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The First Smart Grid Project in Thailand, Pattaya City

By

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Geo Smart Asia 2016, Kuala Lumpur, Malaysia
Strategic City Planning & Smart Electricity
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Outlines

3 Topics

1. About PEA

2. PEA Smart Grid Roadmap

3. PEA Smart Grid Project
Outlines

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3. PEA Smart Grid Pilot Project
About PEA

Vision

To provide efficient and reliable electricity services for quality of life and sustainability of economy and society.
About PEA

Service Area: as of 31 DEC 2015

- Area: 510,000 km² (approx. 99%)
- Province: 74 provinces
- Substation: 539 substations
- Customer: 80,033 villages, 18.05 million households
- Electrified customer: 99.97% (village)
About PEA

General Info: as of 31 DEC 2015

- **Maximum Demand**: 18,596 MW
- **Total Sales of Electricity**: 90,531 Million Unit (kWh)
- **SAIFI**: 4.69 times/customer/year
- **SAIDI**: 153.61 minutes/customer/year
- **Distribution Loss**: 5.75%
Factors Impacting Organizations

1. Technology Factors
2. People Skills
3. Market Factors
4. Macro-economic Factors
5. Regulatory Concerns
6. Globalization

Source: IBM CEO Study 2012
Policy and Strategies

28th September 2016, PEA celebrates its 56th anniversary with

“Human resources development through innovation and operational performance through technology”

Mr. Somsakul Kikkan, Governor of the Provincial Electricity Authority
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PEA’s Smart Grid Drivers

In response to the global drivers, PEA has defined their own Smart Grid driver to align with the nation challenges, organizational vision and strategy:

- Improve Power System Stability
- World Trends toward Low Carbon Economy & Sustainable Society
  - RE Promotion and future challenges of commercial fuel supply
  - Energy Efficiency both on Supply-side and Demand-side
- ICT Application to improve productivity and services
- Social responsibility and operate in an environment friendly manner
- Integration of PEA, MEA, EGAT Smart Grid Roadmaps, and strategic plans of related stakeholders
- Needs of Innovation for the country’s competitiveness
PEA first announced PEA Smart Grid Roadmap in 2011.

**Vision** Improve quality of life while maintaining the environment

**SMART ENERGY**
- Efficient use and generation of energy
  - Use of clean and renewable energy

**SMART LIFE**
- Improve quality of life
  - Better manage home energy / Information accessibility
  - A choice of electric vehicles (EVs) for efficient transportation
  - A choice of intelligent home appliances

**SMART COMMUNITY**
- Intelligent and green community in the future
  - A reduction in greenhouse gases
  - Increase in electricity uses for transportation system i.e. personal EVs, bus, and train system
  - Public charging stations
A Road to PEA Smart Grid
Vision of Our Energy Future

STAGE 1: DEMO & PILOT
Establish the foundation for customer-centric smart grid

STAGE 2: NATIONAL ROLLOUT
Replicate the success nationwide

TODAY: EXISTING GRID
Operate traditional & discrete grid capabilities

Planned Micro Grid Pilot In Mae Sarieng
Approved Pattaya Pilot Scope and Budget
# PEA SG Revision Aligned with National Roadmap

## Thailand Smart Grid Roadmap

### Preparation (2015-2016)
- Establish Smart Grid governance
- Determine platform used for Smart Grid development
- Encourage development of human resources and research

### Short Term (2017 – 2021)
- Support study and research of pilot projects
- Determine policies to support utilities’ investments in pilot projects

### Medium Term (2022 – 2031)
- Develop core infrastructure
- Revise policies and regulations to support the development of smart grid systems
- Encourage utilities to invest in development of core infrastructure

### Long Term (2032 – 2036)
- Encourage utilities to invest in advanced smart grid infrastructure
- Establish policies to support and encourage consumers to adopt smart grid technologies
- Encourage utilities to invest in development of smart grid technologies

## PEA Smart Grid Roadmap

### Demo & Pilot (2016 – 2021)

**STAGE 1: DEMO & PILOT**

*Establish the foundation for customer-centric smart grid*

![Diagram of Smart Grid System](image)

### National Rollout (2022 – 2036)

**STAGE 2: NATIONAL ROLLOUT**

*Replicate the success nationwide*

![Map showing Smart Grid rollout](image)
Outlines

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Pattaya Pilot

Scope of Work

- AMI Installation: 116,308 Units
- Substation Automation: 3 Subs
- Mobile workforce Management: 1 System
- IT Integration: 1 System

Status

- Cabinet approved project and budget
  Dec 23, 2014
- PEA is conducting public hearing and we plan to launch the RFP in Dec.

Project Period: 2016-2018
Budget: $33.4 m
Smart Grid in Pattaya City, Chonburi Province Project

Functionalities

Load Limit
Connect / Disconnect
Demand Response
Meter reading
Outage Monitoring
Temper Detection
Prepayment
Smart Grid in Pattaya City, Chonburi Province Project

Grayed out items are not in the scope of the Pattaya Smart Grid Pilot Project.
Technology Choices

• Although AMI technology has emerged for more than a decade, but there is no right technology that can fit for all environments.
  • RF, PLC or Cellular? Each has its pros and cons.
  • Smart Meter -> Modular comm. module has better future in the long run?
  • Etc.

“No single technology can guarantee a project success.”
# Technology Choices

## Comparison of Technology Attributes

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<th>Wireless Mesh</th>
<th>PLC</th>
<th>Cellular</th>
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| **Environment**      | ▪ High density  
▪ Low cost  
▪ Economical                                                                 | ▪ Complex buildings  
▪ Multiple meters per room                                                                | ▪ Remote Areas  
▪ Low-density areas                                                                 |
| **Proportion Concept** | **The Rest**                                                                 | **10-15%**                                     | **5-10%**                                     |
| **Deployment Areas**  | Meter density is higher than designed threshold, including metropolitan areas | Complex buildings where number of units exceeds defined threshold | Remaining areas (even mesh) to keep 95% of connected ratio at early stage |
## Project Timeline

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<td>Replication Planning</td>
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Smart Grid in Pattaya City, Chonburi Province Project
Procurement Strategy

- An AMI project not only involves most of players in organization but may also change the way they work
  - Need to cooperate with all relevant parts and work out in detail
- Setting up a Proof of Concept (Live Demo.) during a procurement process
  - This is a good idea to ensure interoperability and system performance

Technical Evaluation
(PASS/FAIL Criteria)

- Review of the technical proposals (paper proposal evaluation)

2 Days Live Demonstration

- Qualified bidders shall demonstrate key functionalities of their proposed solutions.

Qualified Bidders

- Bidders who pass both qualifications will participate e-Auction.
The Key Benefits of PEA Smart Grid Project

Key Benefits

- Better power planning (demand VS supply)
- % Reserve margin reduction
- Capital investment deferment
- Improved power reliability and sustainability
- Carbon Emission Reduction
- Ability to shave peak through Demand Response
- Improved household consumption visibility / energy theft reduction
- Improved outage detection, investigation and restoration
- Ability to control over the power bill; view and manage consumption
- Ability to lower power bill
- More choices on tariff and energy services
- Received better and new customer experiences (i.e. real-time troubleshooting, digital channels)
- Improved outage detection, investigation and restoration
- Home Energy Management
Demand Response Programs

- Time-of-Use (TOU)
- Critical Peak Pricing (CPP)
- Direct Load Control (DLC)
- Peak Time Rebate (PTR)
- Real Time Pricing (RTP)

Source: AEIC
Q&A