Smart/Intelligent Grid Development and Deployment in Thailand (Smart Thai)

“Smart Grid: Policy, Services and Applications”

The Smart Grid Business Case
Allocate and Mitigate Risks

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The Smart Grid Business Case
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Electric utility rates cover operational and fuel expenses

Utilities currently make money by deploying capital and recovering it by selling power

Typical U.S. Regulation

- Used and useful assets
- Allowance for Funds Used During Construction (AFUDC), no (partial) Construction Work In Progress (CWIP)
- Deferred taxes subtracted
- Working capital included

- Regulators limit ROE to "fair" levels (now 9.5 - 12.5%)
- Ratepayers are responsible for actual interest payments
- Rates are based on a load forecast that is in the rate case
- Shareholders can over/under-earn vs. allowed ROE if consumption is more/less than forecasted

- Historical last year
- Fuel cost adjustment
- Working capital fluctuations
- Non-performing receivables
- Purchase power and gas cost passed through w/o profit
- Special incentive programs

Revenue Requirement

Used to determine rates for each customer class

Rate Base

Allowed Return on Capital

Allowed rate of return on equity

Operating Expenses

Fuel Costs

Utilities currently make money by deploying capital and recovering it by selling power
As the largest stationary carbon producers, electric utilities must become more energy efficient, produce less power, and reduce total carbon emissions

Notes: Residential, Commercial & Industrial emissions are non-electricity
Source: EIA data; EEI; FERC Form 1
There are also several forces that are going to shape the utility of the future

Forces At Work

- **Aging Grid & Reliability**: Dramatic underinvestment in electric infrastructure for the past decades
- **Customer Needs/Demands**: More services for less money
- **Regulatory Mandate**: No clear mandate due to many uncertainties on the horizon
- **Electricity Value Chain**: Green House Gases Emissions reduction
- **Future Generation Mix/Network Management**: Increase penetration of distributed and intermittent generation
- **Technology Evolution**: Automation technologies are becoming more affordable and are being reconsidered for large-scale deployment

Utilities must shape their own future, or someone else will do it for them
The deployment of Smart Technologies directly addresses these trends and forces.

**Smart Technologies Capability Groups**

1. **Distributed Generation / PHEV**
   - Facilitates the deployment of “greener” and more efficient generation throughout the distribution network.

2. **Smart Grid**
   - Reduces line losses, increases operational efficiency while increasing reliability and power quality.

3. **Demand Response / Energy Efficiency**
   - Enables higher penetration and reduction of energy consumption (load shift and reduction).

4. **Smart Meter/ Home Area Network**
   - Reduces operational costs and allows for more efficient energy management.

What deployment should utilities chose?
Analysis and quantification of operational and societal benefits across the utility value chain

Smart Meter / Grid Business Case Approach

- Leverages client data and public data to model quantifiable benefits by capability
- Uses detailed system attributes and an inventory of Smart technology components to model costs
- Models impacts on the utility’s revenue requirement and financial statements as well as on the customer
- Considers the impact of emerging issues like demand response, energy efficiency & distributed generation

Business Case Sample Output Allows for...

- Financial analysis by capability
- Scenario analysis of deployment options
- Development of technical requirements
- Design of Smart City and other types of pilots
- Analysis of regulatory strategies
- Modeling customer value proposition
- Calculation of carbon reduction and other societal benefits

Cost-benefit analysis helps identify the optimal deployment options that best balance the interests of all stakeholders
Smart Meter / Grid Business Case Approach

1st Horizon – The Strategy

- Customization of the Smart Meter / Grid Business Case
- Load client and external data
- Scenario analysis – model impacts on end-to-end business
- Selection of strategy / deployment
- Build initial IT and telecom requirements

Today

2nd Horizon – The Design

- Creation of new retail operating model to support new strategy
- Mapping of capabilities and skills
- Thorough customer segmentation and different program designs
- In-depth design of system requirements, process and capabilities
- RFQ and selection of vendors

4 Months

3rd Horizon – The Implementation

- Set up program and project management office
- Mobilization of third party and own resources
- Begin deployment of equipment, IT and Telecom infrastructure
- Delivery of future systems and go-live

12 Months

Potential Investments

Today: $0.4-0.6 MM

2nd Horizon: $0.5-2.0 MM

3rd Horizon: $20-50 MM

End-to-End integration of Smart Technologies from Strategy to Implementation
The Approach can be leveraged in the 1st horizon to help mobilizing for the change journey ahead.

Smart Meter / Grid Business Case Mobilization – 1st Horizon

- Data Request /Collection and Benefits/Costs Review
  - Meter Reading
  - Remittance & Collections
  - Customer Services
  - Load Forecast & Planning
  - Gen/ Trans Ops
  - Energy Efficiency
  - Rates & Regulatory
  - Field Service Ops & Metering
  - Dist Eng & Ops
  - Finance & Corp Dev
  - IT/ Telecom
  - Human Resources

- Scenario Development and Analysis

- Screening

- Business Case w/ Recommendations for Utility Regarding Smart Meter/ Grid Options

Screening Criteria
- Implementation Drivers
- Timeline
- Strategic Fit
- Capability

14-16 weeks

Project Kick-off

Business Case Customization & Component Costing
Key Concerns of the Regulator

Ensure Reliability
- Technologies must be reliable and stable

Minimize Economic Impact
- Solutions must be cost-effective (i.e. have minimal impact on electric rates)

Satisfy Societal Demands
- Any Smart Grid strategy must satisfy societal demands that include:
  - reducing energy costs
  - improving quality of service
  - enabling “green” technologies

Easy Implementation
- Deployment plans need to ensure ease of implementation so that electric service can be provided continuously without interruption
| **Expertise** | A research repository of current thinking and perspective in the industry to help the client understand the concepts that are key to any analysis of Smart technologies |
| **Process** | Methodologies and tools that facilitate the gathering of client-specific operational and strategic data for input into the business case. Frameworks for conducting workshops with key functional groups, both visioning and review of cost/benefit analysis |
| **Financial Analysis** | Robust and flexible modeling tool for:  
- analyzing costs and benefits of key Smart technologies  
- producing client-specific financial reports and outputs |
| **Strategic Assessment** | An end-to-end strategic evaluation of:  
- customer needs  
- technological challenges  
- key regulatory issues currently impeding the adoption of Smart technologies |
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