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MEMORANDUM

TO: **Friends of Lazard**

FROM: Lazard Global Power, Energy & Infrastructure

DATE: August 16, 2013

RE: *Lazard's Levelized Cost of Energy Analysis v7.0*

During an extended period of change and volatility, Lazard has remained focused on the evolution of Alternative Energy and its convergence with the conventional Power & Utility Industry (as well as other industries). In that regard, we have always believed that an essential question is how the current and projected costs of various Alternative Energy generation technologies compare to conventional generation technologies. Our most recent study of this topic – Lazard's LCOE v7.0 – is attached.

Reflecting Lazard's approach to long-term thought leadership, commitment to the sectors in which we participate, and focus on intellectual differentiation, we have been publishing this study since 2008, and it is now in its seventh iteration.

The study offers a variety of insights, including the following selected highlights:

- The current and anticipated costs of all forms of utility-scale solar PV continue to decline; we estimate that the LCOE of leading technologies has fallen by more than 50% in the last four years
- Utility-scale solar PV is a competitive source of peak energy as compared with conventional generation in many parts of the world, without any subsidies (appreciating the important qualitative differences related to dispatch characteristics and other factors)
- Wind costs continue to decline; we estimate that the LCOE of leading technologies has fallen by more than 50% in the last four years. While many had anticipated significant declines in the cost of utility-scale solar PV, few anticipated these sorts of cost declines for wind technology

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- Battery storage has an array of established and early-stage participants where estimated LCOEs, combined, in particular, with wind and its off-peak production characteristics, may start to demonstrate value in load shifting, among myriad applications for storage
- Residential-scale solar PV in the United States (and elsewhere) is benefiting from the concentration of multiple levels of federal tax subsidies, state-level tax subsidies, and/or feed-in tariffs. Currently, residential-scale solar PV remains expensive by comparison to utility-scale solar PV. Thus, an issue for consideration is whether these subsidies are distorting resource planning in a way that has externalities for the entire set of constituencies benefiting from an integrated electric utility system
- Very large-scale conventional generation projects (e.g., IGCC, nuclear) face a number of challenges, including: large cost contingencies; absolute costs on a heroic scale; LCOEs which suffer by comparison to natural gas in many parts of the world; and policy uncertainty. Notwithstanding these issues, an integrated electric utility system in an advanced economy requires modern baseload generation, there is value in diversity of generation resources, and effective public policy dictates the need for organized resource planning in order to maximize the benefits of an integrated electric utility system for all constituencies

The study will continue to evolve over time by necessity (e.g., cost positions of solar and wind technologies are continually evolving, cost data for conventional generation technologies remain in a state of flux), and we appreciate that there are various views regarding the merits of some of the data inputs utilized. Accordingly, we would be happy to discuss this work in detail with you.

The past several years have been marked by radical rationalization and retrenchment for many participants in the Alternative Energy sector. Even today, sector participants must navigate numerous challenges: creating rational, long-term financing structures for Alternative Energy deployment in the face of declining subsidies and various financing "fads" whose logic will ebb and flow over time; excess manufacturing capacity; and the globalization of end-markets, among other issues.

However, for all of the well-publicized change and volatility in the sector, there also has been success in many important areas: the emergence of global-scale participants; deployment of some technologies at significant scale; thoughtful advancements in financing (particularly in respect of pension and infrastructure investors for existing assets); and great benefits to consumers as technology has improved and costs have fallen.

Lazard has remained committed to the Alternative Energy sector during this time because we believe that new technologies will continue to be developed and deployed in complement with the existing technologies of integrated electric utility systems globally, *where the new technologies are competitive on an LCOE basis*. One example of this evolution can be seen in emerging "sustainable" solar markets such as the Mid-East, Chile and Australia, where solar PV technology can save energy consumers significant costs as compared with oil-fired electric generation (which remains in use in many parts of the world, particularly in remote locations).

As evidence of this ongoing commitment, Lazard executed over 25 strategic assignments in the past 18 months for our clients in Alternative Energy. The following list represents just a few highlights of our work across M&A, public and private capital raises, restructurings and bespoke analyses. Our assignments demonstrate Lazard's presence in every substantive sector of Alternative Energy, globally:

- Financial advisor to **First Solar**, a global provider of thin-film solar PV power systems, on its underwritten public offering of $428 million of common stock
- Sole financial advisor to **Clean Line Energy**, a merchant transmission developer focused on delivering low-cost wind power from high-availability resource regions to major load centers, on a $40 million private placement led by new investor **National Grid**
- Sole financial advisor to **Ciris Energy**, a developer of advanced natural gas extraction and bioconversion technologies, on a $25 million private placement which included an Asia-based strategic investor leading this round. Lazard has now advised Ciris Energy on both its B and C round private placements, totaling $50 million
- Sole financial advisor to **A123 Systems**, a manufacturer of lithium-ion batteries for electric vehicles and grid storage, on its restructuring and sale to **Wanxiang Group**, China's largest auto components supplier, for $257 million
- Sole financial advisor to Spain-based **ZIV**, a privately-owned provider of digital equipment and systems for electric grid automations, on its sale to India-based **Crompton Greaves**, a manufacturer of electrical equipment for power, industrial and consumer applications, for $184 million
- Sole financial advisor to **United Technologies** on the divestiture of its fuel cell business, **UTC Power**, to **ClearEdge Power**, a private equity-backed manufacturer of onsite power systems
- Financial advisor for two confidentially-marketed public offerings raising $78 million for **FuelCell Energy**, a leading developer of fuel cells for distributed generation applications. Lazard has raised over $225 million for FuelCell Energy in eight transactions over the past seven years
- Various confidential advisory assignments for utilities, market participants and investors in respect of Alternative Energy, including technology assessments, analyses of potential strategic partners globally, public market trading dynamics, perspectives on key end-market trends, commercialization strategies, and potential and evolving sources of capital

Importantly, even as we believe that there will be long-term successes in many Alternative Energy sectors, there has been transactional activity which Lazard has declined to pursue, *often because we believed that there were fundamental issues regarding the long-term viability of a given company in light of the competitive implications of the LCOE of its products*. This insight, for example, was at the heart of our advice to a sovereign government to cease funding a troubled solar PV company. There have been similar examples in the areas of electric vehicles, solar PV and thermal technology, fuel cells, biofuels, and wind generation technology, among others.

If you have any questions regarding this memorandum or Lazard's LCOE v7.0, please feel free to contact any member of the Lazard Power, Energy & Infrastructure Group, including individuals listed below.

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