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Sen. James Merritt, Co-Chairperson
Sen. Rodric Bray
Sen. Michael Crider
Sen. Dennis Kruse
Sen. Jean Leising
Sen. James Tomes
Sen. Carlin Yoder
Sen. Jean Breaux
Sen. John Broden
Sen. Lonnie Randolph
Rep. Eric Koch, Co-Chairperson
Rep. Heath VanNatter
Rep. Robert Behning
Rep. Dale DeVon
Rep. David Frizzell
Rep. Jack Lutz
Rep. Alan Morrison
Rep. Timothy Neese
Rep. Edmond Soliday
Rep. Kreg Battles
Rep. Christina Hale
Rep. Matthew Pierce
Rep. Shelli VanDenburgh

LSA Staff:

Sarah Burkman, Attorney for the Committee
Jessica Harmon, Fiscal Analyst for the Committee

Authority: IC 8-1-2.5-9

REGULATORY FLEXIBILITY COMMITTEE

Legislative Services Agency
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Indianapolis, Indiana 46204-2789
Tel: (317) 233-0696 Fax: (317) 232-2554

MEETING MINUTES[1]

Meeting Date:	**September 30, 2013**
Meeting Time:	**10:00 A.M.**
Meeting Place:	**State House, 200 W. Washington St., the Senate Chamber**
Meeting City:	**Indianapolis, Indiana**
Meeting Number:	**3**

Members Present: **Sen. James Merritt, Co-Chairperson; Sen. Michael Crider; Sen. Dennis Kruse; Sen. Jean Leising; Sen. James Tomes; Sen. Jean Breaux; Sen. John Broden; Sen. Lonnie Randolph; Rep. Eric Koch, Co-Chairperson; Rep. Heath VanNatter; Rep. Robert Behning; Rep. David Frizzell; Rep. Jack Lutz; Rep. Alan Morrison; Rep. Matthew Pierce; Rep. Shelli VanDenburgh.**

Members Absent: **Sen. Rodric Bray; Sen. Carlin Yoder; Rep. Dale DeVon; Rep. Timothy Neese; Rep. Edmond Soliday; Rep. Kreg Battles; Rep. Christina Hale.**

Representative Eric Koch and Senator James Merritt, Co-Chairmen of the Regulatory

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[1] These minutes, exhibits, and other materials referenced in the minutes can be viewed electronically at http://www.in.gov/legislative Hard copies can be obtained in the Legislative Information Center in Room 230 of the State House in Indianapolis, Indiana. Requests for hard copies may be mailed to the Legislative Information Center, Legislative Services Agency, West Washington Street, Indianapolis, IN 46204-2789. A fee of $0.15 per page and mailing costs will be charged for hard copies.

Flexibility Committee (Committee), convened the meeting at 10:00 a.m.

(1) Indiana Utility Regulatory Commission (IURC) Annual Communications Industry Report:

In delivering the IURC's annual communications industry report,[2] Commissioner Larry Landis discussed the following topics:

• Area code relief: On July 31, 2013, southern Indiana was assigned "930" as a new area code when the IURC adopted an overlay to resolve the "812" area code numbering shortage. Although the overlay will require ten-digit dialing in the affected area, a supermajority of public comments indicated support for the overlay over the alternative option, which would have involved splitting the area into two regions, each with a different area code. The IURC held 10 public hearing on the issue. There will be a 13-month "grace period" before the overlay takes effect.

• Statewide direct marketing for video service providers: Under SEA 235-2013 (P.L.241-2013), the IURC now serves as the statewide direct marketing authority for video service providers (VSPs) wishing to conduct direct marketing activities in Indiana. The law allows VSPs to choose whether to register at the state level with the IURC or to obtain the necessary permits from individual localities. In either case, VSPs must continue to follow local ordinances concerning the time and manner of direct marketing activities. Three VSPs have applied for authority from the IURC: MetroNet, Comcast, and Acme Communications.

• Universal service reform: Universal service funding was originally dedicated to ensuring access to telephone service in high-cost areas and to low-income consumers. However, in 2011, the Federal Communications Commission (FCC) issued the Universal Service Fund/Intercarrier Compensation (USF/ICC) Transformation Order, under which funds previously designated for telephone service will be reallocated to support broadband deployment. This change in policy has negatively affected two small, rural Indiana telecommunications companies that had already invested in building out broadband infrastructure: Smithville Communications, Inc., and NineStar Connect.

• Lifeline reform: Part of the universal service initiative, the Lifeline program is designed to increase the rate of telephone subscribership among low-income consumers. Over the past decade, the FCC has shifted funding from landline service to wireless and prepaid wireless service. The cost of the program has ballooned, and waste, fraud, and abuse have surfaced as prepaid wireless companies have sought to enroll customers in Lifeline. The IURC's approach has been to help those consumers who qualify for the

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[2]See Exhibit 1. The full text of the IURC's annual report to the Regulatory Flexibility Committee on the natural gas, electricity, communications, and water and wastewater industries is available at:

http://www.in.gov/iurc/files/2013_IURC_Annual_Report_to_the_Regulatory_Flexibility_Committee.pdf

program and to hold accountable recipients and providers who abuse and exploit the program.

• Rural call completion: Call completion can be a problem in rural areas when a long-distance carrier uses a "least-cost router" to transport its customers' calls. The intercarrier compensation paid to the wholesale carrier responsible for routing the calls is often so low that the wholesale carrier simply does not complete the calls to higher-cost rural areas. Commissioner Landis recognized Tom Horter, a business owner from Bluffton, Indiana, who was in attendance at the meeting and who has experienced the problem of calls not be completed to his aluminum extrusion business. Commissioner Landis encouraged Committee members concerned about rural call completion to discuss the issue with Mr. Horter after the meeting.

• Technology migration: The public switched telephone network (PSTN) has been transitioning away from traditional telecommunications technology known as time-division multiplexing (TDM) to Internet protocol (IP) technology. Because IP technology requires power from the electric grid, communications service can fail during power outages, as occurred during Hurricane Sandy. To ensure a smooth transition from TDM to IP technology, AT&T and the National Telephone Cooperative Association have proposed to the FCC the use of test trials to address potential issues or concerns.

After concluding his presentation, Commissioner Landis took questions from Committee members. Representative Matt Pierce asked whether Commissioner Landis' remarks about the FCC's policies were meant to suggest that the FCC is undermining Indiana's efforts to provide universal service. Commissioner Landis replied that under the FCC's recent approach to universal service and intercarrier compensation, there has been a decrease in investment in broadband infrastructure. Efforts by local and state governments and the nonprofit sector to support broadband deployment had been working, but have been curtailed after the USF/ICC Transformation Order.

Senator Lonnie Randolph asked why companies have been reluctant to invest in needed communications infrastructure. Commissioner Landis explained that when the Telecommunications Act of 1996[3] was enacted, Congress made a covenant with rural service providers and customers. In exchange for allowing competition among telecommunications providers, a move that would largely benefit urban customers, Congress established the universal service program to ensure that rural consumers would be served. The program has traditionally allowed providers to recover both operating and capital expenditures made in serving rural areas. However, the FCC has proposed using universal service funds to cover capital expenses only. This proposed change has made rural providers reluctant to invest in infrastructure, because they would have to be able to afford to operate any infrastructure they build.

Senator Jean Leising asked whether it would take Congressional action to reverse the FCC's USF/ICC Transformation Order. Commissioner Landis responded that Congress could pressure the FCC to reverse the order, or a court could invalidate the order.

(2) Update on the TerraCom Data Security Breach:

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[3]P.L.104-104, 110 Stat. 56 (1996).

Terry Tolliver, Deputy Director of the Consumer Affairs Division in the Office of the Attorney General (OAG), provided an update on the OAG's investigation of a breach of customer data by TerraCom Inc., a provider of wireless service to Lifeline customers. On April 26, 2013, Scripps News notified TerraCom that it had discovered through a Google search that 170,000 customer applications for Lifeline had been posted publicly. Some of the records included full Social Security numbers, bank account information, and driver's license data. In early May, the OAG opened an investigation, focusing on: (1) whether TerraCom failed to properly safeguard the exposed data; and (2) whether TerraCom properly notified affected consumers of the breach after it occurred. In determining whether TerraCom has provided adequate notice to consumers, the OAG will investigate whether the company complied with the requirements of IC 24-4.9, Indiana's statute governing the disclosure of a data security breach. Mr. Tolliver noted that only a small portion of Indiana consumers were notified of the breach by TerraCom. He also reported that TerraCom has accused Scripps News of hacking into its data.

Mr. Tolliver pointed out that the IURC and officials in Illinois, Oklahoma, and Texas are conducting a separate investigation to determine whether TerraCom employees have submitted fraudulent service applications in connection with the Lifeline program.

(3) Communications Technology Transition:

Steve Rogers:

Steve Rogers, Director of Government Relations for AT&T Indiana, described the transition of Indiana's communications infrastructure from TDM to IP technology.[4] He explained that IP is a common "language" used to relay various types of information (including video, photos, voice, and text) as data across networks. IP technology enables seamless communication of data among various devices, such as televisions, phones, laptops, and tablets. According to Mr. Rogers, IP networks allow for a greater variety of services at greater speeds than legacy, copper-based telephone networks.

Mr. Rogers noted that consumers are adopting new devices and technologies at faster rates than in the past. One-third of American homes now use wireless phones only, another third of households use voice over Internet protocol (VOIP), and one-third of homes still use traditional landline phone service. Among low-income households, the percentage of wireless-only households is even greater (47%), and older Americans are increasingly adopting new technologies.

Mr. Rogers reported that to meet this growing consumer demand, AT&T has invested $98 billion in IP technologies since 2007 and plans to invest another $65 billion over the next three years, including $14 billion to expand and upgrade its networks, through its Project VIP strategy.

Mr. Rogers testified that the legacy network is expensive to maintain and cannot be sustained. Needed equipment is being discontinued, and technicians experienced in repairing and maintaining the old network are retiring. Mr. Rogers mentioned AT&T's proposed test trials to address potential issues or concerns with the eventual transition to all IP-based services. He emphasized that the trials should occur while a TDM network is still available to serve as a backup system.

Mr. Rogers concluded his remarks by noting that existing federal regulations will slow the

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[4]See Exhibit 2.

effort to connect all Americans with high speed Internet. The language in the National Broadband Plan acknowledges that regulations requiring certain carriers to maintain "plain old telephone service," or "POTS," lead to investments in potentially stranded assets and siphon investments away from new technologies.

Mr. Rogers then fielded questions from the Committee. Representative Pierce questioned whether federal regulations actually mandate that providers continue to offer TDM. Mr. Rogers replied that although the regulations may not explicitly require TDM, the effect of the regulations is to require it. Mr. Rogers offered to follow up to provide Representative Pierce with a legal explanation as to how the regulations, in fact, impose such a requirement.

Representative Pierce commented that he was concerned that the industry's move to increasingly provide services through wireless networks represented an effort to pursue a preferred business model, rather than to offer higher speeds to customers, given the bandwidth limitations associated with wireless service. Mr. Rogers replied that the current limitations for wireless service will not last. He noted that labs are working on 5G wireless technology, and that wireless speeds will only increase.

Senator Leising reported that when she travels in rural areas she sometimes encounters "dead zones" in which wireless service is not available. Mr. Rogers indicated that many factors can contribute to dropped calls, including network traffic, distance from cell towers, and the topography of the area.

Senator James Tomes noted that Indiana recently relieved incumbent local exchange carriers from "provider of last resort" obligations to serve underserved parts of Indiana.[5] Recalling Mr. Roger's testimony that one-third of households still rely on landline service, Senator Tomes questioned whether such households will continue to receive service if legacy providers relinquish their provider of last resort obligations. Mr. Rogers responded that AT&T assumed the provider of last resort obligation when it was still a monopoly. However, as more competitors entered the market, AT&T found that it was still responsible for the obligation, while no longer benefitting from the advantages of having a monopoly. The legislation enacted by the General Assembly was intended to "level the playing field," so that all providers are treated equally under the law.

Joni Hart:

Joni Hart, Executive Director of the Indiana Cable Telecommunications Association, testified that the cable industry is not involved in the TDM to IP transition. She noted the industry's investment in a two-way cable platform and highlighted some of the two-way services and products offered by cable providers, such as interactive television and remote access capabilities.

(4) Indiana's 811 Laws:

Kurt Youngs:

Kurt Youngs, President of the Indiana chapter of the National Utility Contractors Association, described the safety concerns of contractors who encounter underground utility facilities (such as cables and pipelines) when performing excavation work. He testified that utility companies often do not have accurate records or maps to indicate the

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[5]See HEA 1112-2012 (P.L.8-2012).

precise location of their buried infrastructure. The lack of adequate records impedes the ability of utility companies and the locating service providers they hire to accurately mark the location of their facilities upon being notified of impending excavation work under Indiana's 811 statute.[6] According to Mr. Youngs, Indiana's 811 law compounds the problem by not requiring utility companies to identify with sufficient precision the location of their underground facilities.[7]

Mr. Youngs noted that facilities incorporated into pavement present special risks, because they often are not evident until excavation begins. Before concluding his remarks, Mr. Youngs stressed that lethal substances, such as gas and hazardous liquids carried in pipelines, are often present near excavation sites, putting the lives of contractors and nearby residents and business owners at risk.

Representative Alan Morrison asked Mr. Youngs what he was seeking from legislators. Mr. Youngs stated that under Indiana's 811 statute, all liability for failure to comply with the law rests on contractors. Under HB 1253-2013, which was introduced by Representative David Niezgodski during the 2013 session, utility companies as well as contractors would have been subject to liability for violations. The legislation also would have required utility companies to maintain records of all as-built drawings and record drawings of their active underground facilities. Mr. Youngs urged lawmakers to consider introducing similar legislation in the 2014 session. Pointing to laws in California and New Jersey as model legislation, he referenced a press release from the California Public Utilities Commission that described a recommended $2.25 billion penalty against Pacific Gas & Electric Company for a pipeline rupture in 2010.[8] In response to further questioning by Representative Morrison, Mr. Youngs acknowledged that the changes sought would require utility companies to incur some costs, but he indicated his willingness to cooperate with all interested parties to improve safety.

Paul Fallon:

Paul Fallon, President of HRP Construction Inc. of South Bend, also urged legislators to amend Indiana's 811 statute.[9] He discussed the history of Indiana's one-call law and some of his personal experiences with excavation projects in both Michigan and Indiana. He cited several areas of concern in connection with excavating near buried facilities, including the following:

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[6]See IC 8-1-26. The FCC has designated the abbreviated dialing code 811 as the nationwide toll free number to be used by state "One Call systems," through which persons performing excavation work call to request that the location of underground utility facilities be marked by utility companies before the excavation begins. (See IC 8-1-26-3(3).)

[7]IC 8-1-26-18 provides that a utility company notified of an impending excavation shall, within two full working days after receiving the notice, supply to the person responsible for the excavation the "approximate location" and description of all the company's underground facilities that may be damaged as a result of the excavation. IC 8-1-26-2 defines "approximate location" as "a strip of land at least four (4) feet wide but not wider than the width of the underground facility plus two (2) feet on either side of the outer limits of the physical plant."

[8]See Exhibit 3.

[9]See Exhibit 4.

- Utility companies' decreasing use of in-house staff to perform locating activities, along with an increasing reliance on third-party locating services.
- Locators performing fewer preconstruction locates.
- Live facilities being abandoned in place without record of their location.
- Facilities being broken even by hand-digging.
- Excavators encountering directionally drilled facilities that aren't straight horizontally or vertically.

Mr. Fallon also described some of the changes that HB 1253-2013 would have made to Indiana's 811 law including the following:

- Requiring that locating activities involving subsurface installations or facilities in areas involving pavement be performed by "qualified persons" who receive certain training.
- Requiring utility companies to more precisely identify the location of their underground facilities to within 18 inches on either side of a facility.
- Requiring utility companies to maintain and share as-built drawings for all of their live underground facilities.
- Requiring locators to notify excavators when a facility is buried under pavement and requiring utilities to assist excavators in protecting the facility during the excavation.
- Equalizing the civil penalty that utility companies and excavators are subject to for violations of the law.
- Providing excavators with a cause of action for losses sustained as a result of a violation of the law.

Mr. Fallon suggested the following additional statutory revisions, among others, for legislators to consider:

- Requiring follow-up locating activities every 20 days.
- Requiring minimum strengths for facility materials to withstand hand-digging tools.
- Setting forth protocols for both abandoned live facilities and abandoned inactive facilities.
- Requiring improved recordkeeping by utility companies.

After ending his remarks, Mr. Fallon answered questions from several Committee members. Senator John Broden inquired as to the scope of the undertaking involved if utilities companies were required to track all of their abandoned facilities. Mr. Fallon admitted that such tracking would be a significant undertaking and therefore one that utilities would be unmotivated to undertake absent regulation. He pointed out that new tracking equipment is available to assist in the process.

Senator Leising asked whether it would be helpful to require improved installation and marking methods for all newly installed facilities, so that problems can be prevented at least with respect to new facility extensions. Mr. Fallon replied that such requirements would help, but that issues concerning materials strength and recordkeeping would also need to be addressed.

Representative Heath VanNatter asked whether individuals who perform locating activities for utility companies receiving any training. Mr. Fallon responded that utility companies often outsource their locating activities to third-party locating services. From among these services, utilities often choose the lowest bidder, which often has the largest insurance policy. The employees of these third-party providers are not given the resources they

need to properly locate and mark facilities, and there is a high turnover rate among their ranks.

Senator Randolph asked what role insurance companies play when damage to underground facilities occur. Mr. Fallon answered that when his company damages a facility in the course of its work, its insurance company pays for the damages, less the deductible amount. However, each claim filed on a policy results in higher insurance premiums for contractors.

Representative David Niezgodski:

As the owner of a family-owned plumbing business, Representative Niezgodski testified that he has personally encountered dangerous situations in excavating near buried utility facilities. He stressed that the main motivation behind his efforts to improve Indiana's 811 laws is to ensure the safety of the public and the workers involved in excavation projects. He stated that there needs to be a better balance in the law as to who bears responsibility for ensuring this safety.

Dan Meiners:

Dan Meiners, Executive Director of Indiana 811, testified that Indiana 811 is a non-profit corporation made up of operators of underground facilities in Indiana. In 2003, the General Assembly revised Indiana's 811 law[10] to require all operators that have underground facilities in Indiana to become a member of Indiana 811. In 2009, the legislature made further amendments to the law in an effort to improve the locating process.[11] Damages to underground facilities from excavation work have been reduced as a result of these statutory changes and from Indiana 811's work with the Common Ground Alliance, an association that identifies and promotes best practices for reducing damages to underground facilities.

Mr. Meiners noted that utility companies as well as contractors have been penalized under the law. As for suggestions to increase the statutory civil penalty for utility companies, Mr. Meiners noted that as members of Indiana 811, utilities bear all the costs of the services provided by the organization. He also pointed out that gas and hazardous materials pipelines are subject to additional state and federal regulations.

Senator Leising asked whether Mr. Meiners would recommend legislation that would require stricter standards for new facility installations. Mr. Meiners stated that such legislation may not be necessary. The IURC's Pipeline Safety Division already has rules and guidelines in place concerning the construction of pipeline facilities, for example.[12]

The Committee recessed for lunch at 12:15 p.m.

The Committee reconvened at 1:30 p.m.

(5) FERC Order 1000:

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[10]See P.L.114-2003.

[11]See P.L.62-2009.

[12]See IC 8-1-22.5 and IC 8-1-22.6.

Commissioner Kari Bennett of the IURC discussed Order 1000[13] of Federal Energy Regulatory Commission (FERC), which was issued in 2011 to address transmission planning and cost allocation by public utilities that own and operate electric transmission facilities.[14] Commissioner Bennett explained that FERC Order 1000 was intended to achieve the following policy objectives:

- To remove barriers inhibiting transmission investments.
- To enhance regional and interregional planning and coordination with respect to transmission projects.
- To ensure cost effective, efficient, and fair processes for transmission planning and cost allocation among utilities at both the regional and interregional levels.
- To facilitate federal and state public policies.

As the need for new transmission facilities grows, competitive transmission providers have emerged in the marketplace. These new providers have sought to build the transmissions facilities that incumbent utilities once had a federal right of first refusal to build. With the issuance of FERC Order 1000, however, this federal right of first refusal was eliminated. However, FERC Order 1000 kept intact state authority to regulate transmission siting and permitting. During the 2013 session, the General Assembly exercised this authority by enacting SEA 94-2013 (P.L.174-2013), which established a certification process for new electric transmission owners and allowed incumbent transmission owners a right of first refusal to construct transmission facilities needed to satisfy certain reliability standards.

Commissioner Bennett maintained that the approach adopted by the General Assembly was reasonable and balanced. By providing a "limited right of first refusal," SEA 94-2013 will allow competition for projects proposed for broader policy or economic development purposes, potentially resulting in cost savings for ratepayers. However, by giving incumbent transmission owners the right of first refusal for reliability projects, the law provides certainty that projects needed for grid reliability will be built and maintained, and addresses concerns about the safety and security of transmission projects connecting to existing facilities. The two regional transmission organizations operating in Indiana (MISO and PJM) have adopted similar approaches at the regional level.

Commissioner Bennett predicted that FERC Order 1000 will spur litigation as challenges to new state laws are filed. Some states have adopted full rights of first refusal for incumbent transmission owners, and legal scholars have speculated that such laws could be subject to legal challenge under the Commerce Clause of the U.S. Constitution. However, Commissioner Bennett suggested that Indiana would be well positioned with the approach taken in SEA 94-2103, as the state would be able to provide several justifications, including security concerns, for allowing a right of first refusal for reliability projects.

Senator Randolph asked about how the right of first refusal would affect the rights of landowners whose property would be affected by a proposed transmission project. Commissioner Bennett explained that FERC Order 1000 does not affect state eminent domain laws, so a transmission owner seeking to acquire land for a project would have to either enter into a purchase agreement with the landowner or proceed through the legal process set forth in Indiana's eminent domain laws.

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[13]See Exhibit 5.

[14]FERC Docket No. RM10-23-000; Order No. 1000 (Issued July 21, 2011).

Representative Pierce expressed concern about how the deliberations that resulted in the final language adopted in SEA 94-2013 were conducted during the session. He stated that several stakeholders had complained of being left out of the negotiations. Commenting on the IURC's role in the process, Commissioner Bennett stated that while the IURC did not broker or demand an agreement among the parties, it did facilitate the discussions that took place.

Representative Pierce then asked for clarification as to what would constitute a "broader policy or economic development purpose" cited by Commissioner Bennett as being open for competition among various transmission owners under SEA 94-2013. Commissioner Bennett cited as an example of a policy purpose a potential determination by MISO that more transmission facilities would be needed to connect new wind resources in one state to customers in other states. She cited as an example of an economic development purpose any transmission project that would be larger than what is needed for reliability, such as new transmission facilities in an area where new population growth or business development is anticipated.

Representative Koch noted that other stakeholders who had expressed interest in FERC Order 1000 and SEA 94-2013 during the legislative session had been invited to attend and testify at the present meeting, but could not participate for a variety of reasons. The trade association for rural electric membership cooperatives declined the invitation to testify on the subject.

(6) Small Modular Nuclear Reactors:

Michael Whatley:

Michael Whatley, National and State Affairs Adviser to the Babcock & Wilcox Company, discussed small modular reactors (SMRs), which are part of a new generation of nuclear power plant designs, as a possible new source of electricity generation for Indiana.[15] He reported that because of new federal environmental regulations, 27 coal-fired plants will come offline in Indiana, representing a loss 4,100 MW of generating capacity. Given this loss of generating capacity and a projected nationwide increase in electricity demand over the next decade, Mr. Whatley urged legislators to consider SMRs, with their zero-emissions operations, as an option to replace Indiana's aging coal-fired power plants.

Mr. Whatley explained that Babcock & Wilcox's Nuclear Operations Group, Inc., while based in Virginia, has major operations in Indiana. The company employs 160 people in Indiana and has nuclear manufacturing facilities in Mount Vernon. The company is also a 90% owner in the Generation mPower partnership, which is developing SMRs for commercial electricity generation. The partnership has designed the B&W mPower Reactor, which is a light water reactor system with a scalable, modular design. The reactors are shop-assembled and then transported, already constructed, to a site. Each unit has a 180 MW capacity, and additional generation can be added in 180 MW increments. The reactors have a four-year operating cycle, during which there is no need for refueling. A two-reactor system can be contained fully underground at a 40-acre site. Mr. Whatley described a project involving Babcock & Wilcox and the Tennessee Valley Authority at Clinch River, Tennessee. The project will receive $150 million in funding from the U.S. Department of Energy (DOE) and is expected to be in commercial operation by 2022.

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[15]See Exhibit 6.

Mr. Whatley concluded by setting forth the following benefits of developing SMR technology:

- There is strong support by the federal government for research and the licensing and deployment of these new technologies.
- The innovative design of SMRs enhances their safety.
- SMRs are subject to strong regulation and a new plant licensing program.
- The design and manufacture of SMRs have the potential to create valued jobs in multiple sectors.
- At the Babcock & Wilcox facility in Mount Vernon, there is a potential to manufacture and assemble reactor vessels and core baskets for SMRs.

Representative Morrison asked what detractors of the technology would say about SMRs and what Mr. Whatley's response would be. Mr. Whatley stated that cost and safety concerns are often cited by opponents of nuclear power. With SMRs, the cost per MWh is the same as with traditional nuclear power. He also acknowledged that SMRs require the same site radius that applies to full-scale nuclear plants; as a result, SMRs cannot necessarily be deployed at the same sites as former coal-fired plants.

Senator Tomes asked about the potential for job creation in his southern Indiana district if SMRs were to be manufactured there. Mr. Whatley stated that he could not make any employment projections at this point, but he indicated that the Mount Vernon facility would be suited to the production of SMRs.

Senator Leising asked whether a two-reactor system, with 180 MW per unit, would offset the loss of one coal-fired unit. Mr. Whatley replied that it would depend on the size of the coal-fired unit being closed, but that the two-unit systems can be upgraded as demand for power grows.

Representative VanNatter asked where waste from SMRs is stored. Mr. Whatley stated that currently there is not a long-term solution for the storage of spent fuel. As used with large-scale nuclear facilities, onsite storage casks are planned for the near term.

Representative Terri Austin:

Representative Koch recognized Representative Terry Austin, who, though not a member of the Committee, was in attendance at the meeting. Representative Austin addressed the Committee to urge members to consider SMRs as an option when planning for Indiana's energy needs. She noted that Indiana has no source of nuclear power within its borders but imports such power from neighboring states. She also pointed out that Indiana imports half of the coal used to generate electricity in the state.

Grant Smith:

Grant Smith, Chair of the Legislative Committee for the Sierra Club Hoosier Chapter, urged lawmakers to use caution in considering nuclear power as a source of energy for Indiana.[16] Pointing to the government subsidies that the nuclear power industry has received, he argued that investing in nuclear plants is not economically prudent. He stated that plant cancellations and cost overruns have cost ratepayers and taxpayers billions of dollars and reported on a number of announced plant shutdowns and abandoned projects across the country. Noting that the SMR designs that would be piloted first are water-

[16]See Exhibits 7 and 8.

cooled, Mr. Smith warned legislators that water availability should be a siting concern when SMRs are considered. He concluded his testimony by citing various sources suggesting that solar PV and wind energy will emerge as viable sources of electricity in the near future.

Representative Morrison cited U.S. DOE statistics on wind capacity that he claimed contradicted statistics cited by Mr. Smith. He also expressed doubt that solar and wind would be able to meet the nation's energy needs. Mr. Smith pointed out that Germany uses solar energy for 50% of its energy needs, and that the price of solar panels has been decreasing. Storage technologies are being developed to capture electricity generated by wind and solar resources. At the end of an exchange concerning the viability of alternative sources of energy, Mr. Smith and Representative Morrison concluded they would not agree on the subject.

Representative Lutz asked Mr. Smith to elaborate on Mr. Smith's earlier assertion that reactors for SMRs would most likely be manufactured in China. Mr. Smith explained that because China's nuclear supply chain is more developed than that of the United States, China could ramp up production of reactors more quickly.

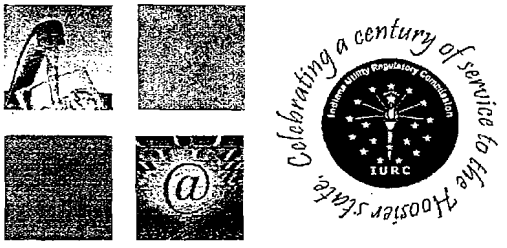
Representative Koch concluded the meeting by indicating that the Committee would not meet again during the interim and would not make any recommendations to the Legislative Council concerning any of the issues discussed at the Committee's three meetings.

The Co-Chairmen adjourned the meeting at 3:00 p.m.

Exhibit 1
Regulatory Flexibility Committee
9/30/13

Presentation to the
Regulatory Flexibility Committee of the
Indiana General Assembly

Larry Landis
Commissioner
Indiana Utility Regulatory Commission



Area Code 930 Will Join 812 Throughout Southern Indiana

Video Service Provider (VSPs) Statewide Direct Marketing

Universal Service "Reform"

LifeLine Program

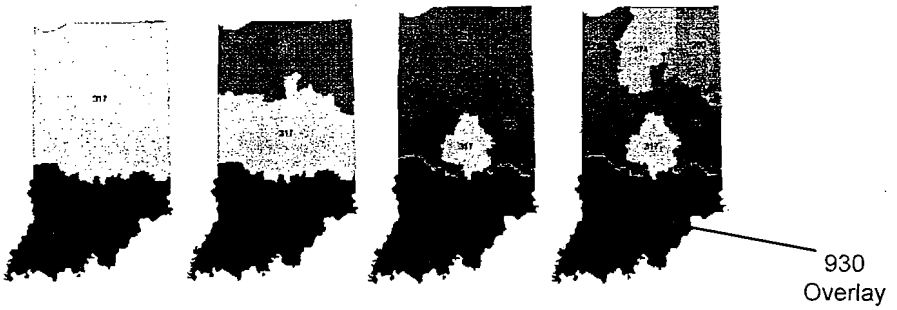
Rural Call Completion

Migration to a New Network Model (TDM to IP)

Area Code Relief

Southern Indiana is Running Out of Numbers

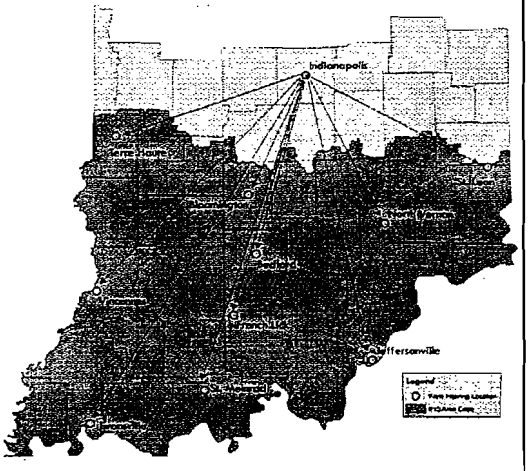
IURC Order in Cause No. 44233 was issued on July 31, 2013



9

Hearings

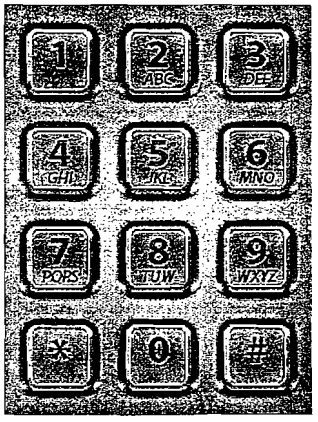
- 1600 miles traveled
- 10 public hearings
- Virtually all residents within an hour of at least one hearing



10

Decision

- Supermajority of all comments favored an overlay, even with 10-digit dialing requirements
- We are now in a 13-month "runup" or grace period

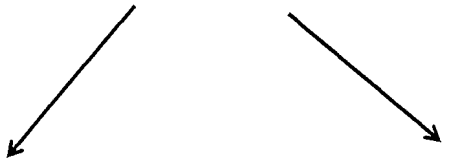


11

Video Service Providers (VSPs) Statewide Direct Marketing

Direct Marketing Authority for VSPs

Companies may choose one or the other:



Local Authority

Statewide Authority

Universal Service "Reform"

The FCC's Decision Repeatedly Trampled On:

State Jurisdictional Authority

Congressional Intent

15

Prior to issuing the order, the FCC **literally rewrote** the record of evidence in the proceeding, introducing thousands of pages of its own "evidence."

16

"No good deed goes unpunished"

Cutbacks have directly affected two small, rural Indiana companies all because they were ahead of the curve on build out

17

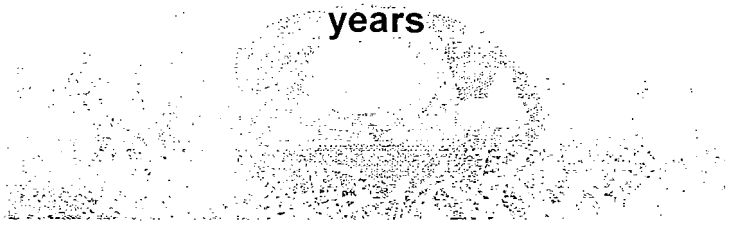
FCC Action has Undercut Broadband Investment in Indiana & Nationally

There is an enhanced risk that the FCC will act to undo certain policies that have been implemented here in Indiana with bipartisan support

18

700+ Rural Co-ops & Mom & Pop companies are at risk

The ICC/USF Transformation Order will begin to hit home this year… and with a vengeance in the coming years



19

70% of all rural companies have cancelled existing plans to build out broadband to unserved areas due to FCC-imposed uncertainty

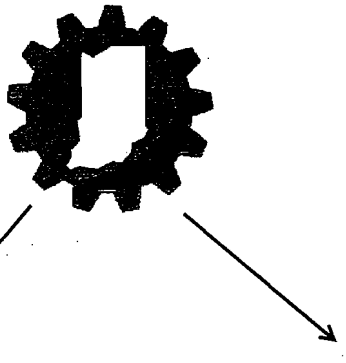
Lending has dried up

FCC has avoided responsibility

$1 billion+ unfunded liability

20

Hobson's Choice



Let small businesses go under?

Find support to help them survive?

21

Issues with the FCC's Order

1. It has been revisited multiple times
2. The model is deeply flawed
3. Commission Pai issues scathing dissent shredding FCC model

22

Lifeline Reform

Background

- Lifeline, traditionally a landline program
- In the last decade, the FCC has shifted funding to support other areas:
  - Wireless
  - Prepaid Wireless

24

Rising Costs

In 2010, Ray Baum of Oregon warned:

"The program could balloon from $800 million to $2 billion in just three years"

25

Waste, Fraud, and Abuse?

Genachowski stated:

"We've cut $200 million in waste, fraud, and abuse"

26

Three Two Years Later

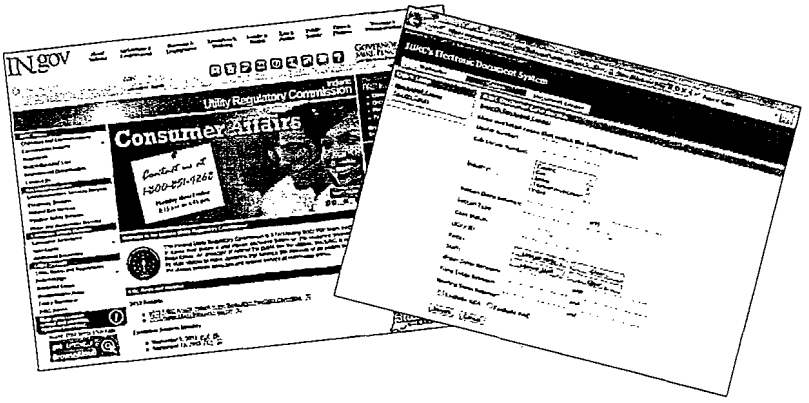
Ray was right…
but it only took two years
to go from $800 million
to $2 billion plus.

IURC Intent

Help those who need and qualify for it…

…and aggressively root out those recipients and providers who abuse and exploit it

Transparency



29

Rural Call Completion

Intercarrier Compensation

- Intercarrier compensation enables local entities to be compensated for delivering calls to customers
- However, "least cost routers" don't always complete the calls like they should
- When this happens, rural areas are the hurt, including the phone companies, the citizens, and local businesses undercutting economic development efforts

31

Why There is a Need to Counterbalance the FCC

1. Issues are ignored
2. Issues can languish for 10 years or more
3. FCC action – or inaction – in some cases may be a matter of life or death to providers, customers, and businesses . .

   (indeed the whole rural economy)

Migration of Communications Networks

Technology Migration

Time Division Multiplexing ⇨ Internet Protocol

(otherwise known as)

TDM ⇨ IP

34

Two Sides

The migration carries significant benefits, but there are also challenges

35

Technological Red Flag

VoiceLink fixed wireless service

State consumer advocates have warned it is "a step backwards in terms of reliability and public safety, data communications capabilities, price and the provision of safe, adequate, and reliable service at affordable rates"

36

Warnings

Witnesses in the FCC proceeding warned VoiceLink does not support:

Medical monitoring devices
Home security systems
Operator access by dialing "0"
Broadband
Fax machines
Collect calls
International calling
"Reverse 9-1-1" outbound emergency notification systems
Credit card readers
LifeAlert systems
Calling card services

37

Proposals

The AT&T and NTCA proposals, involving trials and full examination of the issues, will ensure that the benefits are captured and the shortcomings are avoided/addressed

38

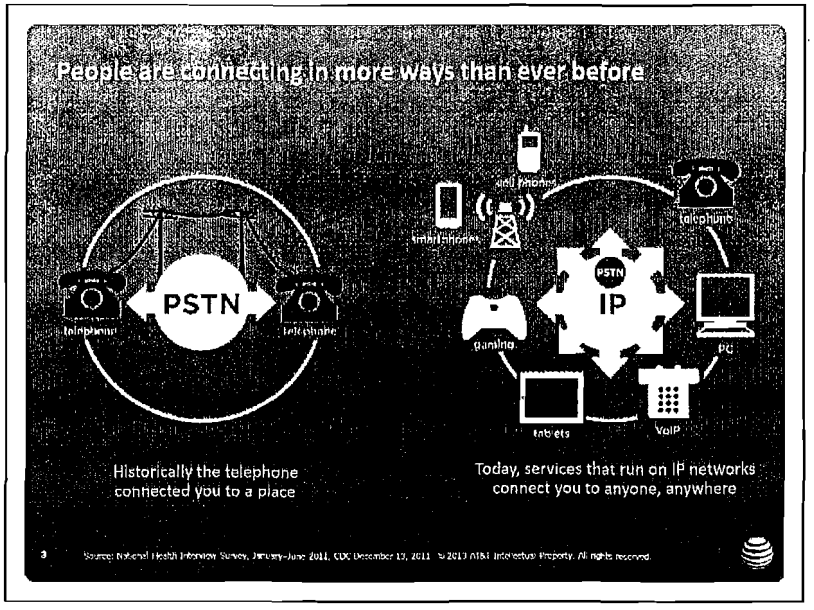
Indiana Regulatory Flexibility Committee

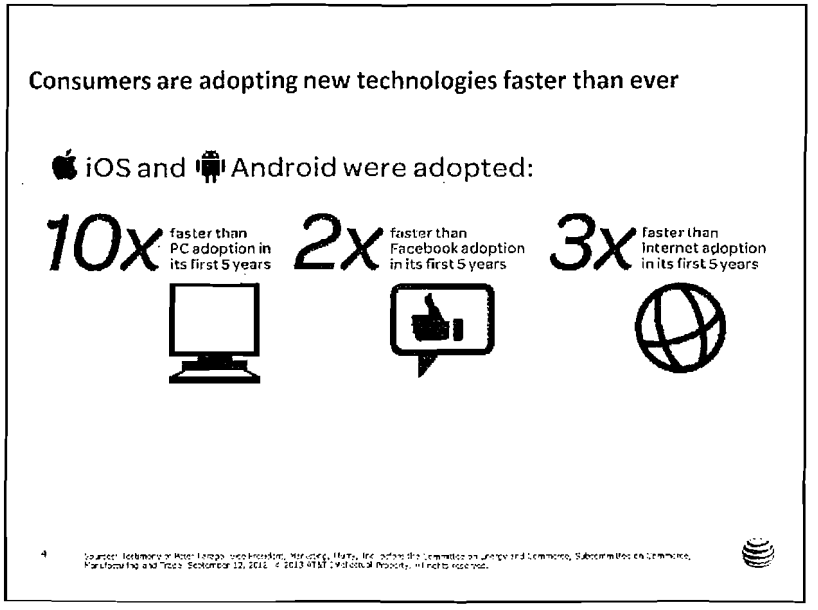
September 30, 2013

Rethink Possible

What is the IP Transition?

- IP: IP stands for "Internet Protocol." A common "language" used to relay various types of information (video, photos, voice, text) as data across networks.
- IP technology enables seamless communication of data among various devices (TVs, phones, laptops, and tablets).
- IP networks offer a greater variety of services at speeds many times faster than old legacy copper-based telephone networks.


People are connecting in more ways than ever before
PSTN
telephone
telephone
cell phone
smartphone
telephone
PSTN
IP
gaming
PC
tablets
VoIP
Historically the telephone connected you to a place
Today, services that run on IP networks connect you to anyone, anywhere
3
Source: National Health Interview Survey, January–June 2011, CDC December 13, 2011 © 2013 AT&T Intellectual Property. All rights reserved.


Consumers are adopting new technologies faster than ever
iOS and Android were adopted:
10x faster than PC adoption in its first 5 years
2x faster than Facebook adoption in its first 5 years
3x faster than Internet adoption in its first 5 years
4
Source: Testimony of Peter Lampe, vice president, Marketing, Hulu, LLC, before the Committee on Energy and Commerce, Subcommittee on Commerce, Manufacturing and Trade September 12, 2012 © 2013 AT&T Intellectual Property. All rights reserved.

New technologies have changed how Americans do business

In 1987, backed by old technology, cellular voice only services

In 2012, modern broadband technologies are essential for America's economic growth and job creation

1987

2012

In 1987, a farmer used a landline to order seeds

In 2012, a farmer can manage irrigation systems from a smartphone

In 1987, a doctor used a landline to collaborate on a diagnosis and schedule appointments

In 2012, a doctor can review an X-ray or MRI online, or diagnose a patient over videoconference

In 1987, a software engineer used a landline to connect to the internet

In 2012, a software engineer can code, test, and deploy new software from a tablet

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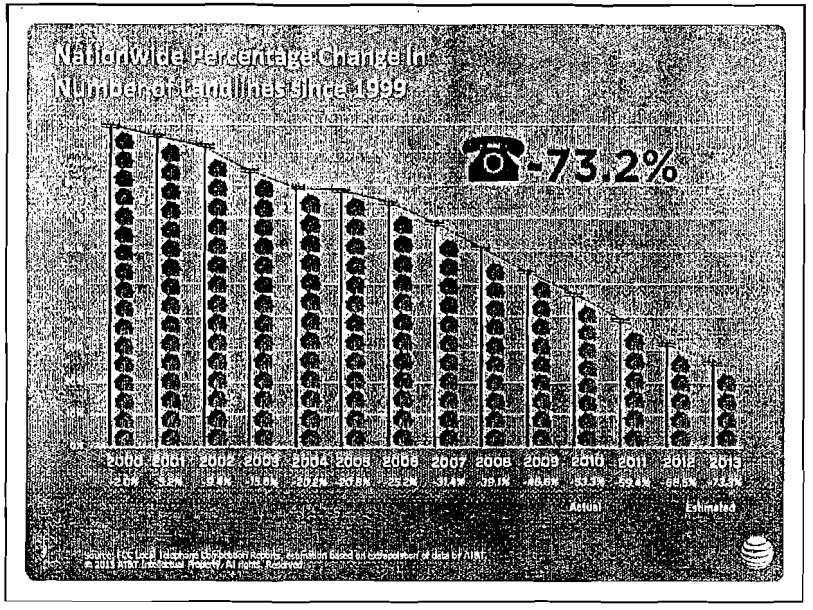
Consumers are quickly replacing traditional landlines

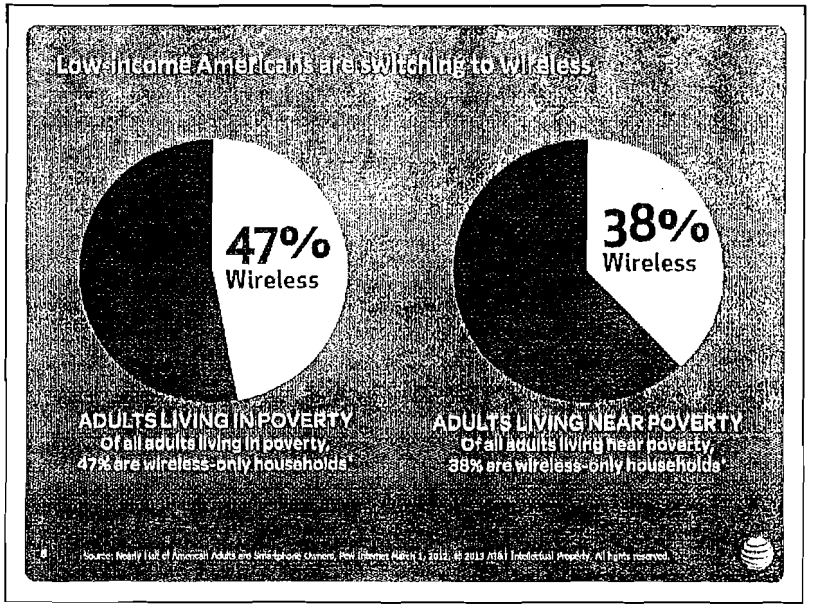
1 out of 3 American homes is now wireless only.
That's double the rate from 2008, and nearly triple that of 2007[1]

Nearly another **one-third of households use VoIP[2]**

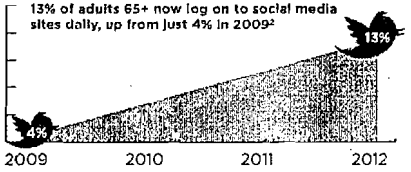
Leaving about **one-third of homes still using traditional landline phone service**

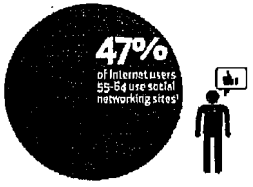
6 Sources: 1. Nielsen Health Insurance Survey, January-June 2011, 2. FCC Docket 13, 2011, 3. FCC 2010 ... telephone Competition Reports, VoIP estimates based on extrapolation of data 2010 FCC Form 477. © 2013 AT&T Intellectual Property. All rights reserved.

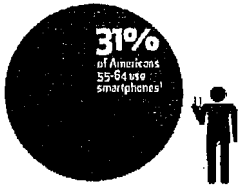

Nationwide Percentage Change in Number of Landlines since 1999
-73.2%
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Actual
Estimated


Low-income Americans are switching to wireless.
47% Wireless
ADULTS LIVING IN POVERTY
Of all adults living in poverty, 47% are wireless-only households
38% Wireless
ADULTS LIVING NEAR POVERTY
Of all adults living near poverty, 38% are wireless-only households*

Older Americans are increasingly adopting new technologies







Sources: 1. Older Adults and Internet Use, Pew Internet and American Life Project, June 6 2012; 2. Older Adults and Social Media, Pew Internet, August 27, 2010.

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To meet growing consumer demand, AT&T has invested $98 billion since 2007

We've invested more in America over the past five years than any other public company

$325 Million invested in Indiana in the first half of 2013

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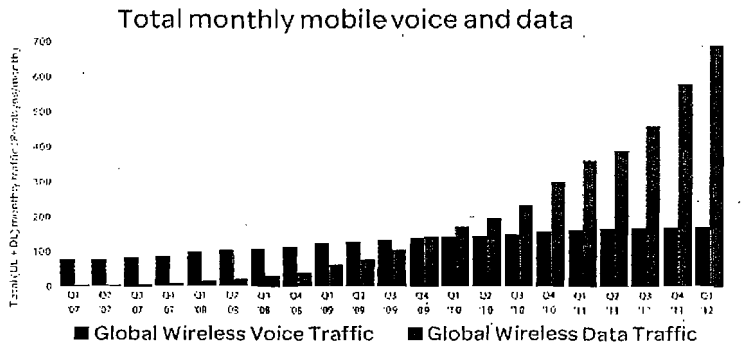
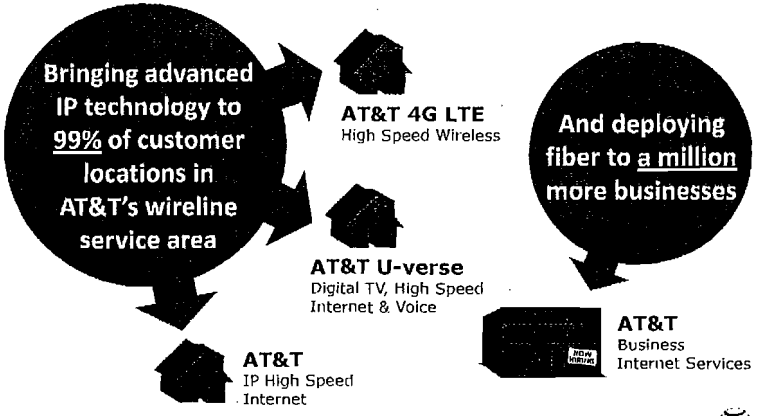
But even more investment is needed to keep up with consumer demand



11 Source: Ericsson, "Mobility Report," June 2012. © 2013 AT&T Intellectual Property. All rights reserved.

Now we plan to invest another **$65 billion** over the next 3 years — including **$14 billion** to expand and upgrade our networks



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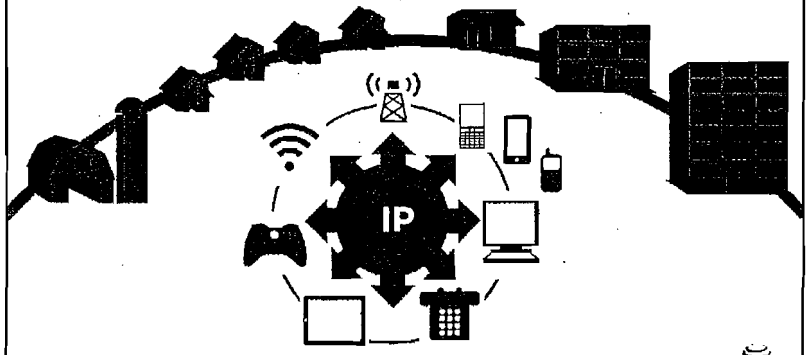
To ensure a smooth transition to all IP-based services, AT&T has proposed to the FCC test trials to address potential issues or concerns



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The World is Changing Now

- Every dollar invested in TDM is a dollar not invested in the network of the future
- There is no choice, TDM cannot be sustained
  - Equipment is becoming discontinued
  - Experienced technicians are retiring
- We should act now while we still have a TDM network as a safety net
  - The devil is in the details, but we need trials

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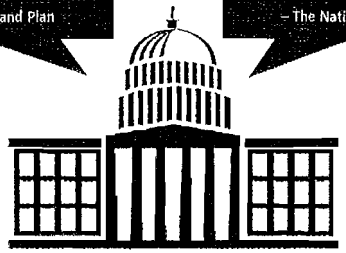
Requiring continued investment in old network technology will slow the effort to connect all of America with high speed Internet

"Regulations require certain carriers to maintain POTS—a requirement that is not sustainable—and lead to investments in assets that could be stranded."

– The National Broadband Plan

"These regulations can have a number of unintended consequences, including siphoning investments away from new networks and services."

– The National Broadband Plan



15 Sources: The National Broadband Plan, Chapter 4: Broadband Competition and Innovation Policy, Section 4.6, Transition from a Copper-Based Network.

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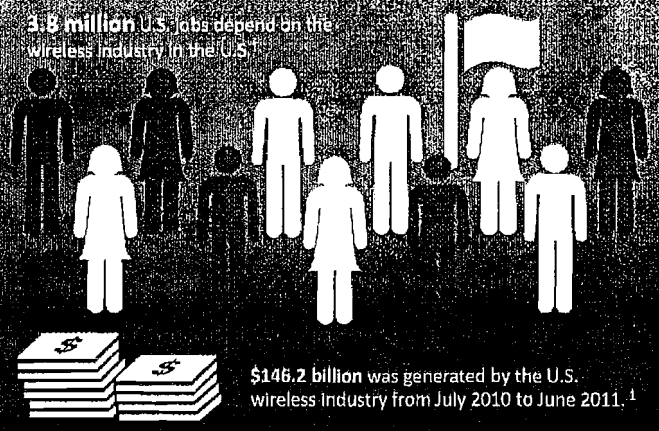
Building an IP economy is key to America's future

3.8 million U.S. jobs depend on the wireless industry in the U.S.[1]



$146.2 billion was generated by the U.S. wireless industry from July 2010 to June 2011.[1]

16 Sources: 1. The Wireless Industry: The Essential Engine of US Economic Growth, Kenan Institute, April 2012; 2. USTELECOM; 3. Investment Heroes: Who's Betting on America's Future, Progressive Policy Institute, July 2012. © 2013 AT&T Intellectual Property. All rights reserved.

Regulation needs to be modernized now to help America achieve an IP economy by:

- Driving innovation & investment in new technologies
- Creating more job growth
- Meeting consumer demand today & tomorrow
- Helping America achieve the National Broadband Plan
- Helping keep America competitive

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Exhibit 3
Regulatory Flexibility Committee
9/30/13

California Public Utilities Commission

505 Van Ness Ave., San Francisco

FOR IMMEDIATE RELEASE
Media Contact: Terrie Prosper, 415.703.1366, news@cpuc.ca.gov

PRESS RELEASE
Docket #s: I.12-01-007, I.11-02-016, I.11-11-009

CPUC STAFF RECOMMEND $2.25 BILLION TOTAL PENALTY AGAINST PG&E FOR SAN BRUNO PIPELINE RUPTURE; PENALTY WOULD BE LARGEST OF ITS KIND ASSESSED IN NATION

SAN FRANCISCO, May 6, 2013 - The Safety and Enforcement Division of the California Public Utilities Commission (CPUC) today recommended that the CPUC impose a total $2.25 billion penalty against Pacific Gas and Electric Company (PG&E) for three penalty cases arising from the Sept. 9, 2010, PG&E pipeline rupture in San Bruno, Calif. If the recommendation is adopted by the CPUC, it would be the largest penalty ever levied by a state regulator.

Brigadier General (CA) Jack Hagan, the Director of the CPUC's Safety and Enforcement Division, said, "I am recommending the highest penalty possible against PG&E, without compromising safety and I want every penny of it to go toward making PG&E's system safer."

The Safety and Enforcement Division's recommendation calls for the $2.25 billion penalty to be used solely for safety purposes. The Safety and Enforcement Division says that the death toll, physical injuries, and extensive damage to homes by the pipeline blast is unsurpassed in its severity and PG&E's failures is long and reprehensible. "There is no amount of money that will bring back the eight people who tragically lost their lives in the pipeline blast or heal the lasting wounds to the people of San Bruno. All we can do is make sure such a tragedy does not happen again. I listened to legislators and the public and determined that every single dollar available from PG&E should go straight to efforts that will ensure safety," said General Hagan. "The recommendation is what the Safety and Enforcement Division believes is the maximum financial penalty that can be imposed on PG&E shareholders without compromising safety. This is a penalty far greater than the CPUC, or any other state regulatory body, has ever assessed."

The recommended penalty payment would encompass monies PG&E already has been ordered to spend on safety enhancements, as well as future safety investments. Under the Safety and Enforcement Division's recommendation, the $2.25 billion penalty would be directed toward Phase I and Phase II of PG&E's Pipeline Safety Enhancement Plan. The money would come out of shareholder funds and would not be paid by ratepayers. Likewise, any capital investments by PG&E would be excluded from the utility's rate base, for ratemaking purposes.

Since the September 2010 pipeline rupture, PG&E has said that it has invested upwards of $1 billion in safety activities such as pipeline test or replacement, installation of safety values, verification audits and inspections, and development of safety management systems. The recommended penalty amount would include these expenditures plus future safety expenses, up to a total of $2.25 billion. Under the recommendation made today, PG&E also would be subject to audits to ensure the company does not under-spend in any other areas of their operations that effect safety to off-set any of these expenditures. The recommendation calls for an independent third-party to oversee the funds to ensure they are spent wholly and appropriately.

The Safety and Enforcement Division's recommendation agrees with the Independent Review Panel that examined the pipeline rupture and cautions that responsibility for the tragedy in San Bruno does not start and stop with PG&E. Said General Hagan, "The CPUC itself must recognize its contribution to the lax safety culture that directly led to the unsafe conditions resulting in the explosion. PG&E was not operating safely, and we at the CPUC did not do enough to spot this. PG&E failed to know, failed to test, failed to prioritize safety in its gas system integrity management program. But the CPUC, its staff, and all intervening parties failed as well to do their job to ensure safety of the natural gas system. This is the harsh lesson of the pipeline rupture. We must never fail to keep it foremost in our minds."

If today's recommendation is adopted by the CPUC, it would be the largest penalty ever levied by a state regulatory body in the U.S. The largest CPUC safety related penalty imposed in the past was a $38 million penalty against PG&E as a result of a natural gas explosion on December 24, 2008, in Rancho Cordova, Calif. Nationally, the largest penalty under federal pipeline safety laws was $101.5

million for an explosion on the El Paso Natural Gas pipeline in New Mexico in August 2000.

PG&E will file its reply to the recommendations of the Safety and Enforcement Division and other intervenors on May 24, 2013; the Safety and Enforcement Division and intervenors will then file any replies to PG&E on June 5, 2013. A CPUC decision is expected in late summer.

The Safety and Enforcement Division recommendation is available at: http://www.cpuc.ca.gov/NR/rdonlyres/1865E039-2482-43A4-91A5-E9E28C40A00A/0/I1201007etalCPSDOpeningBriefonFinesandRemedies.pdf.

For more information on the CPUC, please visit www.cpuc.ca.gov.

###

Possible Changes in IC 8-1-26 and the Background to HB 1253

Paul J. Fallon
HRP Construction Inc.

My apologies to Members of CIDPC.

- I failed to honor a provision of the Charter that I insisted be included.

Contractors do seem obnoxious!

- We build things, and eke out a living doing so, in spite of:

1. Huge risks.
2. Massive Obstructions (permits, inspections, public, cash flow).

We are doers, people that are willing to be, and that need to be, outside the mold.

Typical successful contractors only average around 3% profit.

So, builders are not only doers but also survivors.
Readily recognize, and react to, untenable circumstances.

No vendettas against one or more Utility Owners

- Others utilities might be worse or better.
- We are largely unfamiliar with others.
- Firms of which we speak have good people and we believe want to do the right thing.

- Unfortunately, they are products of their own environments.
- They feel overwhelmed trying to comply with existing law & present challenges.
- Our VENDETTA is not AGAINST particular utilities, but against the system.

Personal History with Laws & Practices

- Started in Michigan in 1969.
- Cooperative positive relationships built on communication:
  - Utilities did their own locating.
  - Would do it before the job.
  - Permitted excavator's employees to cut gas lines.
  - Utility would re-hook them at the end of the day for a minimal fee.

Personal History with Laws & Practices

Continued

- Don't recall any delays during construction phase due to locating utilities.
- One call system started in SE Michigan in 1970.
  - * Encoded in law in 1974
  - * In place in lower peninsula by 1975.

- **Generally things were peaceful & positive.**
- Most problems were avoided / prevented.
- Remainder were worked out.

Personal History with Laws & Practices

Continued

In 1981, came in Indiana and started at HRP.

- Seemed like going backwards.

Negatives:

- No strong one call system.
- Initiation & growth of independent locators.
- Lost the spirit of cooperation
- Relationships were more combative, devisive.

Personal History with Laws & Practices

Continued

- Any damage – we got a bill.
  - We either paid it
  - OR got taken to court and won. (usually after counter suiting).
- More animus and friction
  - But, we were able to operate on a somewhat level playing field.

Personal History with Laws & Practices

Continued

Then, the world as I knew it went upside down:

- Wasn't acutely aware of Indiana's 1990 one call law.

- We were awarded an INDOT job in early 1990s to replace and expand the major east / west thoroughfare on north side of South Bend.

Personal History with Laws & Practices

Continued

- No start until spring, because job carried all of Notre Dame football traffic, road had to be open & job done, by early September (first home football game), an **extremely** tight schedule.
- After starting, phone lines were not in the right place and/or elevation. It took them over 3-weeks to move their facilities.

Personal History with Laws & Practices

Continued

- After they were "done and gone", a loader bucket, while doing nothing more than leveling off the surface, cut the newly "lowered" phone line.

- In the middle of the project's most important intersection
- We lost another week, and then some.

Personal History with Laws & Practices

Continued

HRP and others were infuriated by:

- Their incompetence and its effect on us.
- The time and dollars it cost us.
- Risk to our reputation.

Safety wasn't really an issue.

Personal History with Laws & Practices

Continued

Surprise to us – the phone company folks were equally mad and wanted us to pay!

- They threatened us with:
  - Lawyer fees.
  - Triple damages.
  - And enjoining us from digging anywhere around their facilities.
- In effect, shutting down the job & putting us out of business

Personal History with Laws & Practices

Continued

Our lawyer said the law did allow those measures.

So, we were on the defensive.

- Spent a lot of effort and money defending ourselves.
- Were happy when we didn't have to pay.
- But never collected a cent for our damages and legal expenses.

Personal History with Laws & Practices

Continued

Since then situation only got worse!

- ✓ We could no longer suit or countersuit.
- ✓ Utilities used fewer in-house locators.
- ✓ Locators performed fewer preconstruction locates.
- ✓ More lines abandoned in place without record. (Many of them are live).
- ✓ Vertical taps.
- ✓ Lines broken by hand-digging.
- ✓ Plastic lines being dependent on tracer wires.
- ✓ Plastic lines trenched in un-straight lines.
- ✓ Directionally drilled lines weren't straight horizontally or vertically .

Personal History with Laws & Practices

Continued

Yet – we are still subject to:

- ✓ Paying Utility Company damages.
- ✓ Paying their legal bills.
- ✓ Paying 3x Utility Company damages.
- ✓ Being enjoined from working.

Personal History with Laws & Practices
Continued

Operators use the law to bully excavators into payment.

Personal History with Laws & Practices
Continued

With no recourse when we are wronged.

Personal History with Laws & Practices

Continued

Revisions effective 2009 only made matters worse.

Excavators now:

- Must research and defend themselves in every incident.
- Often on an untimely basis.
- Often without clear resolution.
- Subject to substantial fines.
    * 10 times those applicable to far more wealthy utility companies!

Personal History with Laws & Practices

Continued

Have been told "Other laws, with teeth, keep or will keep utilities in line".

We see no evidence of change.

Personal History with Laws & Practices

Continued

This is not about money!

At least, not HRP's money.

It's about preventing injury and death.

Personal History with Laws & Practices

Continued

I don't want to go to:

- funerals
- or hospitals
- or call any wives / families at home

We understand that if we screw up our people are at risk! We can live with that.

How can, or why should anybody else, protect us against our own errors?

Personal History with Laws & Practices

Continued

But, the majority of errors / dangers / accidents to which our people are exposed are NOT of our doing.

Personal History with Laws & Practices

Continued

In 2012, HRP damaged 10 gas lines:

- 2 were located correctly. (We failed to properly support).
- 1 was located inadequately (committee ruled we failed to provide notice).
- 2 were located incorrectly (tracer wire was 2' form line, and tracer wire didn't follow 2' loop in line).
- 5 were unmarked (operator disclaimed and destroyed his records on "abandoned", yet live, lines).

Personal History with Laws & Practices

Continued

In 2012, HRP damaged 10 gas lines (continued):

- 10 cut lines – all with potentially tragic results.
- In 3 of which we were apparently in the wrong.
- In 7 of which we did nothing wrong.

Personal History with Laws & Practices

Continued

Result of decades of callous indifference by operators that puts the lives of my co-workers, and innocent public at risk.

Personal History with Laws & Practices

Continued

Without acknowledging those problems, their cause, and the resultant unnecessary risks, there won't be any real solutions or improvements.

Personal History with Laws & Practices

Continued

We have been told excavators too often make business decisions that unnecessarily puts the facilities of others, people and property at risk.

That used to sting and frustrate me!

- Because it is accurate, to a point.

Personal History with Laws & Practices

Continued

But, for every such poor business decision our people may have made, Utility Companies have made hundreds or thousands.

Most of our poor decisions were instantaneous, singular, and/or based in ignorance.

Personal History with Laws & Practices

Continued

But Utility Companies' decisions were company wide, planned, and a result of systemic policy by an agency that knows (or should have) known better.

How Does NUCA fit into all of this?

- Contractors are builders & doers in a competitive environment.
- Not good joiners.
- Suspicious of each other.
- Small businessmen wearing many different hats.
- Are busy.
- Don't always play well together.

NUCA is a strong, active, national organization.

- 1500 – 1600 members.
- Work on common problems, there are many such as:
  - OSHA safety standards.
  - Federal laws
  - Funding of programs.
  - Active in CGA.

Indiana NUCA :

- Used to be affiliated with ICI.
- Utilized an E.D. firm.
- Now independent.
- Lost some members when economy dropped.
- Recently has had around 20 members.
- Current members include Miller Pipeline, Columet Civil, and HRP Construction.

Indiana NUCA (continued):

Members #1 issue is underground utilities.

- Their inability or unwillingness to accurately locate their facilities on a timely basis.
- The unbalanced system.
- These practices threaten member's survival.
- ***Most importantly***, they threaten lives and safety of their employees and innocent public.

Indiana NUCA (continued):

Feeling is unanimous!

Feeling is unequivocal!

Indiana NUCA (continued):

For now, Indiana NUCA is largely a one issue organization.

Our president is familiar with a local plumber, who happens to be a State Representative.

Indiana NUCA (continued):

Niezgodski Plumbing, a 90-year old firm, has done a lot of excavating, installing, and/or repairing sewer and water services in public right of ways.

They too believe the system is:

- Flawed.
- Unbalanced.
- Utilities are not accountable.

Only when everyone is accountable can we expect real change.

Indiana NUCA (continued):

- Started out seeking adaption of entire new laws copying from other states.
  - probably not realistic.
- Representative Niezgodski, 2 – 3 from our group, and our attorney met with Legislative Services Staff.

Indiana NUCA (continued):

The result was HB #1253 which:

- ✓ Shrinks hand dig area to 18" (from 24").
- ✓ Requires training of qualified persons.
- ✓ Limits some activities to qualified persons.
- ✓ Requires operator to notify and assist when its facilities are buried beneath pavement.
- ✓ Requires operators to maintain and share as-built records of their facilities.

Indiana NUCA (continued):

The result was HB #1253 (continued):

- ✓ Equalizes maximum penalties issued by IURC for both excavators and operators.
- ✓ Allows civil actions for recovery against those causing the loss (operators).

Utility accountability is the lynchpin.

- Everything else is negotiable.
- If we saw accountability wasn't necessary, we would stop asking for it.
- Many other problems, many possible improvements.

Relative to Abandoned (Dead?) Facilities

- Our Superintendent in tears when told to cut into one.
- Our crew came upon 6 in one day's time.
- Local municipality installed a water tap into a dead abandoned gas line.

Many Other Worthwhile Possible Revisions to the Law

- Case for excepting some surveyor's stakes or pins.
- Require follow-up locate requests after 20 days.
- Minimum material strengths to withstand hand digging tools.
- Better tracer systems.
- Minimum depth for new installations.
- Means to cut, break, and remove pavements.

Many Other Worthwhile Possible Revisions to the Law (continued)

- Define a "safe zone" beneath the bottom of pavement.
- Give protocol on abandoned dead facilities.
- Give protocol on abandoned live facilities.
- Keeping and updating of records.
- Recording of elevations of new facilities.

Present status of HB 1253:

- In hearings / study this summer.
- Plan is to resubmit in next session.
- Details still open.
- Support still open.

Indiana NUCA (continued):

We want to work with any and every body possible:

✓ To improve the system.
✓ So lives aren't risked unnecessarily.
✓ Utility accountability is key.
✓ Open to all other provisions.
✓ Don't care if we lead or follow.
✓ Don't care who gets credit.

Indiana NUCA (continued):

If interested in:

✓Working with us.

✓Helping us.

✓Advancing other agendas.

Please, contact us!

We cannot do this alone!

The purpose of the CIDPC is for all stakeholders to work together.

- It's time to do the right thing.
- Whatever reduces instances, or risk of, injuries and death is good for all of us!!
- Let's have my regret over not informing this group regarding HB 1253 be our worst regret.
- We've all seen how many Indiana homes can be blown up by the gas from a single 5/8" line.
- Let's NOT have to one day regret serious injury or the loss of life!

MISSION STATEMENT: The Indiana Damage Prevention Council, Central Chapter, was created to bring together underground facility owners, operators, government agencies, excavators, industry associations and service providers to address issues related to the goal of improving safety and reducing damages to underground and overhead utilities, and those in proximity to, or working nearby those facilities, to provide cooperation and coordination of construction activities, and to improve communication, involvement and related processes. By virtue of their membership in this group, all such individuals, agencies, and organizations confirm their intent to seek out and consider the input of this council before proposing, supporting, or opposing any new or revised laws affecting these issues.

Meetings: INDCCC Meetings are held on the first Wednesday of each month at 9 AM at the Indiana 811 Call Center Greenwood, Indiana. The exact dates are available at the Indiana 811 calendar of upcoming events.

For more information contact Council Chair Tracey Bryant at tjbryant@vectren.com or Aaron Holeman at aholeman@indiana811.org.

Contact Information

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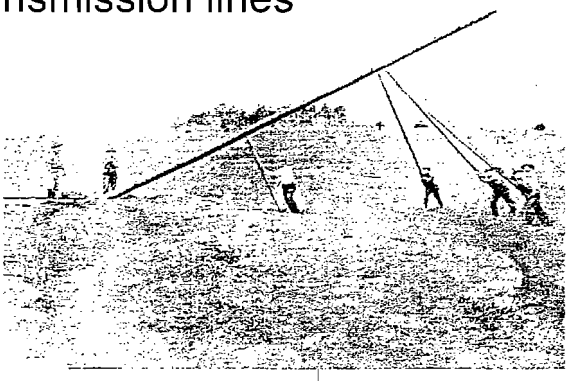
Ralph.miller@nucaofindiana.com

Thank you!

Once Upon a Time…

- Electric service was local
- No need to interconnect localities with transmission lines



2

Now…

- Electric service in broad regions of the country is an interconnected highway
  - Open access
  - Mutual reliance
  - Interstate commerce

3

FERC

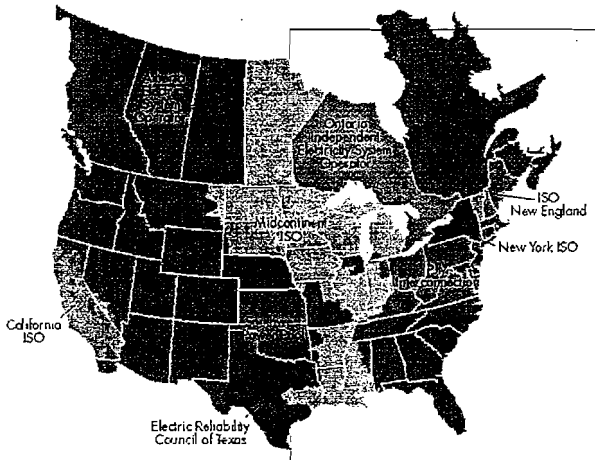
Regulates transmission (interstate commerce)

Policies:

- Regional planning and coordination
- Wholesale competition

4

Regional Transmission Organizations (RTOs)



5

Regional Variations & Local Flavors

- Vertically integrated utilities v. transmission only utilities
- Traditional retail rate regulation v. restructured retail choice/competition

6

FERC's Order 1000 Policy Objectives

- Remove barriers inhibiting transmission investments
- Enhanced regional and interregional planning and coordination
- Cost effective, efficient and fair
- Facilitate federal and state public policy

7

Competition in Transmission Building

- Desire to see more projects proposed and built
- Interest in driving down costs
- Elimination of federal right of first refusal for incumbent utilities
- Honor state laws – transmission siting and permitting

8

Senate Enrolled Act 94

- Certification process for new transmission utilities
- Limited right of first refusal to incumbent utilities for reliability projects

9

Reasoned, Balanced Approach

- Allows competition for projects proposed for broader economic and/or policy purposes - cost savings to ratepayers
- Consistency between Indiana RTOs
  - MISO and PJM Order 1000 compliance filings

10

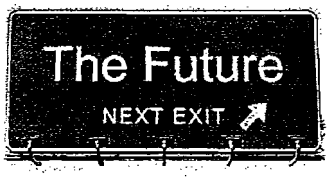
Reasoned, Balanced Approach

- Certification process establishes process for IURC to review technical, financial and managerial ability to own and operate transmission facilities
- Certainty that projects needed for reliability will be built and maintained
- Addresses critical concerns regarding safety and security for projects that connect to existing facilities

11

View to the Future

- Litigation, litigation, litigation
- Federal, regional uncertainty
- Challenges to state laws
- Indiana well positioned with SEA 94



12

Exhibit 6
Regulatory Flexibility Committee
9/30/13

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B&W

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Energy and Economic Development Opportunities in Indiana

Regulatory Flexibility Committee
September 30, 2013

Michael Whatley
National and State Affairs Adviser to
The Babcock & Wilcox Company

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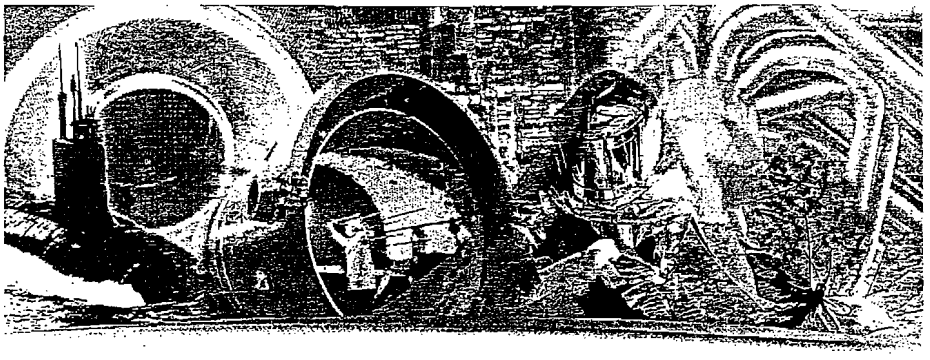

- Fossil & Renewable Power
- Environmental Solutions
- Commercial Nuclear Power
- Small Modular Reactors
- Government Nuclear Operations

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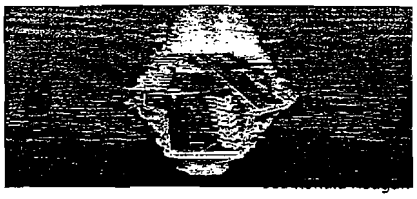
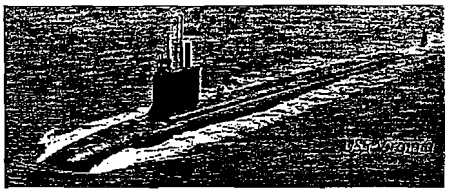
B&W Nuclear Operations Group, Inc.

- B&W NOG is based in Lynchburg, Virginia
- Major operations in Virginia, Indiana, Ohio, Tennessee
- Provides Nuclear Products and Services to the Government
  - U.S. Naval Nuclear Fleet
  - Nuclear Material Downblending for Commercial Use
  - Research & Test Reactor Fuels
- 90% owner in Generation mPower Partnership
  - Developing Small Modular Reactors for commercial electricity generation





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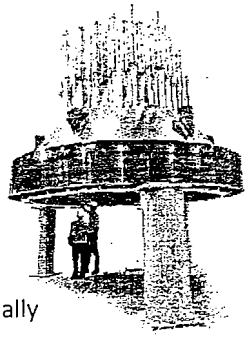
B&W in Indiana



- **Employment**
  B&W and its operating subsidiaries employ more than 160 people in Indiana and create over $9.5 million in total annual payroll
- **Purchases**
  B&W and its operating subsidiaries purchase more than $21 million of goods and services in Indiana annually
- **Taxes**
  B&W pays over $1.4 million in Indiana corporate income, unemployment, and use property taxes annually

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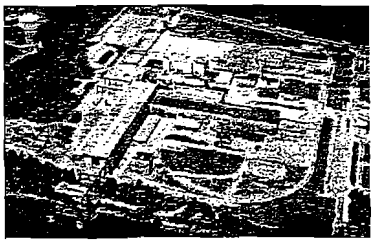
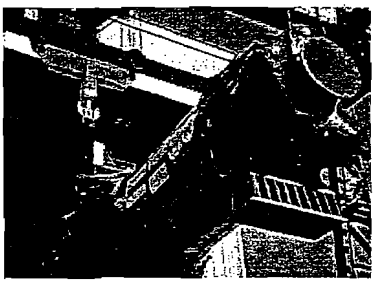
B&W NOG (Mount Vernon)

- Manufactures heavy pressure vessels for the U.S. DOE/NNSA's Naval Nuclear Propulsion Program, for use in U.S. Navy submarines and aircraft carriers, as well as other nuclear components for commercial industry.
- 600,000 ft^2 shop area
- 1,000-ton lift capability on the Ohio River
- Has manufactured more than 100 heavy components for commercial nuclear power generation and through government contracts.
- B&W is the only domestic supplier of large, heavy-pressure vessels with ASME N-Stamp accreditation *(Mt. Vernon, Barberton and Euclid, Ohio)*
- Opportunities to expand capabilities of Mt. Vernon facility for new work





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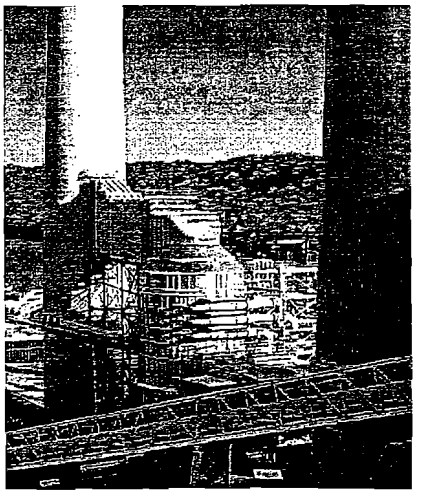
Clean Energy Generation For Indiana

- B&W also designs, supplies and constructs boilers and emissions control systems for power plants
- B&W has designed and supplied 35 boilers to generate power for Indiana and the surrounding region
- In 2011 and 2012, B&W was awarded contracts to design, supply and construct two sulfur dioxide scrubbers and related components for Northern Indiana Public Service Company's (NIPSCO) R.M. Schahfer Plant in Wheatfield



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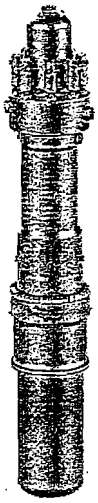
B&W mPower™ Reactor

- The B&W mPower Reactor is an advanced light water reactor system
- Scalable, modular design (can be shop-assembled and shipped to plant)
- Passive safety systems
- Four-year operating cycle without need for refueling
- Clean, zero-emissions operations
- Generating capacity can be added in 180 megawatt increments
- B&W organization offers production capabilities to supply all Nuclear Steam Supply System (NSSS) components, reducing manufacturing costs and streamlining construction



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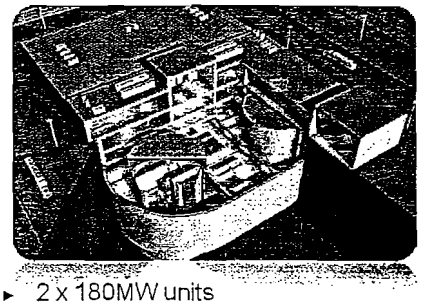
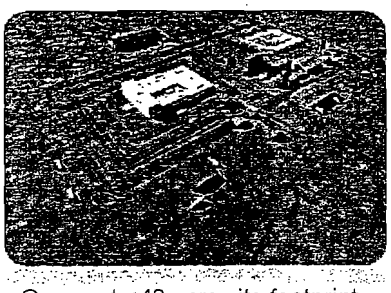
180MW mPower SMR

B&W mPower Nuclear Island Features



- 2 x 180MW units
- Fully underground reactor systems
- Optimized for minimum staff and O&M
- Enhanced spent fuel pool cooling

mPower "twin-pack" Site Layout



- Compact <40-acre site footprint
- Integral, rail-shippable reactor module
- Passively safe design philosophy
- 4-Year extended operating cycle

Simple and robust architecture lowers cost / risk, enhances licensing

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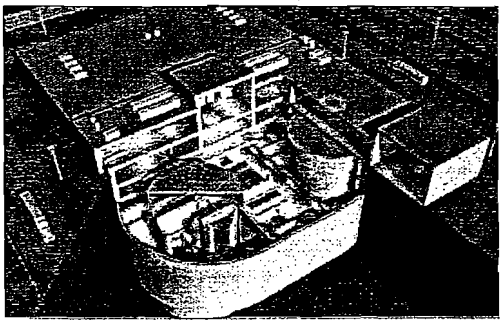
US DOE's SMR Licensing Technical Support Program Timeline

- November 2012 – B&W selected as winner of DOE funding program
- February 2013 – B&W TVA sign contract for Clinch River, Tenn. mPower Construction Permit
- April 2013 – B&W, DOE sign Cooperative Agreement for SMR funding ($150 million over five years)
- Activities are ongoing at Clinch River site



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TVA Clinch River Project

mPower America

mPower America Project:

- Commercialize first mPower SMR
- 2x180MWe mPower Reactors
- Site activities started 2011
- Construction Permit target for 2017
- Reactor Modules ready by 2019
- Commercial Operation (COD) by 2022

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Benefits of Developing SMR Technology in the U.S.

- Largest operating nuclear fleet provides skilled workforce
- R&D community fostered through numerous universities and national laboratories
- U.S. government support for research and licensing of new technologies
- Small-sized utilities drives national need for smaller reactors
- Strong regulator with active new plant licensing program

mPowering America ★

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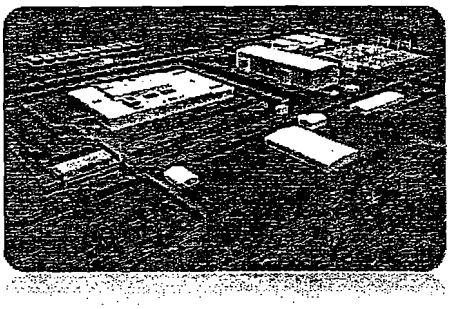
Small Modular Reactor Summary

- Timing ideal for SMR Deployment
- Technology an excellent fit for domestic and international markets
- Innovative design enhances safety
- SMRs have potential to create valued jobs in multiple segments
- Strong U.S. government support for technology deployment



Clean and affordable electricity can be delivered in less than a decade

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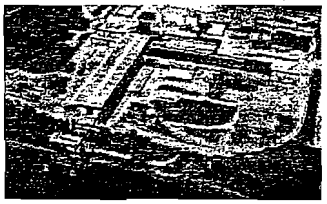
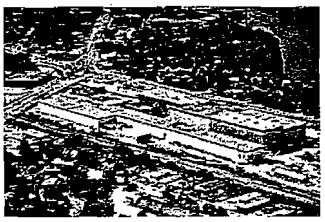
B&W's North American Fabrication Capability

Currently operating "N" stamp and fuel fabrication/manufacturing facilities for nuclear components:

- Heavy component fabrication – up to 1000 tons
  - Mt Vernon, Indiana
  - Barberton, Ohio
  - Cambridge, Ontario
- Control rod drive fabrication
  - Euclid, Ohio
- Fuel fabrication
  - Lynchburg, Virginia





Robust existing Approved Supplier List (ASL):

- Extensive experience with qualified vendors
- Regularly audited for compliance with relevant codes/standards
- Ongoing interface regarding required capacity & supply

B&W's fabrication facilities are unique in the North American nuclear industry

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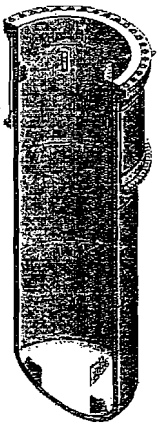
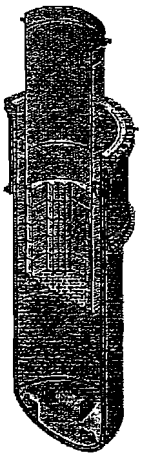
Potential Mt. Vernon Work



Manufacture Reactor Vessel

Manufacture Core Basket



RV/CB Assembly

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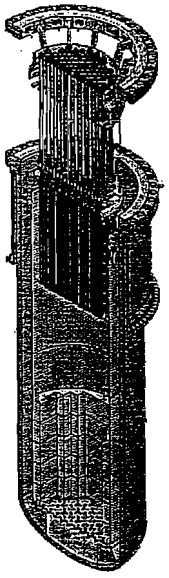

Potential Mt. Vernon Work

- Assemble complete lower vessel
- Full unit fit-up (first unit only)
- Hydrostatic test of LV assembly
- Pre-service inspection
- Package
- Ship to site

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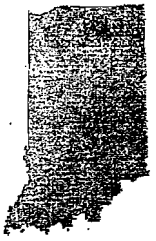
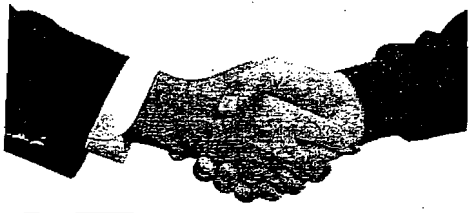
Public/Private Cooperation is Key to Growing Opportunities

- B&W is actively engaged with governments and communities in states where it operates
- B&W, government leaders and regulatory agencies can work together to bring jobs and economic opportunities to Indiana
- Federal and state incentives to deploy low-carbon energy options like SMRs and clean coal technologies are critical





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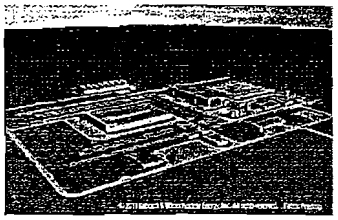
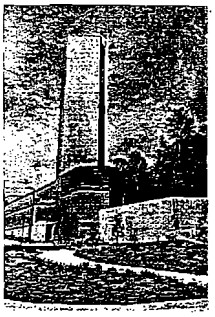
B&W's Recent Public/Private Success Stories

- **Small Modular Reactor Deployment**
  - B&W selected for DOE cost-share program
  - Up to $226 million in DOE funding
  - Potential job creation in Indiana and elsewhere
  - Clean energy, near-zero emissions



- **SMR Integrated Test Facility**
  - Used for testing, development of B&W mPower reactor
  - Built in Bedford County, Virginia with $7.4 million in funding from Virginia Tobacco Commission, as well as local incentives
  - Employs dozens of highly-skilled engineers and support staff



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Energy and Economic Development Opportunities in Indiana

Regulatory Flexibility Committee
September 30, 2013

Michael Whatley
National and State Affairs Adviser to
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SMALL NUCLEAR REACTORS

Presented by Grant Smith on behalf of the
Hoosier Chapter, Sierra Club

Regulatory Flexibility Committee
September 30, 2012

Background on Nuclear Power

- "The failure of the US nuclear power program ranks as the largest managerial disaster in business history… only the blind or the biased can think that most of the money ($125 billon) has been spent well." (Forbes, 1985)
- "Once considered to be too cheap to meter, nuclear power is now too expensive to matter." (The Economist, 2001)
- "We view nuclear generation plants as a 'bet the farm' endeavor for most companies, due to the size of the investment and length of time needed to build a nuclear power facility." (Moody's, June 2009)

Subsidies

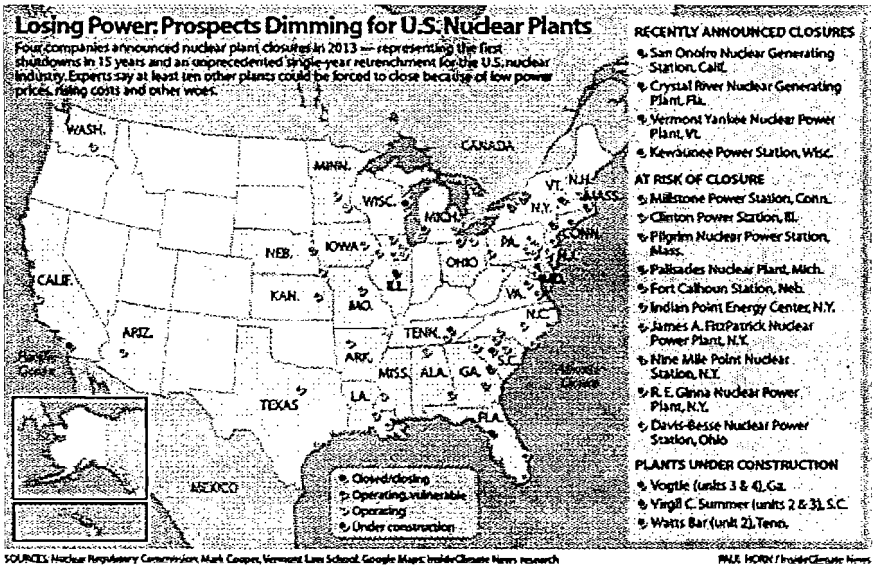
- "In five years, certainly within ten, (nuclear plants would be) … built without government subsidy." (GE, 1954)
- Legacy subsidies to nuclear power are "equal to about 140% of the average wholesale price of power from 1960 to 2008, making subsidies more valuable than the power produced over that period." (UCS, 2011)
- "Subsidies that offset the costs of uranium, insurance and liability, plant security, cooling water, waste disposal, and plant decommissioning"… represent more than 35% of nuclear production costs (O&M plus fuel)." (UCS, 2011)
- Subsidies for new reactors are estimated to range from "70 to 200 percent of the projected value of the power." (UCS, 2011)

Costs to Ratepayers and Taxpayers

- Cancellations Between 1972 and 1984: $40 to $50 Billion (Schlissel et al, 2009)
- Cost Overruns: $150 Billion (UCS, 2011)
- Deregulation Bailout: $110 Billion (Seiple, 1997)

Trends This Year

- Shutdowns Announced: San Onofre, CA; Kewaunee, WI; Crystal River, FL; Vermont Yankee, VT (Seeking Alpha, 2013)
- Abandoned Expansion (Uprates) Projects: Prairie Island, MN; LaSalle, IL; Limerick, PA. (Vermont Law School, 2013)
- Abandoned Projects: Levy, FL; Shearon Harris, NC (Charlotte Business Journal, 2013)
- Cost Overruns: $900 million at Vogtle nuclear plant, GA (AP, 2013)
- On the Bubble: 38 Units in All (Vermont Law School, 2013)



Financial Risk of SMRs

- Financial risks are substantial but shifted from the construction site to the supply chain. (IEER, 2013)
- Industry says operating and maintenance costs are expected to be higher. (IEER, 2013)
- "SMR costs are unlikely to fall below current reactor designs, and may well be higher." (IEER, 2013)
- Suggestions to jumpstart the industry:
  - 2,000 MWs of installations at DOE facilities: $20 Billion
  - Loan Guarantees
  - Tax Credits
  - $200 million per year for five years
  - Reducing safety requirements: reducing operating personnel and shrinking 10-mile emergency planning zone (IEER, 2013)

Financial Risks Continued..

- Factory flaw or replacement of steam generators, which are inside the reactor vessel in the mPower design. (IEER, 2013)
- Planning still an issue for adding units over time: one control room or one for each, containment. (IEER, 2013)
- Due to high costs of ramping up production, manufacturing would probably occur in China.
  - Westinghouse MOU with China's State Nuclear Power Technology Corporation (IEER, 2013)

Water

- SMR designs that would be piloted first are water-cooled.
- Water should be a siting consideration.
- Thermoelectric power in Indiana (mainly coal) represents 65% of all daily water withdrawals in the state

The Wind and Solar Markets

- "Residential solar PV has already reached 'grid parity' in regions of high solar insolation, with much of the world set to follow by 2020.
- "Our view is that utility-scale renewables will be competitive with gas-fired power in the short to medium term... In many regions, we believe competitiveness will be achieved by 2020." (Citi Research, 2012)
- Solar PV has reached grid parity in 16% of US market. (EEI, 2013)
- Solar PV will need little to no subsidies in 75% of world market in 18 months (Deutsche Bank, 2013)

Wind and Solar Markets

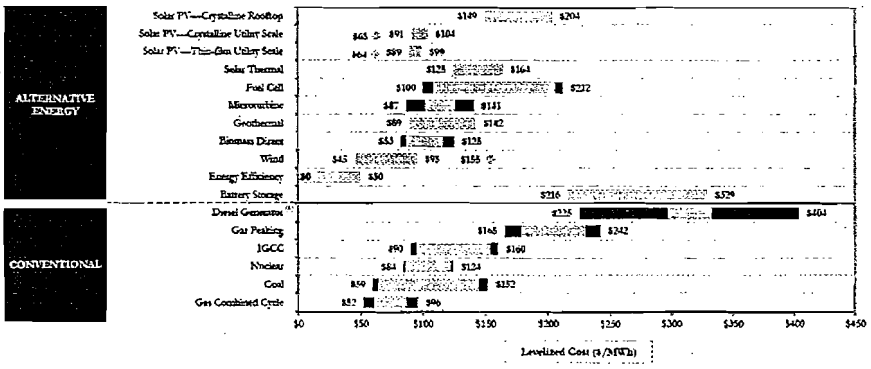
- "Based on generation needs, the most reliable and most cost-effective resources happen to be solar and wind." (Xcel Energy, 2013)

LAZARD

LAZARD'S LEVELIZED COST OF ENERGY ANALYSIS—VERSION 7.0

Levelized Cost of Energy Comparison—Sensitivity to Fuel Prices

Variations in fuel prices can materially affect the levelized cost of energy for conventional generation technologies, but direct comparisons against "competing" Alternative Energy generation technologies must take into account issues such as dispatch characteristics (e.g., baseload and/or dispatchable intermediate load vs. peaking or intermittent technologies)



Source: Lazard estimates.
Note: Displayed ranges at bottom and top represent low end and high end levelized cost of energy ranges resulting from 25% fuel price increases.
(a) Low end represents continuous operation. High end represents intermittent operation.

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History of Nuclear Power in a Nutshell

It is hard to imagine … a more dangerous way of making decisions than by putting those decisions in the hands of people who pay no price for being wrong.
(Thomas Sowell)

LAZARD'S LEVELIZED COST OF ENERGY ANALYSIS—VERSION 7.0

LAZARD

Exhibit 8
Regulatory Flexibility Committee
9/30/13

Introduction

Lazard's Levelized Cost of Energy Analysis ("LCOE") addresses the following topics:

- Comparative "levelized cost of energy" for various technologies on a $/MWh basis, including sensitivities, as relevant, for U.S. federal tax subsidies, fuel costs, geography and cost of capital, among other factors
- Illustration of how the cost of utility-scale solar-produced energy compares against generation rates in large metropolitan areas of the United States
- Illustration of utility-scale solar versus peaking generation technologies globally
- Illustration of how the costs of utility-scale and rooftop solar and wind vary across the United States, based on average available resources
- Comparison of assumed capital costs on a $/kW basis for various generation technologies
- Decomposition of the levelized cost of energy for various generation technologies by capital cost, fixed operations and maintenance expense, variable operations and maintenance expense, and fuel cost, as relevant
- Considerations regarding the usage characteristics and applicability of various generation resources, taking into account factors such as location requirements/constraints, dispatch capability, land and water requirements and other contingencies
- Summary assumptions for the various generation technologies examined
- Summary of Lazard's approach to comparing the levelized cost of energy for various conventional and Alternative Energy generation technologies

Other factors would also have a potentially significant effect on the results contained herein, but have not been examined in the scope of this current analysis. These additional factors, among others, could include: capacity value vs. energy value; network upgrade or congestion costs; integration costs; costs of adding emissions controls (e.g., selective catalytic reductions systems, etc.) to existing fossil power plants; and transmission costs. The analysis also does not address the potential stranded cost aspects of distributed generation solutions in respect of existing electric utility systems, nor does it account for the social costs or other externalities of the rate consequences for those who cannot afford distributed generation solutions

While prior versions of this study have presented the LCOE inclusive of the U.S. Federal Investment Tax Credit and Production Tax Credit, Versions 6.0 and 7.0 present the LCOE on an unsubsidized basis, except as noted on the page titled "Levelized Cost of Energy—Sensitivity to U.S. Federal Tax Subsidies"

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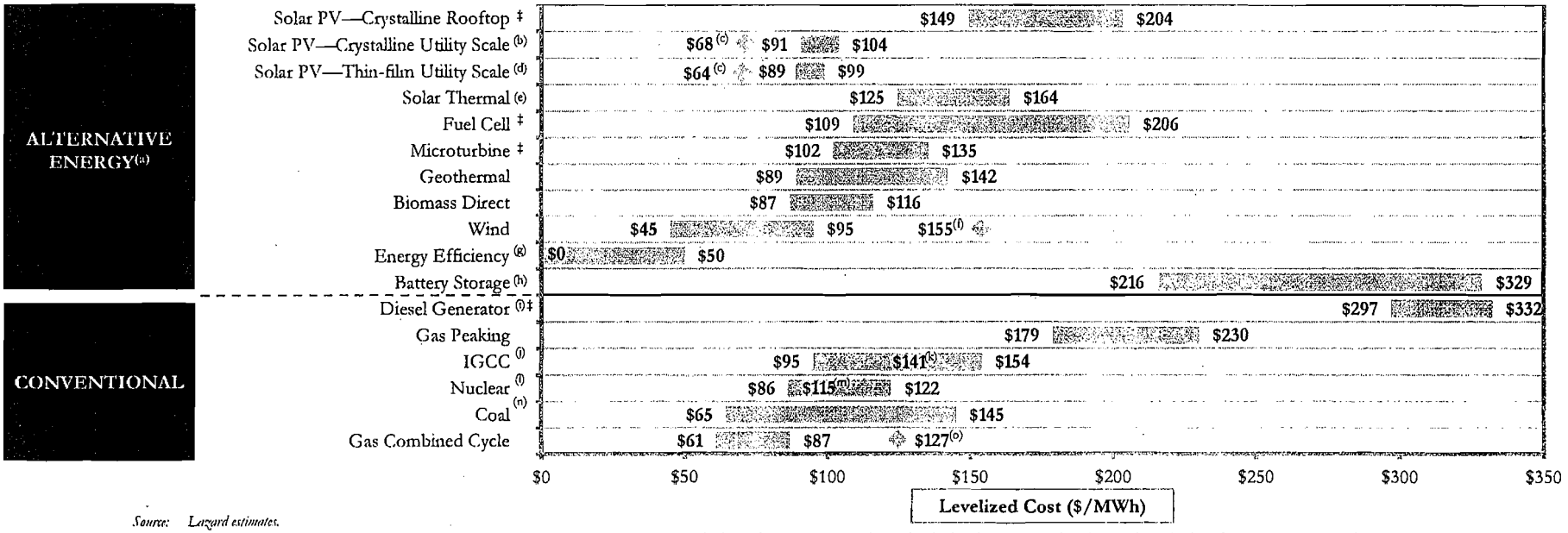
Unsubsidized Levelized Cost of Energy Comparison

Certain Alternative Energy generation technologies are cost-competitive with conventional generation technologies under some scenarios, before factoring in environmental and other externalities (e.g., RECs, transmission and back-up generation/system reliability costs) as well as construction and fuel cost dynamics affecting conventional generation technologies



Source: *Lazard estimates.*

Note: Assumes 60% debt at 8% interest rate and 40% equity at 12% cost for conventional and Alternative Energy generation technologies. Assumes Powder River Basin coal price of $1.99 per MMBtu and natural gas price of $4.50 per MMBtu. As many have argued, current solar pricing trends may be masking material differences between the inherent economics of certain types of thin-film technologies and crystalline silicon.

‡ Denotes distributed generation technology.

(a) Analysis excludes integration costs for intermittent technologies. A variety of studies suggest integration costs ranging from $2.00 to $10.00 per MWh.

(b) Low end represents single-axis tracking. High end represents fixed-tilt installation. Assumes 10 MW system in high insolation jurisdiction (e.g., Southwest U.S.). Not directly comparable for baseload.

(c) Diamonds represent estimated implied levelized cost of energy in 2015, assuming $1.50 per watt for a crystalline single-axis tracking system and $1.50 per watt for a thin-film single-axis tracking system.

(d) Low end represents single-axis tracking. High end represents fixed-tilt installation. Assumes 10 MW fixed-tilt installation in high insolation jurisdiction (e.g., Southwest U.S.).

(e) Low end represents solar tower without storage. High end represents solar tower with storage capability.

(f) Represents estimated midpoint of levelized cost of energy for offshore wind, assuming a range of $3.10 – $5.00 per watt.

(g) Estimates per National Action Plan for Energy Efficiency; actual cost for various initiatives varies widely. Estimates involving demand response may fail to account for opportunity cost of foregone consumption.

(h) Indicative range based on current and future stationary storage technologies; assumes capital costs of $400 – $750/KWh for 6 hours of storage capacity, $60/MWh cost to charge, one full cycle per day (full charge and discharge), efficiency of 66% – 75% and fixed O&M costs of $5 to $20 per KWh installed per year.

(i) Low end represents continuous operation. High end represents intermittent operation. Assumes diesel price of $4.00 per gallon.

(j) High end incorporates 90% carbon capture and compression. Does not include cost of transportation and storage.

(k) Represents estimate of current U.S. new IGCC construction with carbon capture and compression. Does not include cost of transportation and storage.

(l) Does not reflect decommissioning costs or potential economic impact of federal loan guarantees or other subsidies.

(m) Represents estimate of current U.S. new nuclear construction.

(n) Based on advanced supercritical pulverized coal. High end incorporates 90% carbon capture and compression. Does not include cost of transportation and storage.

(o) Incorporates 90% carbon capture and compression. Does not include cost of transportation and storage.

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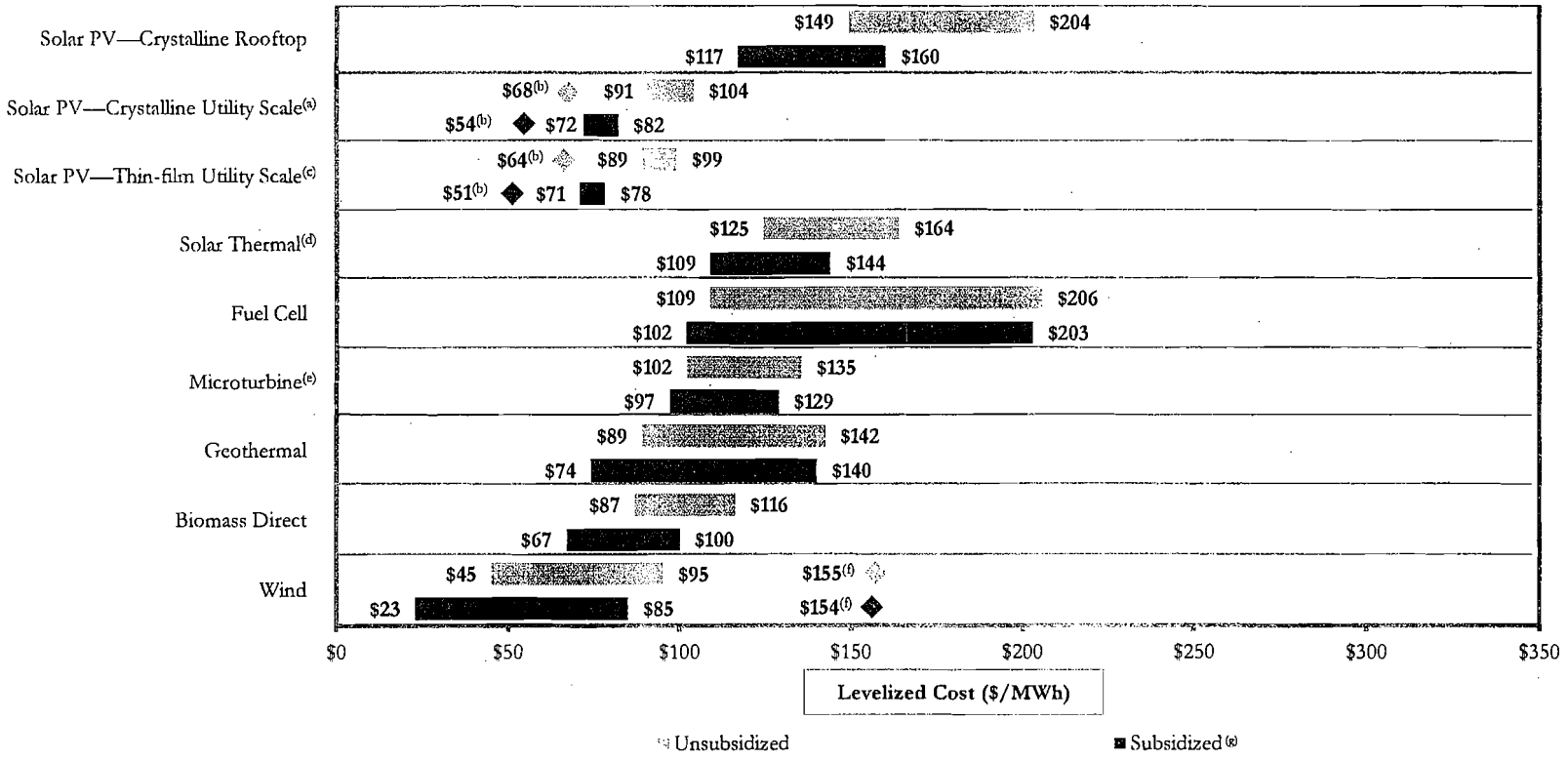
Levelized Cost of Energy—Sensitivity to U.S. Federal Tax Subsidies

U.S. federal tax subsidies remain an important component of the economics of Alternative Energy generation technologies (and government incentives are, generally, currently important in all regions); future cost reductions in technologies such as solar PV have the potential to enable these technologies to approach "grid parity" without tax subsidies and may currently reach "grid parity" under certain conditions (albeit such observation does not take into account issues such as dispatch characteristics, the cost of incremental transmission and back-up generation/system reliability costs or other factors)



Source: Lazard estimates.

(a) Low end represents single-axis tracking. High end represents fixed-tilt installation. Assumes 10 MW system in high insolation jurisdiction (e.g., Southwest U.S.). Not directly comparable for baseload.

(b) Diamonds represent estimated implied levelized cost of energy in 2015, assuming $1.50 per watt for a crystalline single-axis tracking system and $1.50 per watt for a thin-film single-axis tracking system.

(c) Low end represents single-axis tracking. High end represents fixed-tilt installation. Assumes 10 MW fixed-tilt installation in high insolation jurisdiction (e.g., Southwest U.S.).

(d) Low end represents solar tower without storage. High end represents solar tower with storage capability.

(e) Reflects 10% Investment Tax Credit. Capital structure adjusted for lower Investment Tax Credit; assumes 50% debt at 8.0% interest rate, 20% tax equity at 12.0% cost and 30% common equity at 12.0% cost.

(f) Represents estimated midpoint of levelized cost of energy for offshore wind, assuming a range of $3.10 – $5.00 per watt.

(g) Except where noted, reflects Investment Tax Credit. Assumes 30% debt at 8.0% interest rate, 50% tax equity at 12.0% cost and 20% common equity at 12.0% cost.

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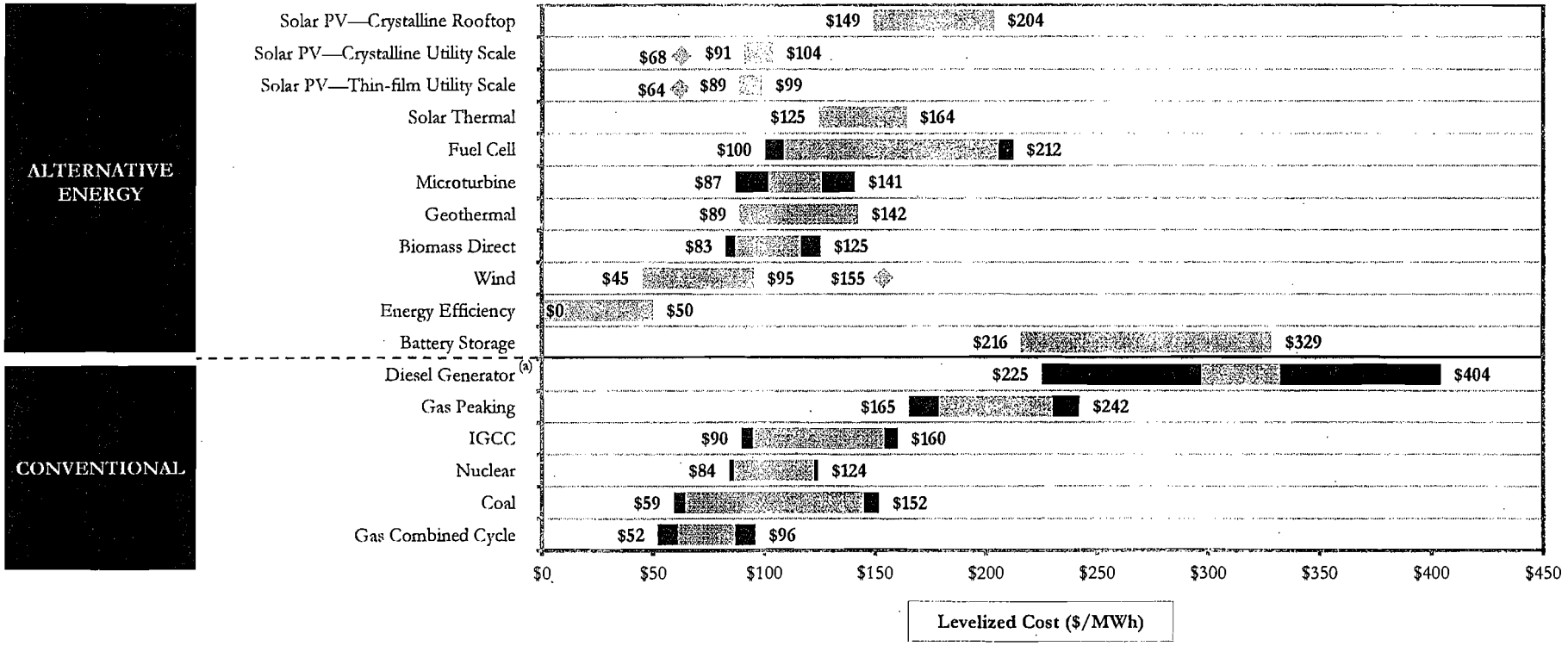
Levelized Cost of Energy Comparison—Sensitivity to Fuel Prices

Variations in fuel prices can materially affect the levelized cost of energy for conventional generation technologies, but direct comparisons against "competing" Alternative Energy generation technologies must take into account issues such as dispatch characteristics (e.g., baseload and/or dispatchable intermediate load vs. peaking or intermittent technologies)



Source: Lazard estimates.
Note: Darkened areas in horizontal bars represent low end and high end levelized cost of energy corresponding with ±25% fuel price fluctuations.
(a) Low end represents continuous operation. High end represents intermittent operation.

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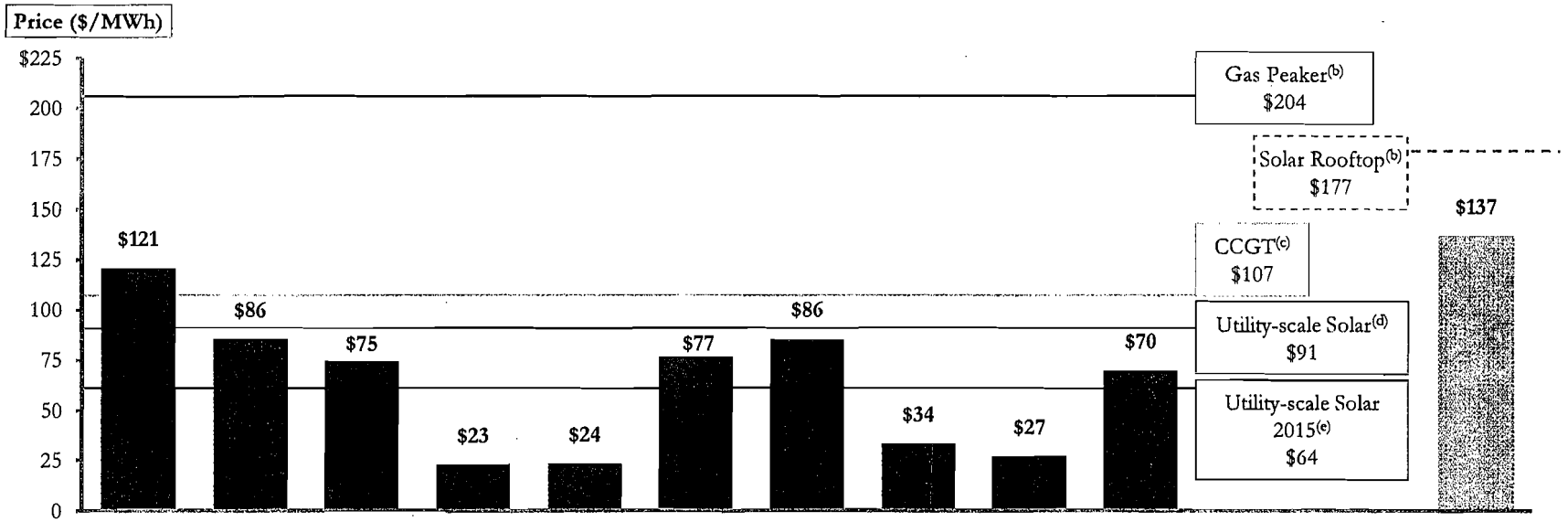
Generation Rates for the 10 Largest U.S. Metropolitan Areas[a]

Setting aside the legislatively-mandated demand for solar and other Alternative Energy resources, solar is becoming a more economically viable peaking energy product in many areas of the U.S. and, as pricing declines, could become economically competitive across a broader array of geographies; this observation, however, does not take into account the full cost of incremental transmission and back-up generation/system reliability costs, as well as the potential stranded cost aspects of distributed generation solutions in respect of existing electricity systems, nor does it account for the social costs or other externalities of the rate consequences for those who cannot afford distributed generation solutions



Metropolitan Statistical Area	New York	Los Angeles	Chicago	Dallas	Houston	Phila.	D.C.	Miami	Atlanta	Boston	U.S. Illustrative Generation, Transmission and Delivery Charge
Population (mm)	20	13	10	7	6	6	6	6	5	5	
Cumulative % of U.S. population	7%	12%	16%	18%	21%	23%	25%	27%	29%	31%	

Source: EEI.

Note: Actual delivered generation prices may be higher, reflecting historical composition of resource portfolio.

(a) Defined as 10 largest Metropolitan Statistical Areas per the U.S. Census Bureau for a total population of 83 million.

(b) Represents an average of the high and low levelized cost of energy.

(c) Assumes 25% capacity factor.

(d) Represents low end of crystalline utility scale. Excludes investment tax credit.

(e) Represents estimated implied levelized cost of energy in 2015, assuming $1.50 per watt for a thin-film single-axis tracking system. Excludes investment tax credit.

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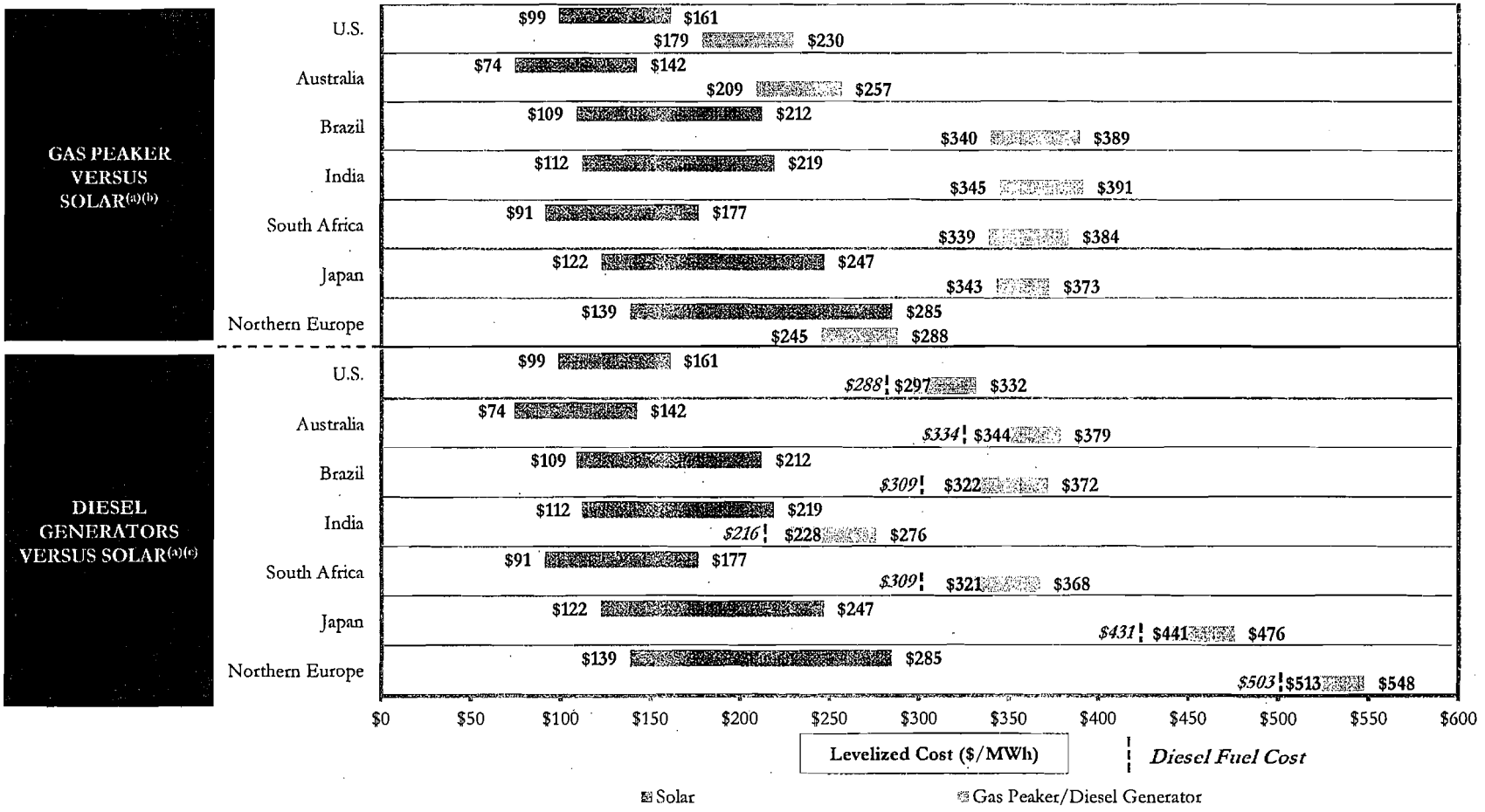
Solar versus Peaking Capacity—Global Markets

Solar PV can be an attractive resource relative to gas and diesel-fired peaking in many parts of the world due to high fuel costs; without storage, however, solar lacks the dispatch characteristics of conventional peaking technologies



Source: World Bank, Waterborne Energy, Department of Energy of South Africa, Sydney and Brisbane Hub Trading Prices and Lazard estimates.

(a) Low end assumes a solar fixed-tilt thin-film utility scale system with per watt capital costs of $1.75. High end assumes a solar crystalline rooftop utility scale system with per watt capital costs of $3.25. Solar projects assume capacity factors of 26% – 28% for Australia, 25% – 27% for Brazil, 23% – 25% for India, 27% – 29% for South Africa, 15% – 17% for Japan and 13% – 15% for Northern Europe. Equity IRRs of 12% are assumed for Australia, Japan and Northern Europe and 18% for Brazil, India and South Africa; assumes cost of debt of 8% for Australia, Japan and Northern Europe, 14.5% for Brazil, 13% for India and 11.5% for South Africa.

(b) Assumes natural gas prices of $7 for Australia, $14 for Brazil, $15 for India, $15 for South Africa, $18 for Japan and $10 for Northern Europe (all in U.S.$ per MMBtu). Assumes a capacity factor of 10%.

(c) Diesel assumes high end capacity factor of 30% representing intermittent utilization and low end capacity factor of 95% representing baseload utilization, O&M cost of $15 per KW/year, heat rate of 10,000 Btu/KWh and total capital costs of $500 to $800 per KW of capacity. Assumes diesel prices of $4.65 for Australia, $4.30 for Brazil, $3.00 for India, $4.30 for South Africa, $6.00 for Japan and $7.00 for Northern Europe (all in U.S.$ per gallon).

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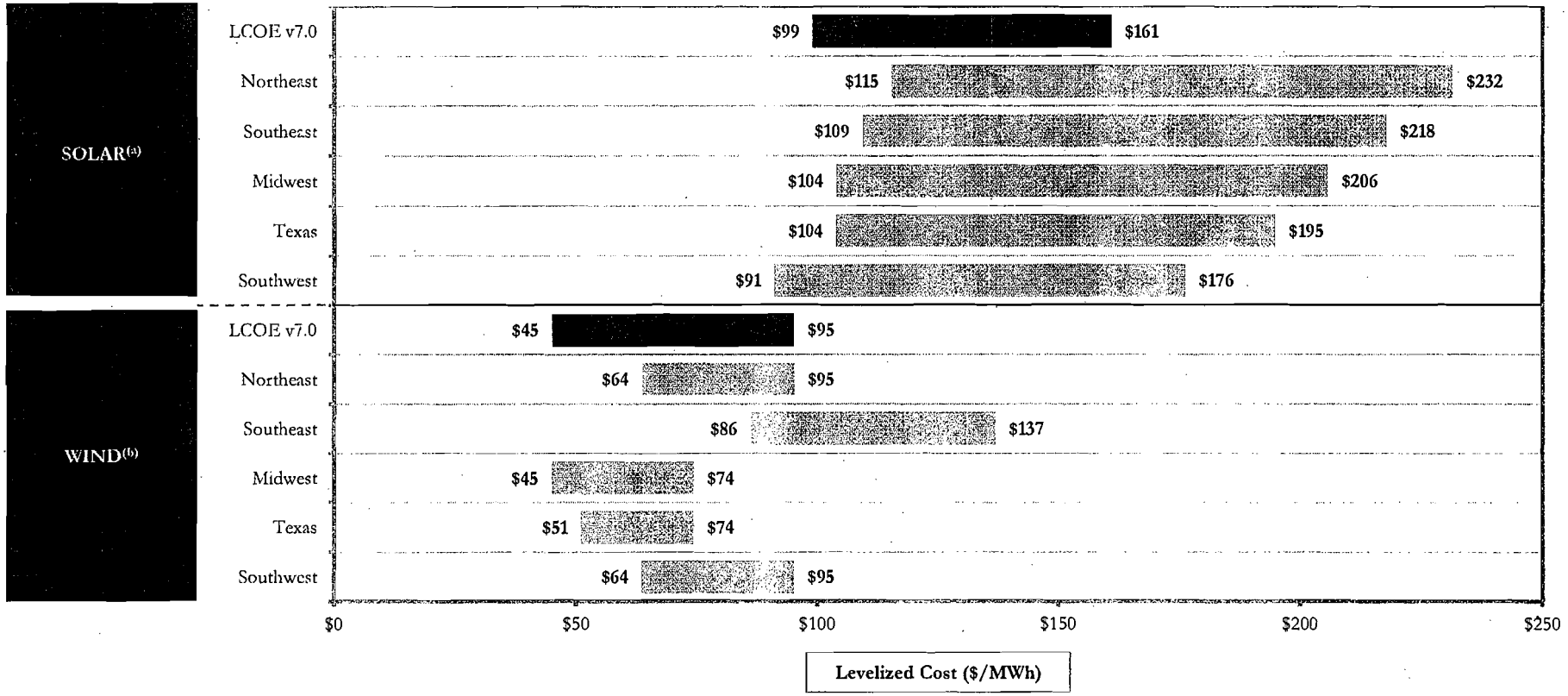
Wind and Solar Resource—U.S. Regional Sensitivity (Unsubsidized)

The availability of wind and solar resource has a meaningful impact on the levelized cost of energy for various regions of the United States. This regional analysis varies capacity factors as a proxy for resource availability, while holding other variables constant. There are a variety of other factors (e.g., transmission, back-up generation/system reliability costs, labor rates, permitting and other costs) that would also impact regional costs



Source: Lazard estimates.

Note: Assumes solar capacity factors of 16% – 18% for the Northeast, 17% – 19% for the Southeast, 18% – 20% for the Midwest, 19% – 20% for Texas and 21% – 23% for the Southwest. Assumes wind capacity factors of 30% – 35% for the Northeast, 20% – 25% for the Southeast, 40% – 52% for the Midwest, 40% – 45% for Texas and 30% – 35% for the Southwest.

(a) Low end assumes a solar fixed-tilt thin-film utility scale system with per watt capital costs of $1.75. High end assumes a solar crystalline rooftop utility scale system with per watt capital costs of $3.25.

(b) Assumes an onshore wind generation plant with capital costs of $1.50 – $2.00 per watt.

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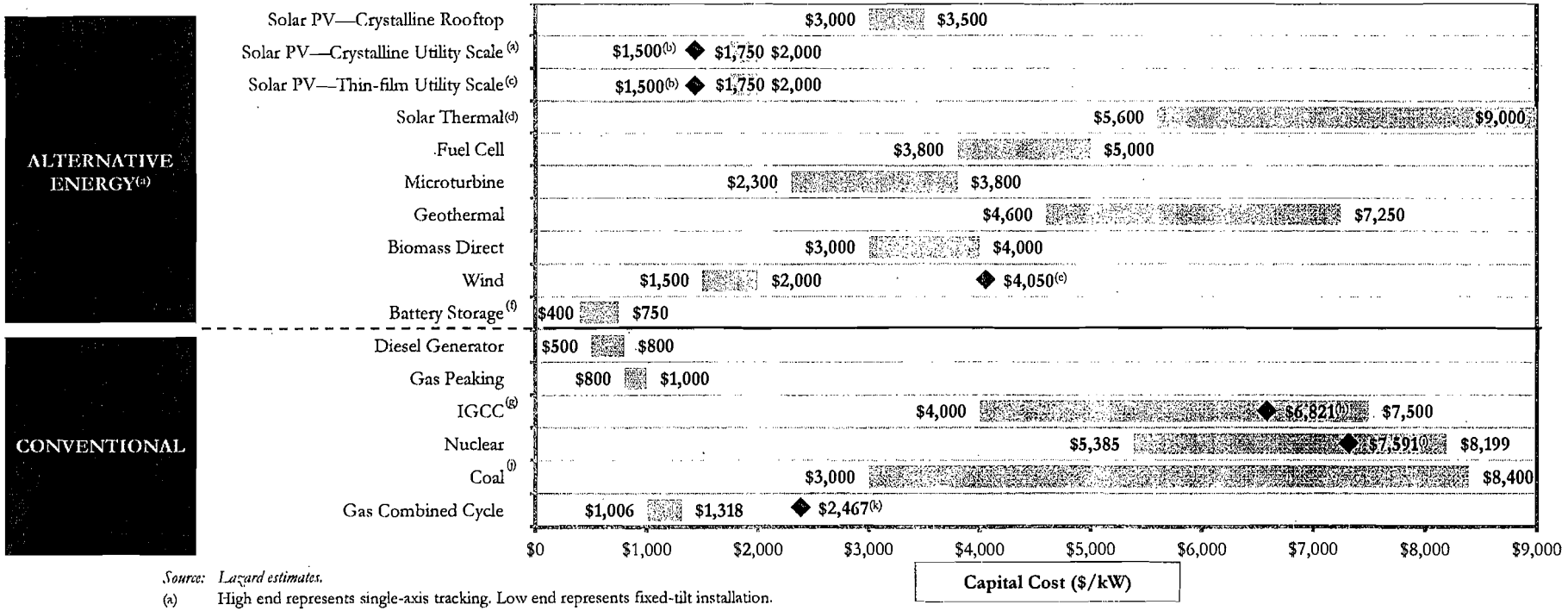
Capital Cost Comparison

While capital costs for a number of Alternative Energy generation technologies (e.g., solar PV, solar thermal) are currently in excess of some conventional generation technologies (e.g., gas), declining costs for many Alternative Energy generation technologies, coupled with rising long-term construction and uncertain long-term fuel costs for conventional generation technologies, are working to close formerly wide gaps in electricity costs. This assessment, however, does not take into account issues such as dispatch characteristics, capacity factors, fuel and other costs needed to compare generation technologies



Source: Lazard estimates.

(a) High end represents single-axis tracking. Low end represents fixed-tilt installation.
(b) Diamonds represent estimated capital costs in 2015, assuming $1.50 per watt for a crystalline single-axis tracking system and $1.50 per watt for a thin-film single-axis tracking system.
(c) High end represents single-axis tracking. Low end represents fixed-tilt installation.
(d) Low end represents solar tower without storage. High end represents solar tower with storage capability.
(e) Represents estimated midpoint of capital costs for offshore wind, assuming a range of $3.10 – $5.00 per watt.
(f) Indicative range based on current and future stationary storage technologies.
(g) High end incorporates 90% carbon capture and compression. Does not include cost of transportation and storage.
(h) Represents estimate of current U.S. new IGCC construction with carbon capture and compression. Does not include cost of transportation and storage.
(i) Represents estimate of current U.S. new nuclear construction.
(j) Based on advanced supercritical pulverized coal. High end incorporates 90% carbon capture and compression. Does not include cost of transportation and storage.
(k) Incorporates 90% carbon capture and compression. Does not include cost of transportation and storage.

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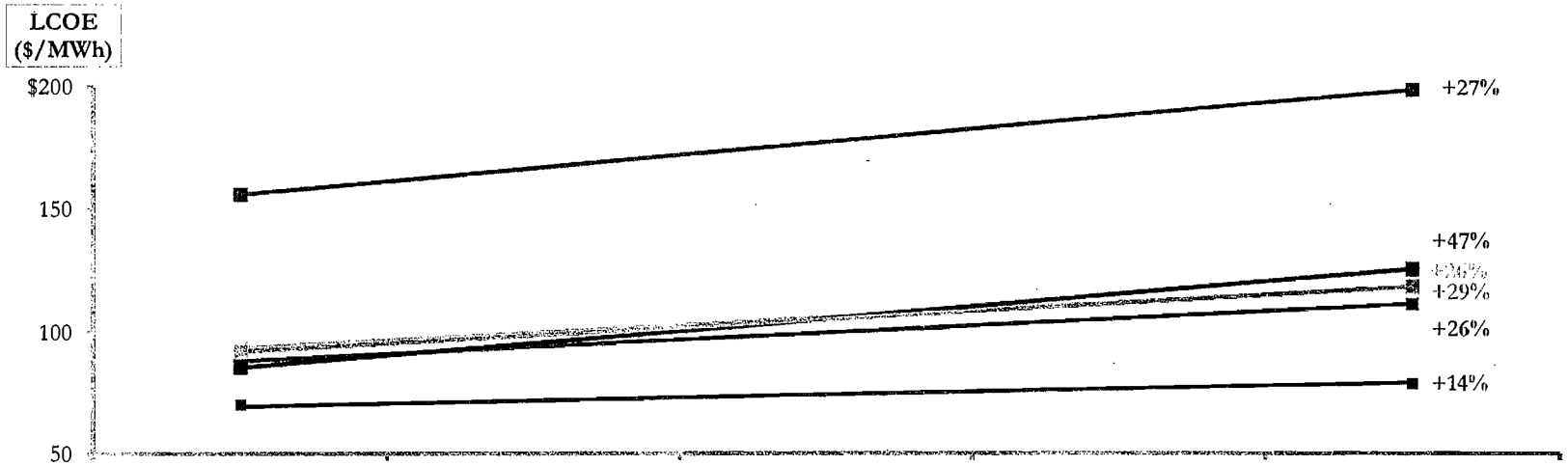
Levelized Cost of Energy—Sensitivity to Cost of Capital

A key issue facing Alternative Energy generation technologies resulting from the potential for intermittently disrupted capital markets (and the relatively immature state of some aspects of financing Alternative Energy technologies) is the reduced availability, and increased cost, of capital; availability and cost of capital have a particularly significant impact on Alternative Energy generation technologies, whose costs reflect essentially the return on, and of, the capital investment required to build them



After-Tax IRR/WACC	6.2%	6.9%	7.7%	8.4%	9.2%
Cost of Equity	10.0%	11.0%	12.0%	13.0%	14.0%
Cost of Debt	6.0%	7.0%	8.0%	9.0%	10.0%

Solar PV—Crystalline Rooftop
Solar PV—Crystalline Utility Scale[a]
Solar PV—Thin-film Utility Scale[b]
Nuclear[c]
Coal[d]
Gas—Combined Cycle

Source: Lazard estimates.
Note: Assumes Powder River Basin coal price of $1.99 per MMBtu and natural gas price of $4.50 per MMBtu.
(a) Assumes a fixed-tilt crystalline utility scale system with capital costs of $1.75 per watt.
(b) Assumes a fixed-tilt thin-film utility scale system with capital costs of $1.75 – $2.00 per watt.
(c) Does not reflect decommissioning costs or potential economic impact of federal loan guarantees or other subsidies.
(d) Based on advanced supercritical pulverized coal.

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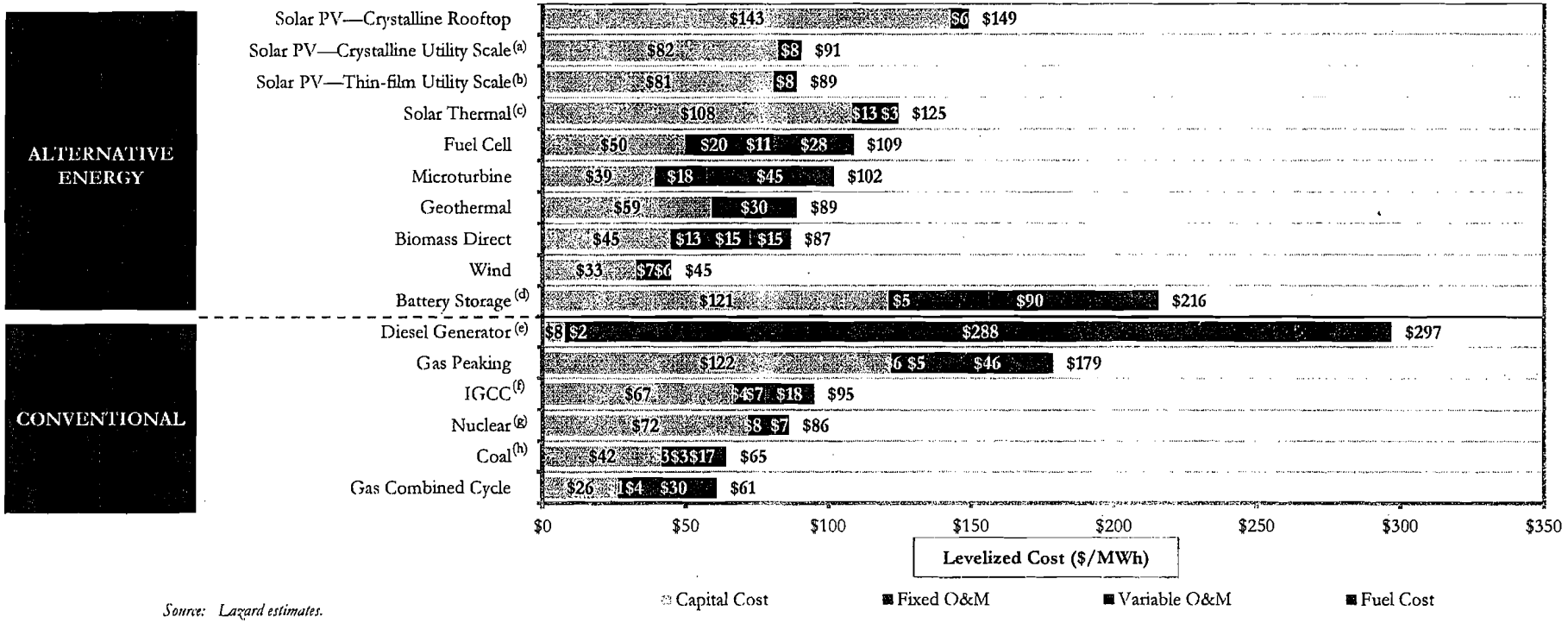
Levelized Cost of Energy Components—Low End

Certain Alternative Energy generation technologies are already cost-competitive with conventional generation technologies; a key factor regarding the long-term competitiveness of currently more expensive Alternative Energy technologies is the ability of technological development and increased production volumes to materially lower the capital costs of certain Alternative Energy technologies, and their levelized cost of energy, over time (e.g., as has been the case with solar PV and wind technologies)



Source: Lazard estimates.

Note: Assumes 60% debt at 8% interest rate and 40% equity at 12% cost for conventional and Alternative Energy generation technologies. Assumes Powder River Basin coal price of $1.99 per MMBtu and natural gas price of $4.50 per MMBtu.

(a) Low end represents single-axis tracking.
(b) Low end represents single-axis tracking.
(c) Low end represents solar tower without storage capability.
(d) Low end represents flow battery.
(e) Low end represents continuous operation.
(f) Does not incorporate carbon capture and compression.
(g) Does not reflect decommissioning costs or potential economic impact of federal loan guarantees or other subsidies.
(h) Based on advanced supercritical pulverized coal. Does not incorporate carbon capture and compression.

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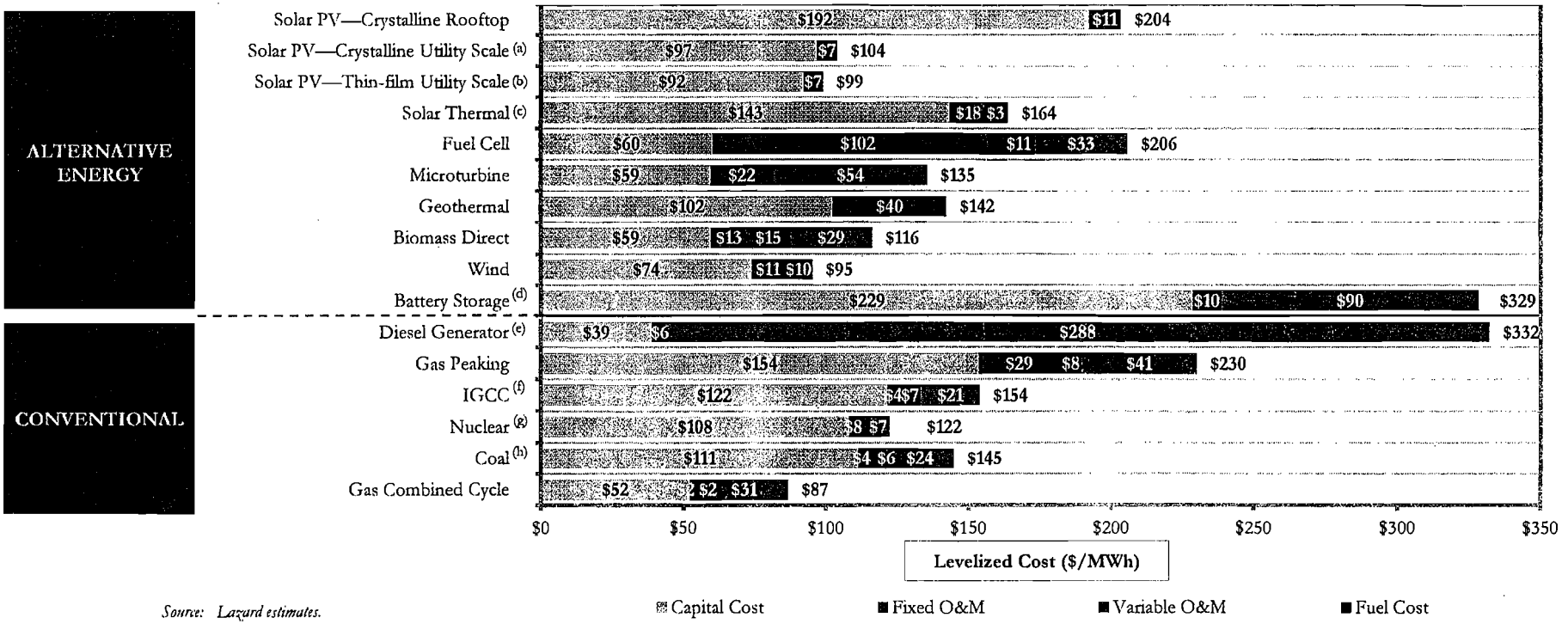
Levelized Cost of Energy Components—High End

Certain Alternative Energy generation technologies are already cost-competitive with conventional generation technologies; a key factor regarding the long-term competitiveness of currently more expensive Alternative Energy technologies is the ability of technological development and increased production volumes to materially lower the capital costs of certain Alternative Energy technologies, and their levelized cost of energy, over time (e.g., as has been the case with solar PV and wind technologies)



Source: Lazard estimates.

Note: Assumes 60% debt at 8% interest rate and 40% equity at 12% cost for conventional and Alternative Energy generation technologies. Assumes Powder River Basin coal price of $1.99 per MMBtu and natural gas price of $4.50 per MMBtu.

(a) High end represents fixed-tilt installation.
(b) High end represents fixed-tilt installation.
(c) High end represents solar tower with storage capability.
(d) High end represents NaS technology.
(e) High end represents intermittent operation.
(f) High end incorporates 90% carbon capture and compression. Does not include cost of transportation and storage.
(g) Does not reflect decommissioning costs or potential economic impact of federal loan guarantees or other subsidies.
(h) Based on advanced supercritical pulverized coal. High end incorporates 90% carbon capture and compression. Does not include cost of transportation and storage.

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Energy Resources: Matrix of Applications

While the levelized cost of energy for Alternative Energy generation technologies is becoming increasingly competitive with conventional generation technologies, direct comparisons must take into account issues such as location (e.g., central station vs. customer-located) and dispatch characteristics (e.g., baseload and/or dispatchable intermediate load vs. peaking or intermittent technologies). This analysis also does not address the potential stranded cost aspects of distributed generation solutions in respect of existing electric utility systems, nor does it account for the social costs or other externalities of the rate consequences for those who cannot afford distributed generation solutions

		LEVELIZED COST OF ENERGY	CARBON NEUTRAL/ REC POTENTIAL	STATE OF TECHNOLOGY	LOCATION			DISPATCH			
					CUSTOMER LOCATED	CENTRAL STATION	GEOGRAPHY	INTERMITTENT	PEAKING	LOAD-FOLLOWING	BASE-LOAD
ALTERNATIVE ENERGY	SOLAR PV	$89 – 204	✓	Commercial	✓	✓	Universal[a]	✓	✓		
	SOLAR THERMAL	$125 – 164	✓	Commercial		✓	Southwest	✓	✓	✓	
	FUEL CELL	$109 – 206	?[b]	Emerging/ Commercial	✓		Universal				✓
	MICROTURBINE	$102 – 135	?[b]	Emerging/ Commercial	✓		Universal				✓
	GEOTHERMAL	$89 – 142	✓	Mature		✓	Varies				✓
	BIOMASS DIRECT	$87 – 116	✓	Mature		✓	Universal			✓	✓
	ONSHORE WIND	$45 – 95	✓	Mature		✓	Varies	✓			
	BATTERY STORAGE	$216 – 329	✓	Emerging	✓	✓	Varies		✓	✓	
CONVENTIONAL	DIESEL GENERATOR	$297 – 332	×	Mature	✓		Universal	✓	✓	✓	✓
	GAS PEAKING	$179 – 230	×	Mature	✓	✓	Universal		✓	✓	
	IGCC	$95 – 154	×[c]	Emerging[d]		✓	Co-located or rural				✓
	NUCLEAR	$86 – 122	✓	Mature/ Emerging		✓	Co-located or rural				✓
	COAL	$65 – 145	×[c]	Mature[d]		✓	Co-located or rural				✓
	GAS COMBINED CYCLE	$61 – 87	×	Mature	✓	✓	Universal			✓	✓

Source: Lazard estimates.

(a) Qualification for RPS requirements varies by location.

(b) LCOE study capacity factor assumes Southwest location.

(c) Could be considered carbon neutral technology, assuming carbon capture and compression.

(d) Carbon capture and compression technologies are in emerging stage.

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Levelized Cost of Energy—Key Assumptions

		Solar PV—Crystalline		Solar PV—Thin-film		
	Units	Rooftop	Utility Scale[b]	Utility Scale[c]	Solar Thermal Tower[d]	Fuel Cell
Net Facility Output	MW	10	10	10	120 – 100	2.4
EPC Cost	$/kW	$3,000 – $3,500	$2,000 – $1,750	$2,000 – $1,750	$5,600 – $9,000	$3,000 – $5,000
Capital Cost During Construction	$/kW	included	included	included	included	included
Other Owner's Costs	$/kW	included	included	included	included	$800 – included
Total Capital Cost[a]	$/kW	$3,000 – $3,500	$2,000 – $1,750	$2,000 – $1,750	$5,600 – $9,000	$3,800 – $5,000
Fixed O&M	$/kW-yr	$13.00 – $20.00	$20.00 – $13.00	$20.00 – $13.00	$50.00 – $80.00	$169 – $850
Variable O&M	$/MWh	—	—	—	$3.00	$10.75
Heat Rate	Btu/kWh	—	—	—	—	6,239 – 7,260
Capacity Factor	%	23% – 20%	27% – 20%	28% – 21%	43% – 52%	95%
Fuel Price	$/MMBtu	—	—	—	—	$4.50
Construction Time	Months	3	12	12	24	3
Facility Life	Years	20	20	20	40	20
CO_2 Emissions	lb/MMBtu	—	—	—	—	0 – 117
Investment Tax Credit[e]	%	—	—	—	—	—
Production Tax Credit[e]	$/MWh	—	—	—	—	—
Levelized Cost of Energy[e]	$/MWh	$149 – $204	$91 – $104	$89 – $99	$125 – $164	$109 – $206

Source: Lazard estimates.

Note: Assumes 60% debt at 8% interest rate and 40% equity at 12% cost for conventional and Alternative Energy generation technologies. Assumes Powder River Basin coal price of $1.99 per MMBtu and natural gas price of $4.50 per MMBtu.

(a) Includes capitalized financing costs during construction for generation types with over 24 months construction time.

(b) Low end represents single-axis tracking. High end represents fixed-tilt installation. Assumes 10 MW system in high insolation jurisdiction (e.g., Southwest U.S.). Not directly comparable for baseload.

(c) Low end represents single-axis tracking. High end represents fixed-tilt installation. Assumes 10 MW fixed-tilt installation in high insolation jurisdiction (e.g., Southwest U.S.).

(d) Low end represents solar tower without storage. High end represents solar tower with storage capability.

(e) While prior versions of this study have presented LCOE inclusive of the U.S. Federal Investment Tax Credit and Production Tax Credit, Versions 6.0 and 7.0 present LCOE on an unsubsidized basis, except as noted on the page titled "Levelized Cost of Energy—Sensitivity to U.S. Federal Tax Subsidies."

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Levelized Cost of Energy—Key Assumptions (cont'd)

	Units	Microturbine	Geothermal	Biomass Direct	Wind	Offshore Wind	Battery Storage[c]
Net Facility Output	MW	1	30	35	100	210	6
EPC Cost	$/kW	$2,300 – $3,800	$4,021 – $6,337	$2,622 – $3,497	$1,200 – $1,600	$2,500 – $4,120	$400 – $750
Capital Cost During Construction	$/kW	included	$579 – $913	$378 – $503	included	included	included
Other Owner's Costs	$/kW	included	included	included	$300 – $400	$600 – $880	included
Total Capital Cost[a]	$/kW	$2,300 – $3,800	$4,600 – $7,250	$3,000 – $4,000	$1,500 – $2,000	$3,100 – $5,000	$400 – $750
Fixed O&M	$/kW-yr	—	—	$95.00	$30.00	$60.00 – $100.00	$10.00 – $22.00
Variable O&M	$/MWh	$18.00 – $22.00	$30.00 – $40.00	$15.00	$6.00 – $10.00	$13.00 – $18.00	—
Heat Rate	Btu/kWh	10,000 – 12,000	—	14,500	—	—	—
Capacity Factor	%	95%	90% – 80%	85%	52% – 30%	43% – 37%	25% – 25%
Fuel Price	$/MMBtu	$4.50	—	$1.00 – $2.00	—	—	—
Construction Time	Months	3	36	36	12	12	3
Facility Life	Years	20	20	20	20	20	20
CO_2 Emissions	lb/MMBtu	—	—	—	—	—	—
Investment Tax Credit[b]	%	—	—	—	—	—	—
Production Tax Credit[b]	$/MWh	—	—	—	—	—	—
Levelized Cost of Energy[b]	$/MWh	$102 – $135	$89 – $142	$87 – $116	$45 – $95	$110 – $200	$216 – $329

Source: Lazard estimates.

Note: Assumes 60% debt at 8% interest rate and 40% equity at 12% cost for conventional and Alternative Energy generation technologies. Assumes Powder River Basin coal price of $1.99 per MMBtu and natural gas price of $4.50 per MMBtu.

(a) Includes capitalized financing costs during construction for generation types with over 24 months construction time.

(b) While prior versions of this study have presented LCOE inclusive of the U.S. Federal Investment Tax Credit and Production Tax Credit, Versions 6.0 and 7.0 present LCOE on an unsubsidized basis, except as noted on the page titled "Levelized Cost of Energy—Sensitivity to U.S. Federal Tax Subsidies."

(c) Assumes capital costs of $400 – $750/KWh for 6 hours of storage capacity, $60/MWh cost to charge, one full cycle per day (full charge and discharge), efficiency of 66% – 75% and fixed O&M costs of $5 to $20 per KWh installed per year.

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Levelized Cost of Energy—Key Assumptions (cont'd)

	Units	Diesel Generator[b]	Gas Peaking	IGCC[c]	Nuclear[d]	Coal[e]	Gas Combined Cycle
Net Facility Output	MW	2	216 - 103	580	1,100	600	550
EPC Cost	$/kW	$500 - $800	$580 - $700	$3,257 - $5,990	$3,750 - $5,250	$2,027 - $6,067	$743 - $1,004
Capital Cost During Construction	$/kW	included	included	$743 - $1,510	$1,035 - $1,449	$487 - $1,602	$107 - $145
Other Owner's Costs	$/kW	included	$220 - $300	included	$600 - $1,500	$486 - $731	$156 - $170
Total Capital Cost[a]	$/kW	$500 - $800	$800 - $1,000	$4,000 - $7,500	$5,385 - $8,199	$3,000 - $8,400	$1,006 - $1,318
Fixed O&M	$/kW-yr	$15.00	$5.00 - $25.00	$26.40 - $28.20	$60.00	$20.40 - $31.60	$6.20 - $5.50
Variable O&M	$/MWh	—	$4.70 - $7.50	$6.80 - $7.30	—	$3.00 - $5.90	$3.50 - $2.00
Heat Rate	Btu/kWh	10,000	10,300 - 9,000	8,800 - 10,520	10,450	8,750 - 12,000	6,700 - 6,900
Capacity Factor	%	95% - 30%	10%	75%	90%	93%	70% - 40%
Fuel Price	$/MMBtu	$4.00	$4.50	$1.99	$0.65	$1.99	$4.50
Construction Time	Months	3	25	57 - 63	69	60 - 66	36
Facility Life	Years	20	20	40	40	40	20
CO_2 Emissions	lb/MMBtu	0 - 117	117	169	—	211	117
Investment Tax Credit[f]	%	—	—	—	—	—	—
Production Tax Credit[f]	$/MWh	—	—	—	—	—	—
Levelized Cost of Energy[f]	$/MWh	$297 - $332	$179 - $230	$95 - $154	$86 - $122	$65 - $145	$61 - $87

Source: Lazard estimates.

Note: Assumes 60% debt at 8% interest rate and 40% equity at 12% cost for conventional and Alternative Energy generation technologies. Assumes Powder River Basin coal price of $1.99 per MMBtu and natural gas price of $4.50 per MMBtu.

(a) Includes capitalized financing costs during construction for generation types with over 24 months construction time.

(b) Low end represents continuous operation. High end represents intermittent operation. Assumes diesel price of $4.00 per gallon.

(c) High end incorporates 90% carbon capture and compression. Does not include cost of storage and transportation.

(d) Does not reflect decommissioning costs or potential economic impact of federal loan guarantees or other subsidies.

(e) Based on advanced supercritical pulverized coal. High end incorporates 90% carbon capture and compression. Does not include cost of storage and transportation.

(f) While prior versions of this study have presented LCOE inclusive of the U.S. Federal Investment Tax Credit and Production Tax Credit, Versions 6.0 and 7.0 present LCOE on an unsubsidized basis, except as noted on the page titled "Levelized Cost of Energy—Sensitivity to U.S. Federal Tax Subsidies."

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Summary Considerations

Lazard has conducted this study comparing the levelized cost of energy for various conventional and Alternative Energy generation technologies in order to understand which Alternative Energy generation technologies may be cost-competitive with conventional generation technologies, either now or in the future, and under various operating assumptions, as well as to understand which technologies are best suited for various applications based on locational requirements, dispatch characteristics and other factors. We find that Alternative Energy technologies are complementary to conventional generation technologies, and believe that their use will be increasingly prevalent for a variety of reasons, including RPS requirements, continually improving economics as underlying technologies improve, production volumes increase and government subsidies in certain regions.

In this study, Lazard's approach was to determine the levelized cost of energy, on a $/MWh basis, that would provide an after-tax IRR to equity holders equal to an assumed cost of equity capital. Certain assumptions (e.g., required debt and equity returns, capital structure, and economic life) were identical for all technologies, in order to isolate the effects of key differentiated inputs such as investment costs, capacity factors, operating costs, fuel costs (where relevant) and U.S. federal tax incentives on the levelized cost of energy. These inputs were developed with a leading consulting and engineering firm to the Power & Energy Industry, augmented with Lazard's commercial knowledge where relevant.

Lazard has not manipulated capital costs or capital structure for various technologies, as the goal of the study was to compare the current state of various generation technologies, rather than the benefits of financial engineering. The results contained in this study would be altered by different assumptions regarding capital structure (e.g., increased use of leverage) or capital costs (e.g., a willingness to accept lower returns than those assumed herein).

Key sensitivities examined included fuel costs and tax subsidies. Other factors would also have a potentially significant effect on the results contained herein, but have not been examined in the scope of this current analysis. These additional factors, among others, could include scale benefits or detriments, the value of Renewable Energy Credits ("RECs") or carbon emissions offsets, the impact of transmission costs, second-order system costs to support intermittent generation (e.g., backup generation, voltage regulation, etc.), the economic life of the various assets examined, the potential stranded cost aspects of distributed generation solutions and social costs or other externalities of the rate consequences for those who cannot afford distributed generation solutions.

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