Potential of IoT/AI Energy Management System in Factory, Building and Community

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Asia Clean Energy Forum

Outline

- CU BEMS: Application of IoT to Smart Building
- Zero Energy Buildings
- RENKEI Control

Acknowledgements

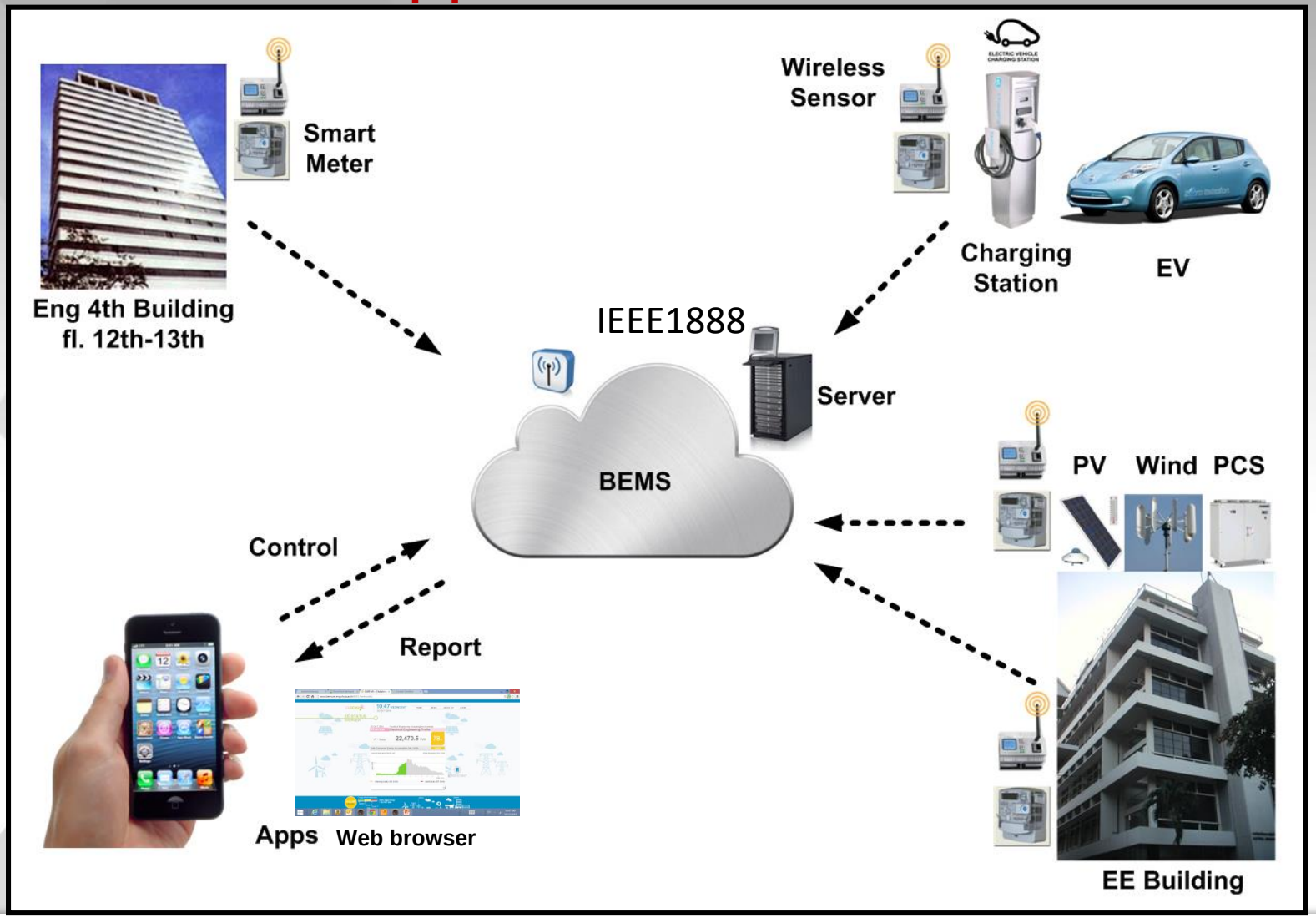
Thailand Energy Conservation Promotion *Fund*

JEITA

Information Technology and Industrial Systems Board
Industrial System Committee
Control and Energy Management Committee
Working Group1 - Energy Management

Thailand is ASEAN's 2nd largest economy.

CU BEMS: Application of IoT to Smart Bldg



Network Architecture

Facility Status and Control
on your smartphones/Tablet

The Internet

WAN

LAN

Installation by Chula with UT

Designed by Chula/NDRS

Simple SCADA

IEEE1888

Server/Storage

IEEE1888

System Controller
(APP)

IEEE1888

IEEE1888

IEEE1888

IEEE1888

IEEE1888 Power Meters (50A,300A)
@ Power Distribution Boards

IEEE1888

GW

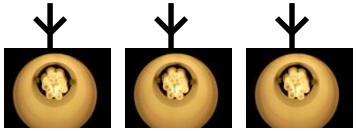
Modbus/RS485 (Digital I/O)

HVAC
(Air Conditioner)

IEEE1888

GW

ZigBee



Sensors

IEEE1888

GW

Modbus

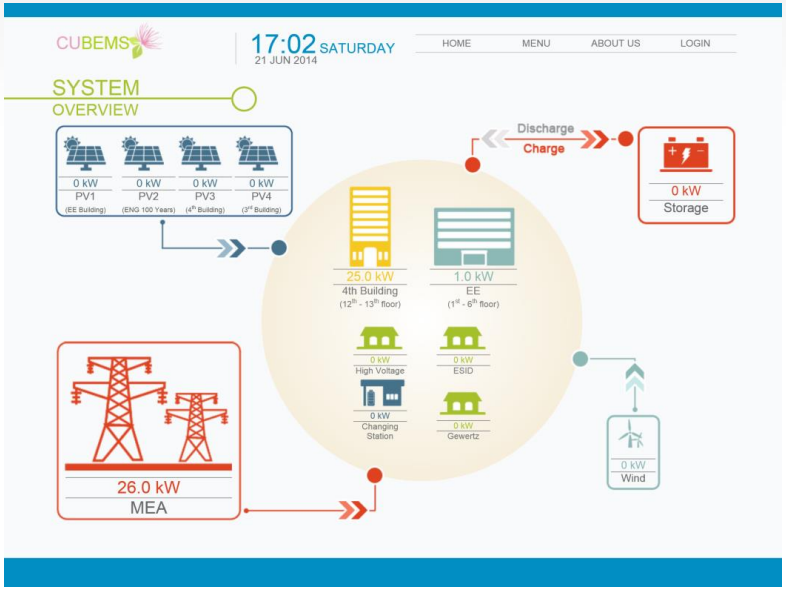
Strings
monitor

PV, Wind, Battery


CUBEMS
11:15 FRIDAY
31 JAN 2014
HOME SIGN UP LOGIN ABOUT US CONTACT US
EE STATUS
OVERVIEW
31 JAN 2014
Faculty of Engineering, Chulalongkorn University
12:00-12:59
Electrical Engineering Profile
Today
25,000 kWh
81%
Monthly Accumulation 28,000 kWh
Level 2
Peak Demand 28,000 kW
Peak Demand 28,000 kW
30,000
15,000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Warning Level (18,000 kW)
Alart Level (23,000 kW)
MAIN MAP
COLOR LEGEND
Energy Alarm Notification
100% Target energy
(Level 1) (Level 2) (Level 3)
©Copyright 2013, Chulalongkorn University Building Energy Management System


CUBEMS
17:13 SATURDAY
21 JUN 2014
HOME MENU ABOUT US LOGIN
FLOOR
SECTION
ELECTRICAL ENGINEERING BUILDING 4 : 12th FLOOR
AREA : All Corridor North South
View Mode
GROUP : Day Month Year
Map Meaning
Area Usage
FLOOR12
4.9%
37.3%
57.8%
Load Usage
FLOOR12
13.2%
35.3%
51.5%
floor12
COLOR LEGEND
Energy Alarm Notification
(Level 1) (Level 2) (Level 3)
Copyright 2013, Chulalongkorn University Building Energy Management System


CUBEMS
11:15 FRIDAY
31 JAN 2014
HOME SIGN UP LOGIN ABOUT US CONTACT US
100 Years ENG Building PV
Energy 30,000 kWh
ENG3 Building PV
Energy 15,000 kWh
4th Building
Energy 12,500 kWh
EE Building
Energy 12,500 kWh
ESID Building
Energy 9,000 kWh
Gewertz Building
Energy 11,000 kWh
Charging Station
Energy 1,500 kWh
High Voltage
Energy 9,000 kWh
CHART
COLOR LEGEND
Energy Alarm Notification
100% Target energy
= 250,000 kWh
(Level 1)
(Level 2)
80%
(Level 3)
90%
SUPPLY
DEMAND
©Copyright 2013, Chulalongkorn University Building Energy Management System

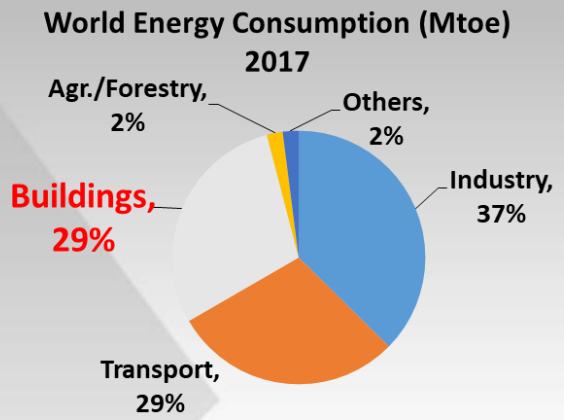

CUBEMS
17:02 SATURDAY
21 JUN 2014
HOME MENU ABOUT US LOGIN
SYSTEM
OVERVIEW
0 kW
PV1
(EE Building)
0 kW
PV2
(ENG 100 Years)
0 kW
PV3
(4th Building)
0 kW
PV4
(3rd Building)
Discharge
Charge
0 kW
Storage
25.0 kW
4th Building
(12th - 13th floor)
1.0 kW
EE
(1st - 6th floor)
0 kW
High Voltage
0 kW
ESID
0 kW
Charging Station
0 kW
Gewertz
0 kW
Wind
26.0 kW
MEA

Introduction of CEFIA Flagship (ZEB)

100th Anniversary of Chula Engineering 2013

Toward ZEB (Zero Energy Buildings)

The current energy efficiency measures cannot achieve COP21 requirements for reduction of global warming gas. The more drastic measures have to be implemented.



Source: IEA World Energy Balance 2019

Step by step approach to ZEB

ZEB Ready
Significant energy saving **more than 50%** from reference point

Nearly ZEB
Net energy saving **not reach 100%** But more than ZEB Ready

(net)ZEB
Net energy saving of **100% or more**

Including Renewable energy

Public-Private Collaborations

International Standardization

TS 23764``An Approach for non-residential Zero Energy Buildings`` is now proceeding to CD ballot @ Moscow in the end of Sept. 2020

Seminar and workshop

Japanese Business Alliance for Smart Energy Worldwide

Oct. 2019@Bangkok

July 2019@Legazpi
Oct. 2019@Manila

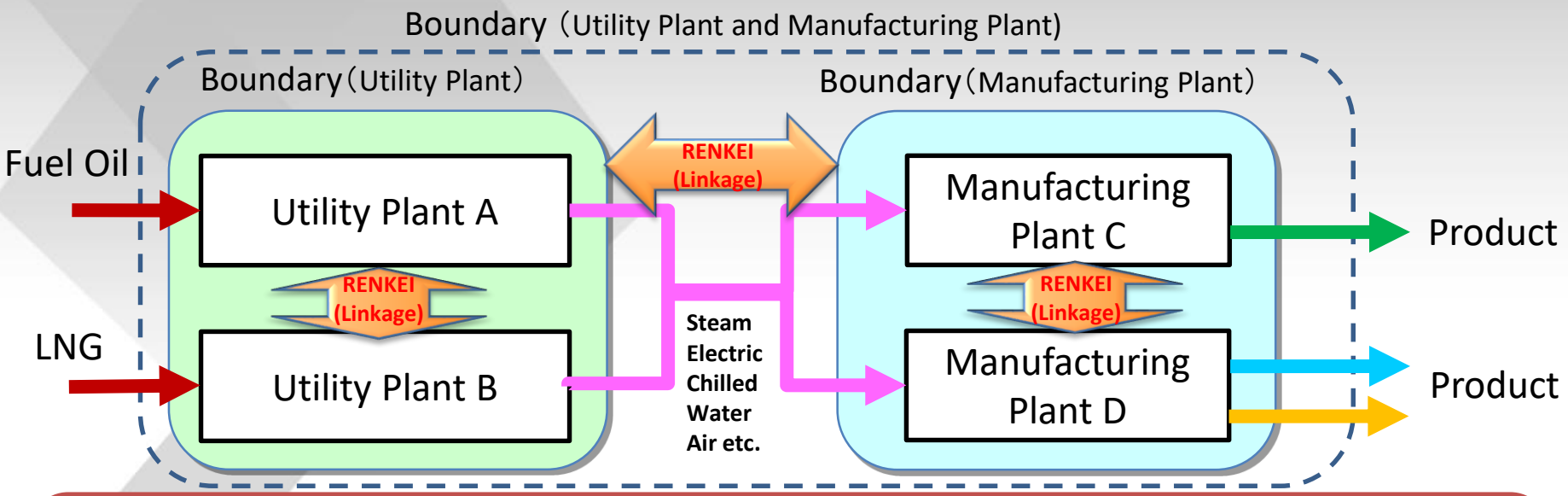
Workshop (Webinar) is planning in Vietnam and Indonesia in 2020

ASEAN Energy Awards

ZEB Ready Award has been added to ASEAN Energy Awards since 2019 for promoting ZEB among the ASEAN members states

RENKEI Control

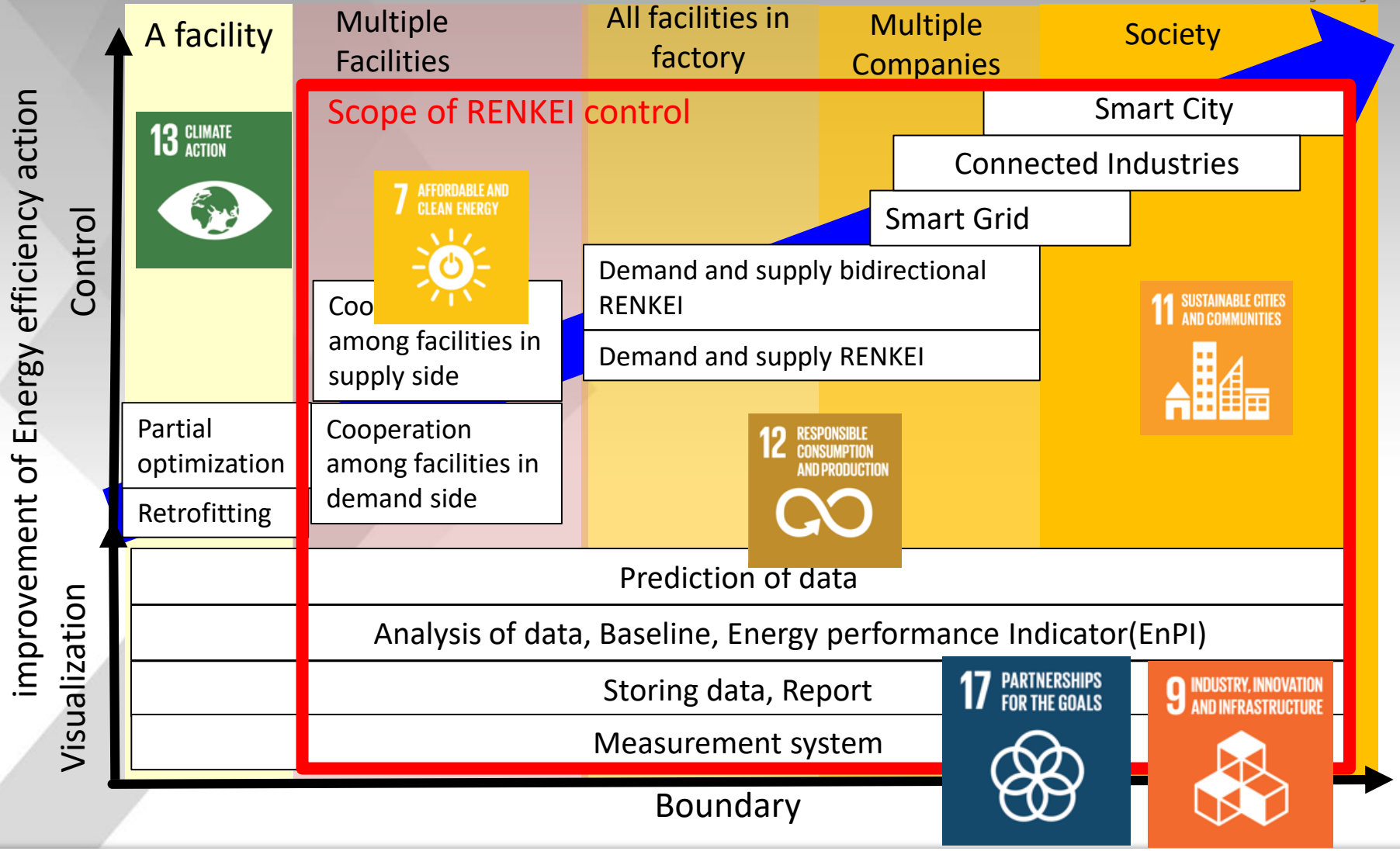
- to address society issues including environmental GHG emission and energy saving
- to link multiple devices and equipment and improve total performance
- to realize significant energy savings by expanding the optimization range from a single equipment to multiple equipment



Compared to H/W approaches (replacement with high-efficiency equipment), **RENKEI** approaches are ”Short construction period”, “Less investment”, “highly cost-effective” – **Quick-Win Approach**

Will Contribute ASEAN GHG reduction target under the Paris Agreement

Future Direction for RENKEI Control



CEFIA Flagship Project RENKEI Control Project Organization