: Where Wind Energy is Headed, 2006
Don Smith, California Public Utility Commission, 2003
Carl Weinberg, former Manager of R&D at Pacific Gas & Electric Co., 1996
UK's Energy Research Centre, The Costs and Impacts of intermittency, 2006
Peter Freere, Energy Professor at Monash University in Australia, 1997

Research and Development

DOE Electricity-Related Funding Varied Widely across Fuels in FY2007

Fuel Sources and Transmission	Types of Fuels	Total Energy Subsidies ($ Millions)[a]	Percent Used for Electricity	Net Electricity Subsidies ($ Millions)	Electricity Generation - Megawatt-Hours
Fossil	Coal	$572.8	91.9%	$526.5	1,955.7
	Oil	3.6	2.3%	0.1	98.7
	Natural Gas	16.1	25.4%	4.1	643.6
Nuclear	Nuclear	1,235.3	100.0%	1,235.3	780.3
Renewable	Hydrogen	246.1	0.0%	0.0	0.0
	Biomass	253.9	13.3%	33.9	23.3
	Solar	202.6	100.0%	202.6	0.6
	Wind	62.7	100.0%	62.7	15.9
	Geothermal	6.4	91.0%	5.8	14.6
	Hydropower	0.0	98.7%	0.0	269.9
Transmission	All Above	137.0	100.0%	137.0	--
Total		$2,736.6		$2,208.0	

Sources: DOE Fiscal Year 2007 Operating Plan and EIA Annual Energy Review 2006.
[a]Program management allocated on a pro rata basis to individual fuel types.

Tax Expenditures

Tax Expenditures are Large and Growing Support Provided to Electricity Production

We estimate electricity-related tax expenditures totaled $18.2 billion from FY2002 to FY2007 (2007 dollars).[3]

- $13.7 billion for fossil fuels
- $2.8 billion for renewables
- $1.7 billion for transmission
- None assigned to nuclear

Electricity-related tax expenditures increased from $2.2 billion to $4.1 billion (2007 dollars) from FY2002 to FY2007.

- Fossil fuels: $1.9 billion to $2.7 billion (43% increase)
- Renewables: $238 million to $790 million (232% increase)

Many tax expenditures applied to multiple fuels.

- We made assignments to fuels based, in part, on EIA data.

Many electricity-related tax expenditures created since 2005, others extended or expanded.

[3]Summing tax expenditures does not take into account interactions between individual provisions.

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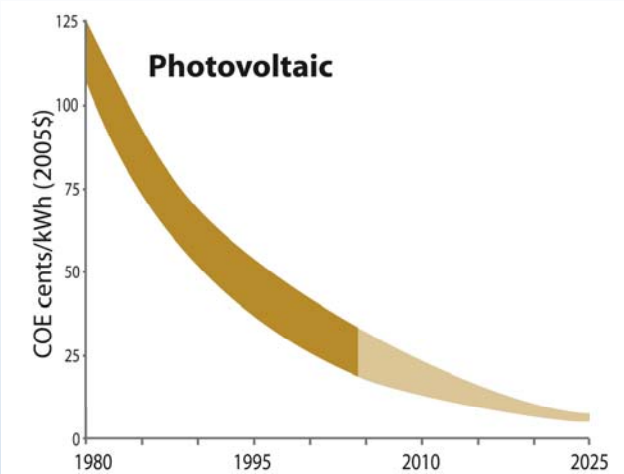
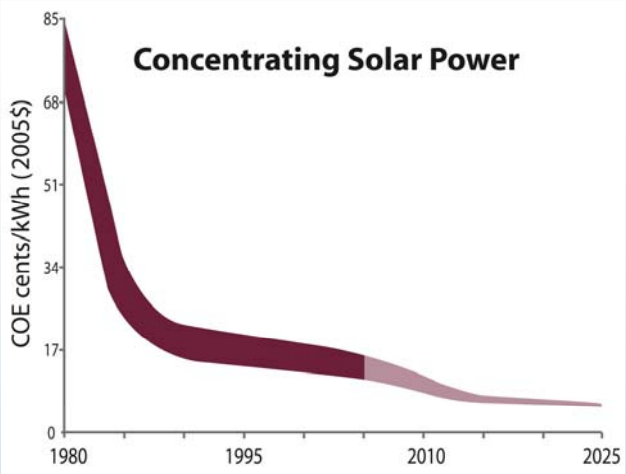
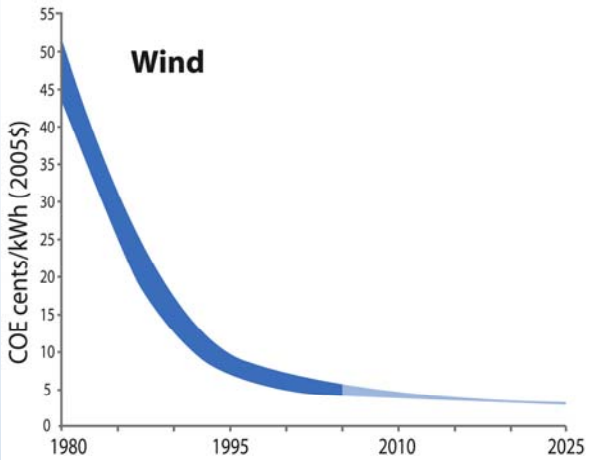
GAO Accountability * Integrity * Reliability

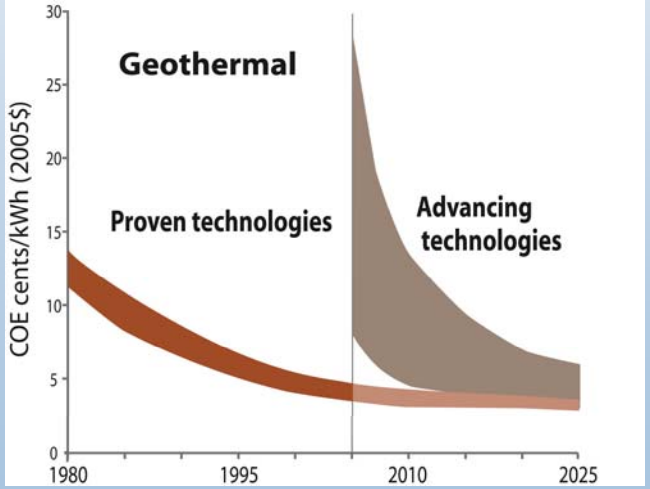
Renewable Energy Cost Trends

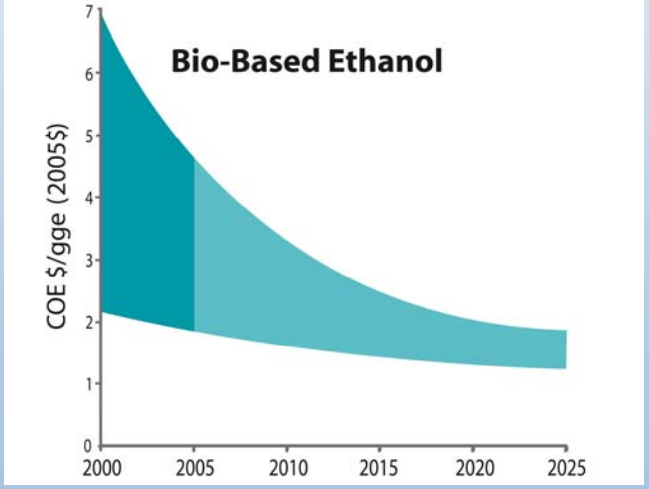
Levelized cost of energy in constant 2005$[1]











Source: NREL Energy Analysis Office (www.nrel.gov/analysis/docs/cost_curves_2005.ppt)
[1]These graphs are reflections of historical cost trends NOT precise annual historical data. DRAFT November 2005

Renewable Electricity Technology Cost Trends

Chart Notes, Page 1

Background

- The Cost Curves are expressed as a band in constant, 2005 year dollars where the low to high range represents variations in resource quality, scale of installation and financing terms.
- Actual project costs can vary substantially – not only over time, but from project to project – based on variables such as siting and permitting costs, land costs, transmission access, labor costs, and financing terms.
- The Cost Curves are **not based on specific project data,** but are composite representations derived from a variety of sources outlined below.
- Historic costs from 1980 to 2000 generally reflect costs that were published in various DOE Renewable Energy Program plans such as five-year program plans, annual budgets, and other program publications. DOE/EPRI Renewable Energy Technology Characterizations published in 1997
- The Future Cost Curves generally reflect how the DOE Renewable Energy Programs expect the costs of renewable energy to decrease through lowered technology costs and improved performances, resulting from R&D efforts and other factors.
- Projections of cost to 2025 for wind are based on GPRA 06 projections, for photovoltaic and CSP GPRA 06 and MYPP projections. For geothermal projections are based on modeling results from the GETEM model. For bio-based ethanol projections are based on program modeling efforts.
- The lower band of the Cost Curves generally assume the availability of high-quality resources. This is an important point because systems using lower quality resources are being built, in some cases with costs much higher than for high quality resources.
- The Cost Curves do not include the effects of tax credits or production tax incentives.

Renewable Electricity Technology Cost Trends

Chart Notes, Page 2

General Observations

- The renewable technology cost trends typically show a steep decline from 1980 to the present. Projections show this decline to continue, but at a slower absolute pace as the technologies mature.

- Historic cost of energy trends reflected in this chart are in broad agreement with the trends published in "Winner, Loser, or Innocent Victim? Has Renewable Energy Performed as Expected?" Renewable Energy Policy Project, Report No. 7, April 1999.

Technology Specific Notes

- Wind technology cost projections represent wind power systems in locations with Class 6 resources for the lower part of the band and Class 4 resources for the high part of the band. Low wind-speed turbine technology is under development, which will make available large amounts of usable wind resources that are closer to transmission. Lower costs will result from design and technology improvements across the spectrum from foundations and towers, to turbine blades, hubs, generators, and electronics.
- Bio-based ethanol represents a combination of corn starch in the near term and lignocellulosic ethanol in the long term. Lignocellulosic production technologies that co-produce feed products and electricity with ethanol are projected to become the lower cost technology in the latter years of the projected values.
- Geothermal cost projections for Proven Technologies are largely Flash technology with a few binary technology systems. Cost reductions will result from more efficient and productive resource exploration and characterization as well as from continued improvements in heat exchangers, fluid-handling technologies, turbines, and generators. The Advancing Technologies cover three general topics: energy conversion (power generation systems), drilling and wellfield construction systems, and geologic systems. The Advancing Technologies cost curve illustrates year 2005 projections of future LCOE values for this suite of technology topics, considering a wide range of potential research results that can lower the net costs of geothermal power. For conversion systems the principal improvements are expected to come from such benefits as raising process efficiencies and lowering the costs of systems to make it competitive to generate power with cooler temperatures than are now feasible. In drilling and wellfield construction, such issues as corrosion play a major role in well costs. Work is under way to identify new metal alloys and protective coating systems to lengthen the serviceable lifetime of piping components. Drilling costs are a substantial fraction of overall development costs, and R&D are focused on such things as drill bit design to raise ROP values (rate of penetration of drill bits, leading to less time and costs of the drilling operation).
- Solar thermal cost projections are for parabolic trough and power tower for historical values from 1980-1990. While 1980-1990 saw a significant reduction in COE due to R&D efforts, the 1990s R&D efforts were at lower levels and reductions in COE came largely from improvements in operation and maintenance (O&M) costs. Projected values for 2005-2025 are from the Solar program MYPP for 2005 and based on parabolic trough technologies and are based on a detailed due-diligence study completed in 2002 at the request of DOE. Cost reductions will result from improved reflectors and lower-cost heliostat designs, improved solar thermal receivers, heat exchangers and fluid handling technologies, and turbines and generators, as well as from volume manufacturing.
- Photovoltaic cost projections are based on increasing penetration of thin-film technology into the building sector. Likely technology improvements include higher efficiencies, increased reliability (which can reduce module prices), improved manufacturing processes, and lower balance of system costs through technology improvements and volume sales.

Attachment 8

The Economic Benefits of Renewable Energy

A report released by Environment Ohio, Energizing Ohio's Economy; Creating Jobs and Reducing Pollution with Wind Power, found that meeting Ohio's increasing energy demand with wind power would help to diversify Ohio's electricity mix thereby shielding Ohio ratepayers somewhat from an impending cap on carbon emissions from coal while also providing a significant benefit for our economy. The report found that:

Wind energy creates jobs

- Diversifying Ohio's electricity supply with 20 percent wind energy by 2020 would create an estimated net of 40,000 person years of employment through 2020, or the equivalent of 3,100 permanent, full-time jobs[1]. It would also increase wages paid to Ohio workers by a cumulative net total of $3.7 billion through 2020[2].
- Harnessing Ohio's well-developed industrial base to manufacture renewable energy technologies for export would provide additional economic advantages. For example, the Renewable Energy Policy Project and Policy Matters Ohio estimate that a national commitment to wind energy could create more than 13,000 wind turbine component manufacturing jobs in Ohio – more than in any state except California[3].

Wind energy creates economic growth.

- Diversifying Ohio's electricity supply with wind energy would increase gross state product (GSP) by an estimated net of $8.2 billion through 2020[4].

Ohio's rural areas can benefit from wind energy development.

- Landowners can lease land for wind farms, creating an additional income stream. Increasing Ohio's use of wind energy could supplement landowner income with cumulative total lease payments of $200 million through 2020[5].
- Developing Ohio's wind power resources would generate on the order of $1.5 billion in property taxes (total through 2020)[6] to fund education and other local government services, mainly in rural areas of the state.
- Communities can maximize local benefits by organizing and financing their own wind projects, much like the Bowling Green wind farm.

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[1] Renewable Energy Policy Project, *Wind Turbine Development: Location of Manufacturing Activity*, January 2005.

[2] Minnesota IMPLAN Group, *2001 Data for the State of Ohio*, Stillwater, Minnesota, 2005.

[3] Environment Ohio, *Energizing Ohio's Economy*, August 2007

[4] Environment Ohio, *Energizing Ohio's Economy*, August 2007

[5] Environment Ohio, *Energizing Ohio's Economy*, August 2007

[6] Data for 2005, obtained from Greg Payne, ODOD, Office of Energy Efficiency, personal correspondence, 28 March 2007, See also: Energy Information Administration, U.S. Department of Energy, *Form FERC-423 Database: Monthly Cost and Quality of Fuels for Electric Plants Data – 2005*, downloaded from www.eia.doe.gov, 20 March 2007

Wind energy creates jobs in part by replacing expenditures for fuel with expenditures for labor and materials produced at home. Ohio is deeply dependent on fuel imports for power generation relying on other states or countries for 90 percent of its natural gas, 59 percent of its coal and 97 percent of its petroleum[7]. For example, in 2005, $1.3 billion of the money Ohio spent on coal for electricity generation ended up leaving the state[8]. In contrast, wind energy has no fuel costs, keeping more dollars in the local economy and thus increasing employment in the state.

Renewable energy policies also produce more jobs than building fossil-fueled power plants because they stimulate industries that are more efficient at creating jobs than other parts of Ohio's economy. For example, every $1 million spent on construction in Ohio creates 16.3 jobs. Alternatively, investing $1 million dollars in coal mining creates only 6.5 jobs, while putting $1 million into natural gas distribution creates only 5.3 jobs.

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[7] Greg Payne, ODOD, Office of Energy Efficiency, personal correspondence 28 March 2007

[8] According to the U.S. Energy Information Administration, including all costs (transportation, taxes, etc.), Ohio utilities spent $1.9 billion on imported coal in 2005:

Comparison of Senate Bill 221 and McGregor Bill Renewable Portfolio Standard

	Renewable Energy Requirements							
	SB 221	SB 221 Cumulative	HB 357	HB 357 Cumulative	OCC	OCC Cumulative	Solar	MESCSP* Cumulative
2008								
2009	0.007	0.007			0.01	0.0100	0.00009	
2010	0.007	0.015	0.02	0.02	0.01	0.0200	0.00056	
2011	0.007	0.022	0.02	0.04	0.01	0.0300	0.00112	
2012	0.007	0.029	0.02	0.06	0.01	0.0400	0.00185	
2013	0.007	0.037	0.02	0.08	0.01	0.0500	0.00268	
2014	0.007	0.044	0.02	0.10	0.01	0.0600	0.00367	
2015	0.007	0.051	0.02	0.12	0.01	0.0700	0.00498	0.1
2016	0.007	0.059	0.02	0.14	0.01	0.0800	0.00670	
2017	0.007	0.066	0.02	0.16	0.01	0.0900	0.00898	
2018	0.007	0.074	0.02	0.18	0.01	0.1000	0.01000	
2019	0.007	0.081	0.02	0.20	0.01	0.1100		
2020	0.007	0.088	0.02	0.22	0.01	0.1200		0.2
2021	0.007	0.096	0	0.22	0.01	0.1300		
2022	0.007	0.103	0	0.22	0.01	0.1400		
2023	0.007	0.110	0	0.22	0.01	0.1500		
2024	0.007	0.118	0	0.22	0.01	0.1600		
2025	0.007	**0.125**	0	**0.22**	0.0125	**0.1725**		**0.25**

* Stands for Midwest Energy Security and Climate Stewardship Platform signed on to by Governor Strictland.
By 2030 the renewable goal is 30 percent.

Comparison of Senate Bill 221 and McGregor Bill Energy Efficiency Requirements

	Energy Efficiency									Peak Demand Reduction					
	SB 221	SB 221 Cumulative	HB 357	HB 357 Cumulative	Illinois Law	Illinois Law Cumulative	OCC	OCC Cumulative	MESCSP* Cumulative	SB 221	SB 221 Cumulative	HB 357	HB 357 Cumulative	OCC	OCC Cumulative
2008			0.002	0.002	0.002	0.002						0.001	0.001	0.0075	0.008
2009	0.003	0.003	0.002	0.004	0.004	0.006	0.003	0.003		0.006	0.006	0.001	0.002	0.0075	0.015
2010	0.003	0.006	0.002	0.006	0.006	0.012	0.005	0.008		0.006	0.012	0.001	0.003	0.0075	0.023
2011	0.003	0.009	0.002	0.008	0.008	0.02	0.007	0.015		0.006	0.018	0.001	0.004	0.0075	0.030
2012	0.003	0.012	0.002	0.01	0.01	0.03	0.008	0.023		0.006	0.024	0.001	0.005	0.0075	0.038
2013	0.003	0.015	0.004	0.014	0.014	0.044	0.009	0.032		0.006	0.029	0.001	0.006	0.0075	0.045
2014	0.003	0.018	0.004	0.018	0.018	0.062	0.01	0.042		0.006	0.035	0.001	0.007	0.0075	0.053
2015	**0.003**	**0.021**	**0.002**	**0.02**	**0.02**	**0.082**	**0.01**	**0.052**	**0.02**	0.006	0.041	0.001	0.008	0.0075	0.060
2016	0.003	0.024	0	0.02	0.02	0.102	0.01	0.062	0.04	0.006	0.047	0.001	0.009	0.0075	0.068
2017	0.003	0.027	**0**	0.02	0.02	0.122	0.01	0.072	0.06	**0.006**	**0.053**	**0.001**	**0.01**	**0.0075**	**0.075**
2018	0.003	0.03	0	0.02	0.02	0.142	0.01	0.082	0.08	0.006	0.059				
2019	0.003	0.033	0	0.02	0.02	0.162	0.02	0.102	0.1	0.006	0.065				
2020	0.003	0.036	0	0.02	0.02	0.182	0.02	0.122	0.12	0.006	0.071				
2021	0.003	0.039	0	0.02	0.02	0.202	0.02	0.142	0.14	0.006	0.076				
2022	0.003	0.042	0	0.02	0.02	0.222	0.02	0.162	0.16	0.006	0.082				
2023	0.003	0.045	0	0.02	0.02	0.242	0.02	0.182	0.18	0.006	0.088				
2024	0.003	0.048	0	0.02	0.02	0.262	0.02	0.202	0.2	0.006	0.094				
2025	**0.003**	**0.051**	**0**	**0.02**	**0.02**	**0.282**	**0.02**	**0.222**	**0.22**	0.006	0.100				

Notes: SB 221 annual energy efficiency savings are estimated based on 20 year PUCO projected Ohio electricity growth of 1.2% per year.
See http://www.puco.ohio.gov/emplibrary/files/util/UtilitiesDeptReports/OhioLTFEnergyReq2003-2023final.pdf.
Based on actual data however, from 1990-Present, there would have been 7 years with no energy efficiency requirement under SB 221 due to lack of load growth.
HB 357 has a rate cap of half a cent per year per kilowatt hour.
Some have interpreted the HB 357 energy efficiency requirements as equivalent to the Illinois legislation. For that to be true, the language needs to be amended for clarification.
* Stands for Midwest Energy Security and Climate Stewardship Platform signed on to by Governor Strictland. Values from 2015-2024 have ben interpolated.

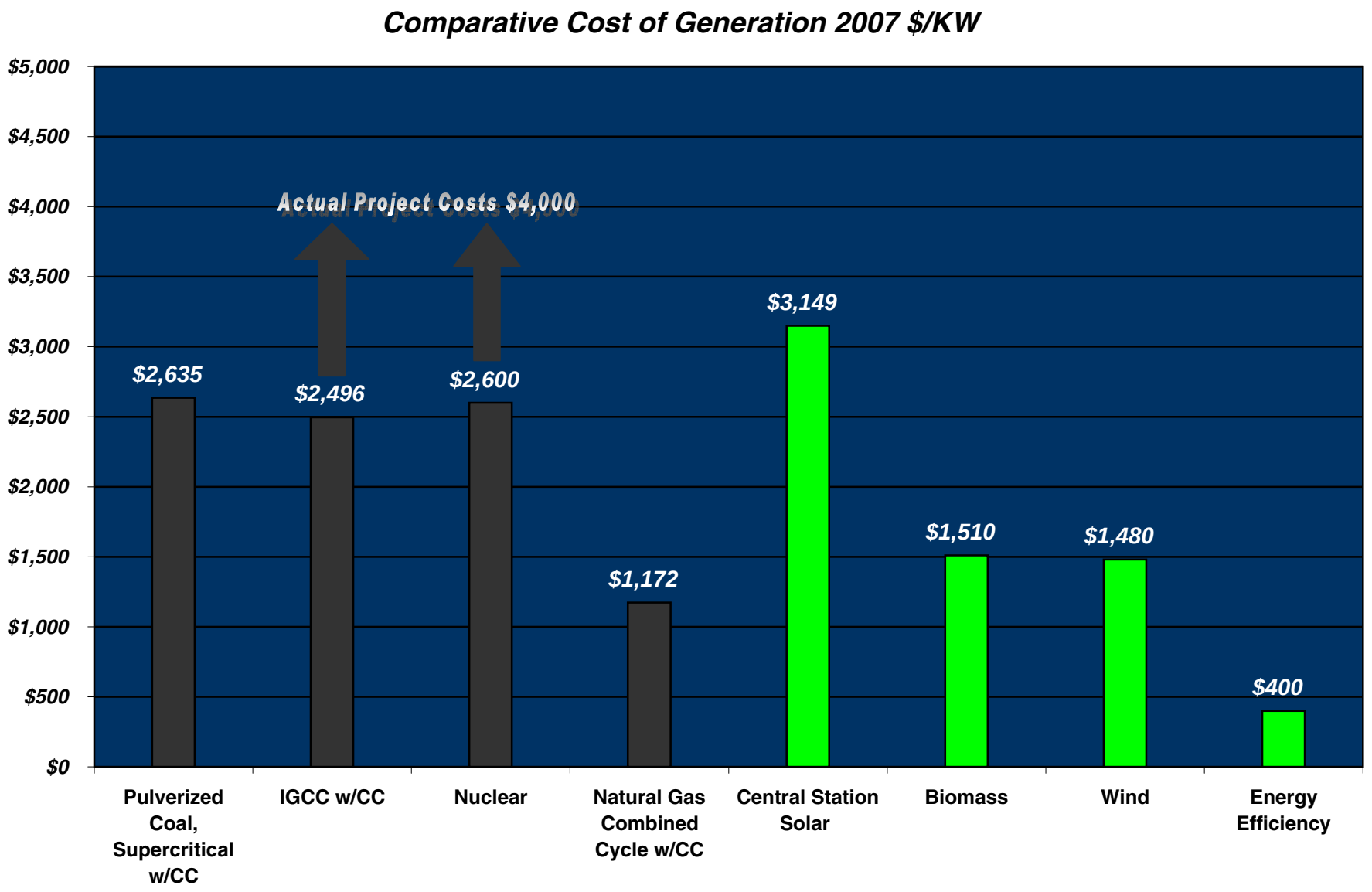
Technology	IGCC AVG (1)	IGCC AVG (1)	Latest IGCC Project estimate AEP & Duke (2)	Pulverized Coal (1)				Latest PC Plant Estimate (3)	Natural Gas Combined Cycle (1)		Nuclear (4)	Latest Nuclear Project Quote (5)	Wind Actual Cost (6)	Energy Efficiency (7)
Metric				**Subcritical**		**Supercritical**			**2 x 7FB**					
Case #	w/o CC	with CC		w/o CC	with CC	w/o CC	with CC	w/o CC	w/o CC	with CC				
$/kW	$1,841	$2,496	$4,000	$1,474	$2,626	$1,508	$2,635	$2,600	$554	$1,172	$2,000	$4,000	$1,480	$400
LCOE, Cents/kWh*	7.79	**10.63**		**6.40**	**11.88**	**6.33**	**11.48**		**6.84**	**9.74**	**6.70**		**4.90**	**1.3 - 3.2**
% Increase in COE with Capture		36.4			85.6		81.4			42.4				

Notes:

*** 20 year LEVELIZED COST OF ELECTRICITY (LCOE). Includes estimate of capital cost, fixed operating cost, variable and operating cost and fuel cost.**

1. Average of 3 IGCC designs (GE, CoP E-Gas, Shell), "Cost and Performance Baseline for Fossil Energy Plants", Exhibit ES-2, DOE, May 2007. CO2 transport, storage and monitoring adds <0.5 ¢/kWh, increase in COE ~ 3 cents/kWh (36%).
2. Based on latest IGCC estimates, see 9/10/07 Power Daily, page 5, for Duke $2.0 billion estimate and 6/18/07 $2.23 billion filing of AEP's 629 MW W. Virginia plant.
3. Based on expected cost of Longview supercritical, pulverised coal-fired generating facility in West Virginia at $1.8 billion for 695 MW, or about $2,600/kW, http://www.altassets.com/news/arc/2006/nz9491.php.
4. "The Future of Nuclear Power", Table 5.3, MIT, 2003. These figures do not include an estimated decommissioning cost of $350 million per plant.
5. "Realistic" costs of nuclear power as expressed by AEP CEO Mike Morris, "AEP not interested in nuclear plants", Bloomberg, AP and Staff Reports, 8/29/2007.
6. "Annual report on U.S. Wind Power Installation, Cost and Performance Trends: 2006, DOE. Figures are capacity weighted averages and include federal production tax credit.
7. Levelized cost of saving electricity, Martin Kushler, "The Midwest Energy Crisis and Why Energy Efficiency Should Be a Top Policy Priority", ACEEE 2005.

Attachment 11



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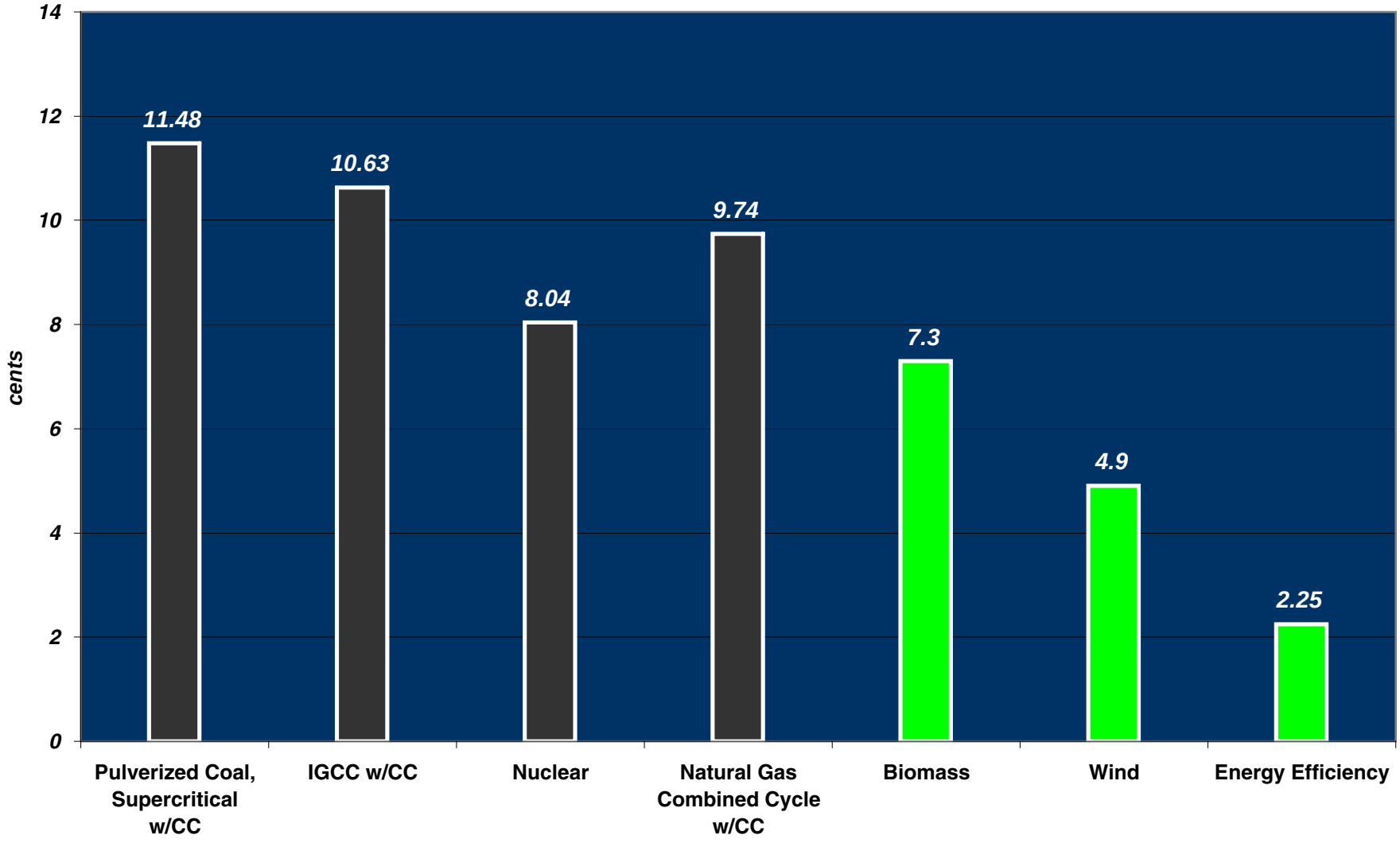
Comparative Cost of Generation 2007 cents/kWh