

GRIDWEEK™

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Power Grid Transmission & Distribution Technology Roadmap

Energy Task Force of the Business
Roundtable



GRIDWEEK Energy Task Force

- Business Roundtable Organization: (member organization of >160 CEOs of largest U.S. companies)
- Vision:
 - To increase energy dependence on domestic sources
 - To reduce energy consumption
 - To improve energy efficiency above the status quo
- Actions:
 - Technology workshop held in 11-06 and industry roadmaps developed
 - Targets developed for private sector companies
 - By early May 2007, BRT CEOs will adopt targets and plans

GRIDWEEK Energy Task Force: T&D Sector

- ABB – Lead in sector
- AEP
- GE
- National Electrical Manufacturers Assn.
- Siemens
- TVA
- TXU



- Out of all energy consumed to produce electricity, only 30% reaches consumers in the form of electricity
 - 60% is lost in generation
- ***10% is lost in transmission and distribution***
 - Dollar impact of 10% T&D losses estimated at over \$25 billion per year
 - Congestion costs are over \$4.8 billion annually - some estimates are over \$50 billion
 - Annual T&D losses account for 1.31 Quad BTU, equivalent to 226 million barrels of crude oil
- ***Electric power transmission & distribution is an “enabler” to improve energy efficiency, increase reliance on domestic energy sources, and to reduce oil and gas consumption***

- Priority 1
 - Increase reliance on domestic energy resources by expanding T&D system to *enable optimal deployment and use of power generation resources*
- Priority 2
 - *Optimize power grid design* with new or advanced technologies and practices to save energy without sacrificing reliability
 - *Develop enhanced online T&D system operation and control* to improve energy efficiency
- Priority 3
 - *Develop and install energy efficient power apparatus*

New or advanced technologies and practices recommended for grid optimization to save energy without sacrificing reliability (unranked)

- Flexible Alternating Current Transmission Systems (FACTS) to increase power transfer capability and replace uneconomical generators
- Direct power delivery to mega load centers with High Voltage Direct Current (HVDC) technology
- Direct Current (DC) distribution to reduce power losses
- Distributed generation/Microgrids to eliminate long distance transmission where more losses occur
- More underground distribution lines to reduce 80% of distribution power losses
- Intelligent grid design (smart grids via automation)
- Reduction of overall T&D transformer MVA
- High temperature superconducting lines, cables, and transformers
- Energy storage devices
- Three phase design for distribution to reduce losses inherent with single phase feeder branches
- Ground wire loss reduction techniques can save 5-6% of the total line loss

Enhanced online system operation and control to improve energy efficiency

- Higher transmission operating voltages
- Voltage optimization through reactive power compensation
- Asset replacement schedule optimization
- Distribution loss reduction via distribution automation
- Power factor improvement
- Load management (smart metering for price sensitive load control)
- Power electronic transformers

- Advanced grid technology investment obstacles include
 - Cost allocation – who benefits and who pays
 - Cost justification of more costly advanced technologies as opposed to conventional means of expanding grid
 - No incentives to deploy technologies on a broad basis
 - State jurisdiction versus federal jurisdiction for transmission line construction
 - Energy policy helps but not a straight-forward solution
- Inter-regional transmission planning is needed instead of traditional utility planning
- Lack of public support for transmission expansion and demand side technologies which may be overcome partially with better public education