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Electricity for the 21st century: digital electricity for a digital economy

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Abstract

In August 2002, the Board of Directors of the Electric Power Research Institute encouraged the Institute to examine the serious challenges facing the electric power sector. The goal was to define the characteristics of a vital and robust sector, and to help develop an actionable leadership framework. The ultimate goal of the “Electricity Sector Framework for the Future” project is to establish a coherent set of actions and accountabilities that will enable the electricity sector to meet the escalating needs and aspirations of its customers, investors/owners, and society. In order to be effective, such a set of actions must reflect mutual self-interest and equity across the broad electricity stakeholder community. In general, this requires a unified industry leadership commitment that electricity, through innovative technology, has a service value greater than its traditional basic commodity value. This vision of innovative opportunities to transform the reliability and value of electricity for the future must be “sold” to the public and public policy leaders at the local, state, and federal levels who can credibly advocate the message. Additionally, the initiative must be expanded to educate stakeholders about mechanisms for strengthening industry credibility, building trust, and gaining broad public and political support for the sector’s vision and needed actions. Finally, the costs and benefits must be made tangible, compelling, and urgent for all stakeholders, especially consumers.

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The electricity sector stands at a critical fork in the road of progress, and its stakeholders must make choices about the future value of the sector. The decisions made and the path taken will make a profound difference, not only to the

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electricity sector itself but also to the nation and the world. With so many factors converging at one time on the electricity sector, stakeholders will need to identify the means for moving on several fronts simultaneously.

In August 2002, the EPRI Board of Directors encouraged the Institute to examine the serious challenges facing the electric power sector. Key findings of the report, entitled *Electricity Sector Framework for the Future*, reflect the comprehensive results of the examination. The goal was to define the characteristics of a more vital, robust sector and to develop an actionable leadership framework for achieving this future.

1. Stakeholder vision

In spite of the regional differences in market development and the timing of technological advances, the US electricity sector is expected to eventually reach a vision which the EPRI calls the “21st Century Transformation.” Key questions are: how long will it take, will it be driven predominately by the current participants or others, and what can be done to enable a smooth and predictable transition rather than a series of disruptive and expensive, crisis-laden experiences? Equally important is ensuring that the costs of the transition, and any discomfort experienced by the public, do not outweigh the benefits. The Transformation represents an integrated, sustainable solution to the rising expectations of stakeholders—a future where the electricity sector becomes a platform for technical innovation and continued economic prosperity.

One of the linchpins for economic growth is digital control of the power delivery network, combined with a consumer-based technology that replaces the traditional electric meter with a “consumer portal” for two-way flow of information and energy. Eventually, it is expected that this platform will enable every end-use electrical appliance to be linked with the open marketplace for goods and services, including, but not limited to, electric power. Economic productivity will increase substantially as the electric power sector is transformed, generating additional wealth to help cope with ongoing societal, security, and environmental challenges.

There are several advantages to transforming the electricity/information infrastructure:

- US productivity is increased.
- The value and output of goods and services are increased, thus creating the wealth needed to fund the growing societal costs of an aging population.
- Energy efficiency and electricity intensity are improved.
- Reduction of carbon emissions is accelerated.
- The overall security of the power system is improved.

2. Increasing the value of electricity

As the history of other technological enterprises has shown, markets may move along a path that is not necessarily controlled either by regulators or the existing

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