AMI (Advanced Metering Infrastructure) Cases for the Power Infrastructure Digitalization

Sep. 2020

Sangki Jung
TIDE Co., Ltd.
Index

1. Introduction
2. Indonesia AMI Project
3. Systems
4. History of Indonesia Project
1. Introduction

1.1 The purpose of AMI SYSTEM

- **Encourage customers** to reduce energy consumption voluntarily by identifying real-time power usage and billing information.
- **Provide an infrastructure** for demand response programs through two-way communication and data processing systems.

AMI (Advanced Metering Infrastructure) consists of

1) **Upper System** (MDMS: Metering Data Management System), which analyze the metering data (Big Data),
2) **Intermediate System** (HES: Head End System), which gathers the metering data from Lower System.
3) **Lower System**, which includes Smart meter, communication modem and DCU (Data Concentration Unit).
1. Introduction

1.2 Why AMI?

1. Digital Infrastructure of Energy

- Smart Home/Smart City/Smart Nation.
- Monitoring the accurate consumption/status/quality of energy for the energy efficiency.

2. Demand & Response Renewable Energy

- Minimize Black Out & Peak Demand Control
- More accurate forecasting of power consumption
- Accelerating Renewable Energy (RE)

3. Time-of-Use (TOU) and Flexible tariffs

- Differentiated Tariffs
  (Business/Residential, Poor/Rich, Day/Night)
- Efficient O&M of the Limited Resources.
  (Human and Energy)

4. “Loss” Detection and Remote Control

- Reduce and Minimize “Loss” in the field.
  (Technical, Non-Technical Loss like tampering)
- Efficient Operation and Control of Energy Resources.
1. Introduction

1.3 AMI Installation Plan in Korea

AMI Installation Plan : 10Millions (43%) installed.

<table>
<thead>
<tr>
<th>Year</th>
<th>’10</th>
<th>’13</th>
<th>’14</th>
<th>’15</th>
<th>’16</th>
<th>’17</th>
<th>’18</th>
<th>’19</th>
<th>’20</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Meters (Millions)</td>
<td>0.5</td>
<td>2.0</td>
<td>-</td>
<td>-</td>
<td>2.3</td>
<td>3.0</td>
<td>4.0</td>
<td>5.2</td>
<td>5.5</td>
<td>22.5</td>
</tr>
<tr>
<td>Total Meters (Millions)</td>
<td>0.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>4.8</td>
<td>7.8</td>
<td>11.8</td>
<td>17</td>
<td>22.5</td>
<td>22.5</td>
</tr>
</tbody>
</table>

“Delayed” caused by Security Technology Application

Meter Data Growth in 2020:
- 2,642 Million Records/Day,
- 1,521 Peta Byte/10 Years

Real-time Data Processing based on the “Big Data Technology”
2. Indonesia AMI Project

2.1 Power Structure & Status of Indonesia

- PT. PLN is single power company, and manage “Generation, Transmission and Distribution”.
- Higher Losses and SAIDI, comparing to other south-east countries -> Plan to deploy AMI System.

**PT. PLN**

<table>
<thead>
<tr>
<th>Location</th>
<th>Jakarta, Indonesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee</td>
<td>45,061 (in 2019)</td>
</tr>
<tr>
<td>Establishment</td>
<td>1st Jan. 1965</td>
</tr>
</tbody>
</table>

**Operation**

- Indonesia has a total of about 79 million power customers.
- Average power consumption per population is 1,020 kWh, which is very low compared to neighboring countries. (Malaysia: 4,900 kWh, Singapore: 8,700 kWh).
- 14 Million meters shall be re-calibrated immediately, and it has made customers unsatisfied, because of the wrong bill. (overstate power consumption by 15%, understate power consumption by 17%)

**Major Indicator**

- **Financial losses due to the rate of loss of power transmission and distribution.**
  (economic burden on the nation's finances)
- **Very high *SAIDI (Serious Power Quality Problem)**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PLN</th>
<th>KEPCO</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>18,321</td>
<td>48,893</td>
<td>US$ Mn</td>
</tr>
<tr>
<td>Capacity</td>
<td>57,822</td>
<td>119,092</td>
<td>MW</td>
</tr>
<tr>
<td>Max. Power</td>
<td>38,770</td>
<td>92,478</td>
<td>MW</td>
</tr>
<tr>
<td>Loss</td>
<td>9.51</td>
<td>3.56</td>
<td>%</td>
</tr>
<tr>
<td>*SAIDI</td>
<td>958.2</td>
<td>8.59</td>
<td>Min.</td>
</tr>
</tbody>
</table>

Source: 2018 PLN Statistics

* SAIDI: System Average Interruption Duration Index, the average outage duration for each customer served.
## 2. Indonesia AMI Project

### 2.2 Benefit of AMI in Indonesia

#### Advantages for both side, PLN and Customers.

<table>
<thead>
<tr>
<th>Enhancing Cost Benefit</th>
<th>Increasing customer satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Reduction of billing management cost”</td>
<td>“Providing more accurate metering to customer”</td>
</tr>
<tr>
<td>![Checkmark] Billing and meter reading fee omission</td>
<td>![Checkmark] Ensure higher customer’s trust about Billing</td>
</tr>
<tr>
<td>![Checkmark] No need officer visit to detect Meter tempering</td>
<td>![Checkmark] Enable customers to access ‘Real-time energy consumption and tariffs’</td>
</tr>
<tr>
<td>![Checkmark] No need officer visit to cut off Electricity</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Higher System Reliability</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>“Lower SAIDI and SAIFI by real-time based monitoring”</td>
<td>“Quick response for customers’ complain”</td>
</tr>
<tr>
<td>![Checkmark] Quick detection of abnormal distribution line</td>
<td>![Checkmark] Recover blackout even before Customer notice</td>
</tr>
<tr>
<td>![Checkmark] More accurate forecasting of Energy consumption</td>
<td>![Checkmark] Officer can visit customer for changing power limit before customer ask</td>
</tr>
</tbody>
</table>
2. Indonesia AMI Project

2.3 Existing PoC in Jakarta (1)

- Both TIDE and KEPCO have two pilot projects.
- 2018 Cengkareng PoC (Success Rate 95.35%) and 2020 MDMS PoC (Success Rate 96.94%).
2. Indonesia AMI Project

2.3 Existing PoC in Jakarta (2)

**Cengkareng PoC**
- 2018 ~ 2019
- DCU: 10ea
- Meter & Modem: 500ea
- HES server: 1ea
- Success Rate: 95.35%
- KEPCO, TIDE, IT-PLN

**MDMS PoC**
- 2019 ~ 2020
- DCU: 6ea
- Meter & Modem: 333ea
- HES server: 2ea
- Success Rate: 96.94%
- KEPCO, TIDE, PLN

Installation of Meter and DCU and research the circumstance of Indonesia AMI network

Completing test for AMI End-to-End service from Meter in household to Server in PLN
3. Systems

3.1 Smart Meter, Modem, DCU and HES

The AMI products are tested and proven by PoCs with PLN.

**Smart Meter**
- Adopting International standard (DLMS/COSEM protocol)
- Providing essential functions for international standard of smart meter

**PLC Modem**
- Inserted in Smart Meter and communicating with DCU
- Strong and Stable against noise interruption

**Data Concentration Unit (DCU)**
- Communicating with Modem
- Connecting with about 400 smart meters
- Monitoring “distribution transformer” information by TDU

**Head End System (HES)**
- Gathering metering data (Equipment status, Load Profile data, Power Quality, Abnormal status alarm)
- Remote control of Smart Meter
3. Systems

3.2 MDMS

- MDMS has been operated/proven by KEPCO for 10M AMI household in KOREA.
- MDMS provides variety of functions for Advanced Metering.
4. Company Profile

4.1 Company Profile

Overview

Established 21th October, 2010
CEO Kevin, CHO
Address 115, Seosomun-ro, jung-gu, Seoul, Korea
Business PLC / LTE based AMI Solution
Energy IoT Solution
Sales $ 20M (2018)
Capital $ 2.5M
Homepage www.tidekorea.com

Reference

KOREA KEPCO 1,450,000 household (‘20~ , estimated)
KEPCO 1,000,000 household (‘16~’18)
INDONESIA PT.PLN 500 household (‘18~’20)
ROMANIA CEZ 1,000 household (‘16~’17)
JAMAICA JPS 30,000 household (‘12~’16)
KUWAIT Smart City Project 50,000 household (‘21~)
5. History of Indonesia Project

Pilot Project Ceremony

1st Pilot Project Ceremony (Nov. 2018)  
2nd Pilot Project Ceremony (Sep. 2019)
5. History of Indonesia Project

AMI System Installation

DCU Installation (June 2018)

Smart Meter Installation (June 2018)
5. History of Indonesia Project

AMI Standardization

MOU for Standardization (Sep. 2019)
5. History of Indonesia Project

AMI Technology Seminar

AMI Technology Seminar (June. 2019)
5. History of Indonesia Project

PUSLITBANG Simulation Set Installation & Demo/Training
5. History of Indonesia Project

AMI Simulation Set Installation
Demo & Training

AMI Demo and Training (July. 2019)
5. History of Indonesia Project

MDMS (Meter Data Management System) Installation
5. History of Indonesia Project

MDMS Demo & Technology Seminar

MDMS Seminar (Jan. 2020)
Thank You

https://youtu.be/2lewWodUluw

Email: peter@tidekorea.com