Smart Meter – PEA Smart Grid Project in Pattaya

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Provincial Electricity Authority
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Electricity Supply in Thailand

Mainly comprises 3 state-enterprises

Electricity Generating Authority of Thailand (EGAT)

Metropolitan Electricity Authority (MEA)

Provincial Electricity Authority (PEA)
Thailand Electrical Power System

EGAT Generation

EGAT

Transmission

Substation

Customer

Distribution

Substation

PEA/MEA

Sub-Transmission
Electricity Service of PEA

- Approximately (km²) 510,000
  (99% of the country)
- Electrified Villages (%) 99.98
- No. of Customers 17,293,128
- No. of Employees: 27,804
- Peak Demand (MW) 17,293
- Losses (%) 5.12
- No. of Substation 520
- DG connected to PEA 524
  (about 5,000 MW)

Update: July 2014
**PEA Targets**

<table>
<thead>
<tr>
<th>Existing in 2013</th>
<th>KPI</th>
<th>Targets in 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>112,606 MWh</td>
<td>LOAD</td>
<td>&gt; 141,060 MWh</td>
</tr>
<tr>
<td>17,293 MW</td>
<td>Peak Load</td>
<td>&gt; 20,844 MW</td>
</tr>
<tr>
<td>17.29 Million</td>
<td>Customer</td>
<td>18.13 Million</td>
</tr>
<tr>
<td>249.45 Min/Customer/year</td>
<td>SAIDI</td>
<td>&lt;161 Min/Customer/year</td>
</tr>
<tr>
<td>7.15 Times/Customer/year</td>
<td>SAIFI</td>
<td>&lt; 5.2 Times/Customer/year</td>
</tr>
</tbody>
</table>
1. Beyond SMART GRID
2. Road to LED
3. Green Investment
4. Green Office
5. 100% Electrified
6. ZERO Accident
7. Community Partnership
8. Moving to AEC
9. High Quality & Qualified Labor
10. PEA Rebranding

Performance & Modern Organization and Customer centric
PEA Smart Grid Roadmap
PEA Smart Grid Applications

Supply Side
- RE and DG
- Micro Grid
- Virtual Power Plant
- V2G

Network
- Smart Substation (IEC 61850)
- Feeder Automation (SCADA/DMS/EMS)

Demand Side
- Advanced Metering Infrastructure, AMI
- Smart Home HEMS
- Demand Response
- EV Charging Station

Provincial Electricity Authority
PEA Smart Grid Road Map

**Smart Level**

100
- Pattaya SG (1,439 M.Baht)
- Mae Sa Reang MG (320 M.Baht)
- Kood & Maak Island MG (387 M.Baht)

70

30

Total 2,146 MB (67 M.USD)

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**Stage 1**
Planning & Pilot Project

**Stage 2**
Large Scale Expansion
- AMI Expansion in big City
- Smart Substation and Feeder Automation
- Demand Response
- EV Charging
- RE and DG Dispatch
- Energy Storage
- Etc

**Stage 3**
Optimal Stage
- AMI Full area Expansion
- Self-healing enabled
- Virtual Power Plants
- Real time pricing (2-way)
- V2G enabled

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2012-2016
2017-2021
2022-2026

Year
PEA Smart Grid Drivers
PEA Smart Grid Drivers

Driven to Improve Power System Stability

Driven to the efficiency of PEA’s organization

Driven to be socially responsible and operate in an environmentally friendly manner
The latest power development plan (PDP 2010) indicates a compound growth in energy usage of over 5% per annum.

Increasing of DG and VSPP
Driven to Improve Power System Stability

Impact of DG & VSPP

• Increasing current fault in the distribution system

• Mis-operate of Protective Devices

• Interconnection between DG and Utility’s Grid (Voltage, Power Factor, Harmonic, etc.)
Driven to Improve Power System Stability

In PEA’s current infrastructure this would cause considerable problems and systems have to be modified to accommodate the increase in DG and VSPP
Driven to the efficiency of PEA’s organization

PEA needs to update infrastructure and advanced technology to develop electricity networks that can deliver power for more efficiently.

Upgrade Infrastructures and Technologies

Improve Quality of Service
Driven to be socially responsible and operate in an environmentally friendly manner

The main culprits of greenhouse gas production is:
- Power generation particularly from the use of fossil fuels
- Transportation
“PEA’s Smart Grid focus is to improve quality of life while maintaining the environment.”
PEA Smart Grid Project
PEA Smart Grid Project

1. Smart Grid in Pattaya City, Chonburi Province

2. Micro Grid Development Project (Koh Kood and Koh Mak)

3. Micro Grid Development Project (Mae Sareang district, Mae Hongson province)
Smart Grid in Pattaya City, Chonburi Province (Pilot Project)
# Smart Grid in Pattaya City, Chonburi Province

## Scope of Work

<table>
<thead>
<tr>
<th>Component</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Center System</td>
<td>1</td>
<td>System</td>
</tr>
<tr>
<td>Smart Meter</td>
<td>116,308</td>
<td>Meters</td>
</tr>
<tr>
<td>Communication Infrastructure</td>
<td>1</td>
<td>System</td>
</tr>
<tr>
<td>Mobile Workforce Management System</td>
<td>1</td>
<td>System</td>
</tr>
<tr>
<td>IT Integration system</td>
<td>1</td>
<td>System</td>
</tr>
<tr>
<td>Substation Upgrade to IEC 61850</td>
<td>3</td>
<td>Substations</td>
</tr>
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Smart Grid in Pattaya City, Chonburi Province

AMI System
## AMI System

### Narrow Band Service

<table>
<thead>
<tr>
<th>Solution</th>
<th>Technology</th>
<th>Last Mile</th>
<th>Customer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Backbone</td>
<td>WAN</td>
<td>Single phase</td>
<td>Three Phase</td>
</tr>
<tr>
<td></td>
<td>(MDMS to Sub.)</td>
<td>(Sub. to DCU)</td>
<td>2555</td>
<td>2556</td>
</tr>
<tr>
<td>Model 1</td>
<td>F/O</td>
<td>PON</td>
<td>Zigbee</td>
<td>1,700</td>
</tr>
<tr>
<td>Model 2</td>
<td>F/O</td>
<td>PON</td>
<td>PLC</td>
<td>1,700</td>
</tr>
<tr>
<td>Model 3</td>
<td>GPRS</td>
<td>PON</td>
<td>Zigbee</td>
<td>1,673</td>
</tr>
<tr>
<td>Model 4</td>
<td>GPRS</td>
<td></td>
<td>PLC</td>
<td>1,673</td>
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<tr>
<td>Model 5</td>
<td>GPRS</td>
<td></td>
<td></td>
<td>10</td>
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</table>

### Broadband Service

<table>
<thead>
<tr>
<th>Solution</th>
<th>Technology</th>
<th>Customer</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>PON</td>
<td>200</td>
<td>500</td>
</tr>
<tr>
<td>Model 6</td>
<td>F/O</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Model 7</td>
<td>F/O</td>
<td>Metro Ethernet</td>
<td>10</td>
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<tr>
<td>Total</td>
<td></td>
<td>6,956</td>
<td>95,508</td>
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</table>
Smart Grid in Pattaya City, Chonburi Province

Total Diagram Smart Grid
# Smart Grid in Pattaya City, Chonburi Province

## Investment

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Budget (M. Baht)</th>
<th>Budget (M. US dollar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AMI System</td>
<td>917</td>
<td>28.66</td>
</tr>
<tr>
<td>2</td>
<td>Mobile Workforce Management</td>
<td>12</td>
<td>0.38</td>
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<tr>
<td>3</td>
<td>Substation Automation System</td>
<td>104</td>
<td>3.25</td>
</tr>
<tr>
<td>4</td>
<td>IT Integration System</td>
<td>36</td>
<td>1.13</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>1,069</strong></td>
<td><strong>33.42</strong></td>
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</tbody>
</table>
Status

- Implementation Plan of Smart Grid in Pattaya City has been completed and approved by PEA’s Board of Directors on 24 April 2013

- The National Economic and Social Development Board (NESDB) have approved Project on 3 March 2014
  - The Energy Regulatory Commission of Thailand (ERC) have approved Project on 21 August 2014

- Pilot Project is preparing to the Cabinet submission for final approval
Thank you for your attention