



## Accelerating the Greening of China

Joint US-China Cooperation on Clean Energy

by

Dr. ML Chan 陈文龙博士

China Executive Director of Smart Grid Cooperative, JUCCE

([mlchan@jucce.com](mailto:mlchan@jucce.com))

Vice President, Quanta Technology, LLC, USA

([mlchan@quanta-technology.com](mailto:mlchan@quanta-technology.com))

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### Outline of Presentation

- What is Smart Grid?
- China electric energy future
- Smart Grid's impact on China's environment
  - Energy efficiency
  - Carbon footprint
- Concluding Remarks



## Smart Grid is ....

- Convergence of Information Technology & Power Delivery Technology to achieve:
  - System efficiency
  - Sustainability (green the grid)
  - Optimal utilization
  - Enhanced system reliability
- A Smart Grid is intelligent, efficient, accommodating, motivating, opportunistic, quality-focused, resilient and green

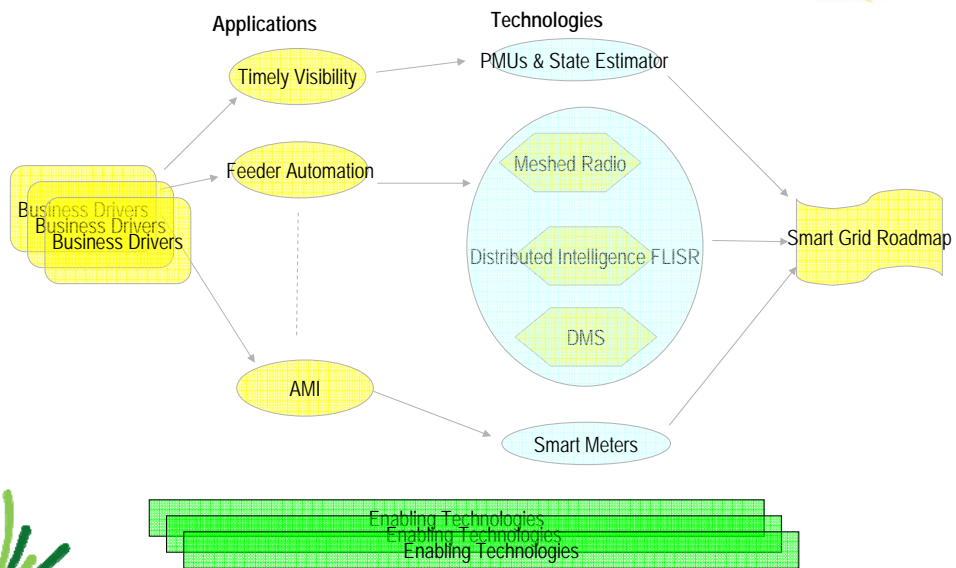


## The Smart Grid of The Future<sup>1</sup>

20th Century Grid	21st Century Smart Grid
Electromechanical	Digital
One-way communications (if any)	Two-way communications
Built for centralized generation	Integrates distributed generation & renewables and supports EVs or hybrids
Radial topology	Network topology; bidirectional power flow
Few sensors	Monitors and sensors throughout; High visibility
Manual restoration	Semi-automated restoration & decision-support systems and eventually self-healing
Prone to failures and blackouts	Adaptive protection and islanding
Scheduled equipment maintenance	Condition-based maintenance
Limited control over power flows	Pervasive control systems; state estimator
Not much sustainability concern	Sustainability and Global Warming concern
Limited price information	Full price information to customers – RTP, CPP,



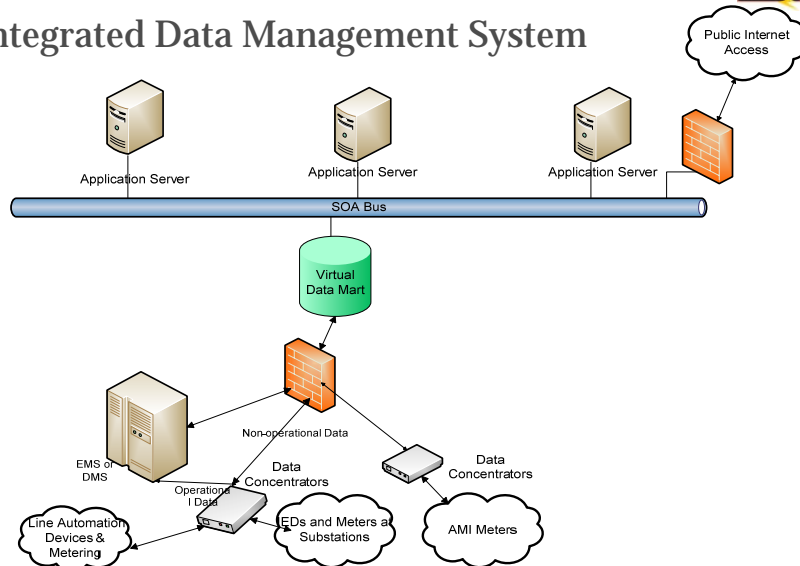
## Smart Grid .....



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## Integrated Data Management System



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## China's Electric Energy Future

- For new installed capacities, migrate from coal-fired dominance to renewable (wind and solar PV farms) and micro-nuclear plants
- Wind farms in Northwest being delivered through the robust UHV transmission grid infrastructure; bundled “Thermal & Renewable” energy from West to East; about 9000 MW wind in 2008, a ~50% increase over 2007; exponential growth in the future
- Renewable and nuclear because of carbon footprint
- Developing carbon trading market



## China Electric Energy Future (cont'd)

- Smart Grids at each rural village; will increase GDP at rural areas, and no increased mega-city overloadings; not sustainable.
- Microgrids, renewable, and Net Zero Energy Buildings at urban areas, the load centers
- PHEV increased penetration, replacing gas dependency
- Energy efficiency – end-user level and grid system operations. China could be responsible for 1/8 of energy growth by 2030



## Smart Grid Applications that Significantly Affect the Environment

### Generation

- Real-time Heat Rate Curve
- Continuous Emission Monitoring System
- Carbon Trading Market

### Transmission

- Integration of wind and solar PV (intermittent) resources to transmission grids; energy storage technologies and power electronics (LVRTs)
- Power electronics (e.g., FACTS) to improve the transmission system efficiency



## Smart Grid Applications that Significantly Affect the Environment

### Distribution

- Integration with microgrids, renewable, DGs, and associated system protection
- Reduce line losses (about 7-8%) with IVVC and Feeder Peak Load Management

### Customers

- AMI systems
- Net Zero Energy Buildings with smart meters and controllers
- Net Zero Energy Communities at villages; preserve the “national asset”
- PHEVs integration



## Conclusions

- Significant carbon reduction associated with renewable and system efficiency gains
- Barriers in the customer participation of Smart Grid; more for integrating renewable
- PHEVs will shift dependence from petroleum; ideal if charged batteries by renewable



# Thank You





[ML Chan, PhD, China Executive Director of Smart Grid Cooperative, JUCCCE, and Executive Advisor and Vice President, Asian Business Development, Quanta Technology, LLC](#)

Dr. Chan, is an expert in the areas of Smart Grid and the utilization of computer and communications system technologies to deliver power system reliability, performance improvement, and optimal asset management for utilities. He combines his power system planning and operations expertise to integrate renewable, distributed energy resources, demand responses and load management, AMI/AMR systems, Home Automation Network (HAN), feeder automation, substation automation, SCADA, asset condition monitoring, condition-based maintenance (CBM), phasor measurement unit, wide area protection and FACTS technologies into a Smart Grid vision for utilities. The full realization of that vision is made possible when Dr. Chan guides utilities in developing and implementing enterprise IT system architecture to provide business intelligence for utility operations. His environmental resources background since the 70's also provides with significant insight to integrate renewable resources, demand side management and efficient energy building technologies into utility operations and planning. For more than 30 years, Dr. Chan has provided consulting services to over 70 utilities in the United States and around the world. He has published over 60 technical papers in the open literature, and has given many presentations and speeches in seminars and tutorials. He is the Chair of IEEE Power System Planning and Implementation Committee, and a member of Executive Advisory Committee for DISTRIBUTECH Conferences. He is also on the Editorial Board of *IEEE Transactions on Power Systems*. Dr. Chan has SB, SM and Electrical Engineer's degrees from MIT, and PhD from Cornell University. Prior to joining Quanta Technology and JUCCCE, he has worked with Energy Resources Company, Tetra Tech, Systems Control, Inc., Energy Management Associates, ECC, Inc., ML Consulting Group, SchlumbergerSema, and KEMA, Inc.

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## JUCCCE accelerates the greening of China

- Non-profit, NGO
- Building China's ability to deploy clean and efficient energy
- Brings in international expertise and technologies
- Hub of multi-sector leaders working together on innovative solution for disruptive change
- Led by professionals
- Leverage corporate partner resources



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## Example Key Programs 我们的项目

### 聚思中国智能电网联盟 Smart Grid

International dialogue to accelerate the drive for Smart Grid in China.

### 市长培训项目 Mayoral Training

Working with the mandatory Mayoral Training center to incorporate city-level energy efficiency coursework and international speakers.

### 节能灯泡交换计划 Clean Lighting Conversion

Using carbon credits to fund the distribution of 10M energy efficient lightbulbs to students along with educational seminars. Free compact fluorescent recycling- the first in China.

### 绿色英雄全民手机环保活动 Green Heroes Mobile Campaign

Using an engaging mobile and web campaign to encourage people to submit Green Deeds everyday.

### 聚思中国能源论坛 JUCCE China Energy Forum

World class speakers in interactive dialogue to discuss innovative solutions. New reports, case studies. Nov 10-11, 2008 Beijing

### 绿色办公室计划 Green Office in a Box

Educational kit to make building out green office interiors easier.



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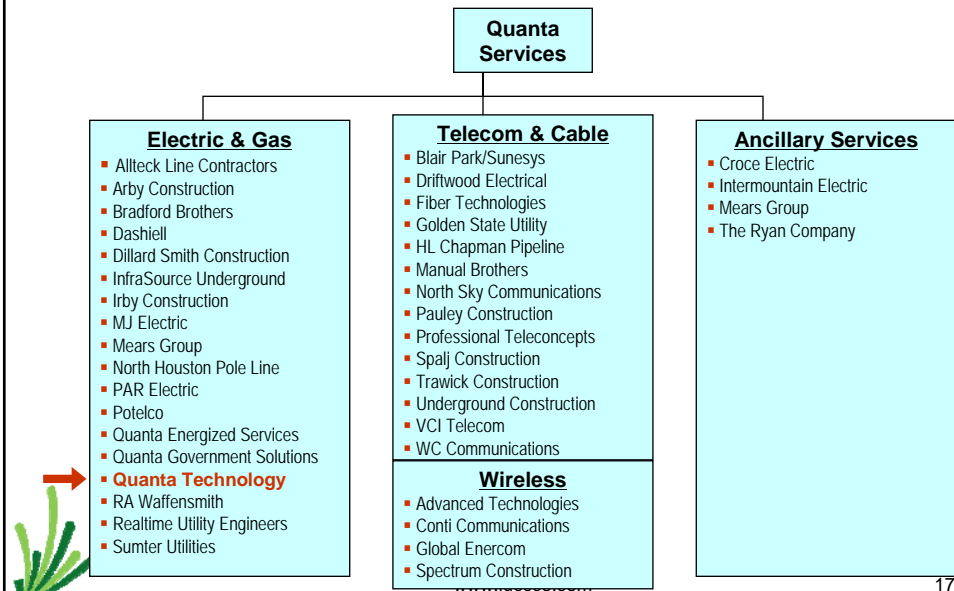
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## Quanta Services - Organization



## Quanta Technology, LLC



### Who We are:

- The high-growth, independent consulting arm of Quanta Services
- Now 60 professional staff, with many industry-renowned experts
- Headquarters in Raleigh, NC and regional offices in MA and CA

### Our Mission:

Help energy utilities achieve better performance - via application of technologies and best practices

### Business Critical Success Factors:

- Provide full range of technical and business analytical capabilities
- Be the top experts in the industry – provide creativity and thought leadership
- Combine technical depth with industry experience – to understand and effectively satisfy clients' needs
- Services leaders involved in client projects – to assure success
- Maintain independence and objectivity



### Range of Our Technical and Analytical Services



- **Strategic and asset management planning**
- **T&D infrastructure planning and analysis**
- **System protection and automation**
- **“Smart Grid” development**
- **Enterprise systems integration**
- **Equipment condition, design and maintenance standards assessment**
- **Sustainable energy portfolio assessment**
- **Project and program implementation**
- **Best practices assessment and utilization**
- **Regulatory, ERO, RRO and RTO/ISO support**
- **Staff training**

