# **Smart Buildings**



Department of Alternative Energy Development and Efficiency Ministry of Energy, Thailand

T H A I L A N D ENERGY AWARDS

EWG45 ESCI-KSP Workshop 19<sup>th</sup> March 2013 Samui Island, Thailand





# Content

- Energy Situation
- Concept of Smart Building & Trend
  - EE of building
    - Envelope
    - Automation control & Appliance
  - Environmental Friendly
  - Trend
- Policy to support smart building in Thailand
  - Building Energy Code (BEC) => whole Building Performance
  - Standard & Labeling =>Appliance and Construction Material
  - Financial Support
- Current Situation & Implementation of Smart Building in Thailand
  - Award
  - Case study
- Next step











#### **Energy Situation**





Info: education.randmcnally.com



# **Energy Situation**





Info : Energy Information Administration (EIA)



# Thailand's Energy Consumption Final Energy Consumption 2009-2011 By Sector

Economic Sector	Energy Consumption (ktoe)			Growth (%)
	2009	2010	2011	2011
Agriculture	3,477	3,499	3,686	5.34
Industry	24,060	25,571	25,087	1.89
Residential	10,089	10,963	10,967	0.04
Commercial	4,940	5,620	5,356	4.70
Transportation	24,132	24,594	25,466	3.55
Total	66,698	70,247	70,562	0.40





#### **Energy Situation 2011**

# **Thailand's Energy Consumption** Final Energy Consumption 2009-2011 By Sector



Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

# **Energy Situation 2011**





# **Energy Situation**

# **Thailand's Energy Plan 2011**

- A guideline for implementing energy efficiency measures
- Approved by the Committee on 18 April 2011
- Target to reduce energy intensity by 25% in 2030 in accordance with
  - energy policy
- Now working on the first 5-year operational plan



แผนอนุรักษ์พลังงาน 20 ปี (พ.ศ. 2554 - 2573)







# Concept of Smart Building & Trend`





# **Concept of Smart Building**







#### **EE for Building**

# Lots of thing can be reduced heat & energy consumption in Building One of them is "Envelope" ...

















🧶 กระทรวงพลังงาน MINISTRY OF ENERGY



#### **EE for Building**

#### "Automation control & appliance " ...











- Location, Landscape and Architecture
- Quality of environment in Building
- Environmental impact to Building







# **Environmental Friendly**





#### Trend

香港建築環境評估法





**LEED** in USA ICC is standard in Small buildings in USA **ASHRAE** is label for heating, ventilation, air-conditioning and refrigeration in USA **BEAM** in England Green Label in Hong Kong **HK-BEAM** in Hong Kong





#### Trend

#### Organization : DEDE, TGBI, TEI, Pollution Control Department (PCD) and EGAT



THAILAND

AWARDS

อาการอนรักษ์พลังงาน กรมพัฒนาพลังงานทดแทน และอนุรักษ์พลังงาน กระทรวงพลังงาน



TGBI



GREEN BUILDING

อาคารเขียวในประเทศไทย



The Engineering Institute of Thailand Under H.M. The King's Patronage อิศอกรรมสถานแห่งประเทศไทย ในพระบรมราชูปถันภ





Pollution control department ลังงาน MINISTRY OF ENERGY



# Policy to support Smart building in Thailand





#### Building Energy Code is ...

- Mandatory for designed building which area over 2,000 m<sup>2</sup>
- Minimum performance of buildings
- Focus on new & retrofitted buildings

#### **Concept of BEC**

- Push & Pull Mechanism
  - Push : Mandate BEC to upgrade efficient designs and products in buildings Pull : Encourage smart building mechanism and economic value
- Promote sustainable technology knowledge
- Analyze whole building Energy Compliance
- Analyze life cycle costing
- Design for Environment and Health





#### Components of BEC

- Building envelope get OTTV and RTTV formulations

Office & Academic Inst	itution 🛁				
Wall 50 w/ m <sup>2</sup>	Roof 15 w/ m <sup>2</sup>				
Super store					
Wall 40 w/ m <sup>2</sup>	Roof 12 w/ m <sup>2</sup>				
Hotel & Hospital					
Wall 30 w/ m <sup>2</sup>	Roof 10 w/ m <sup>2</sup>				
Lighting system get allowable rated power (LPD)					
Office & Academic Inst	itution 14 w/ m <sup>2</sup>				
Super store	18 w/ m²				
Hotel & Hospital	12 w/ m²				



# Components of BEC (Cont.)

- Air-conditioning system

Split type size less than 12,000 Watt get COP 3.22 or ERR 11 Btu/hr/Watt Chiller and Absorption Chiller other parts

- Hot water generating system

Steam Boiler/Hot Water Boiler Heat pump water heater

- Renewable energy utilization





SolarWindBiogasBiomassHydroOther Technology to support EE eg. Glass, separate switch, ...

- Whole building performance

The overall energy consumption of the proposed building must less than the overall consumption of reference building





#### **Standard & Labels in Thailand**

#### **Standard for appliance**

#### Labels for appliance

ABEL :T

TE

For Electrical appliance in Home/Office DAY WHEN DO diaran 1 (Albian EGAT For Material TISI

For non Electrical appliance in Home/Office & Electrical in Industries



DEDE





# **Financial Incentives**

#### **Tax Incentives**

- Tax Incentive for EE Investment for buildings or factories
- Incentive through Board of Investment (BOI)
  - Exemption of import duties and cooperate tax on new investment in EE equipments or ESCO
- Incentive through Revenue Department
  - Additional 25% expense deduction for buying EE equipments



#### **Direct Subsidy 20:80**

- For EE measures to buy EE products
- Subsidy 20% of EE measures,
  - maximum 3 million baht (≈ USD 97,000) minimum 50,000 baht (≈ USD 1,600)
- Payback period ≤ 7 years

More information on http://www.dede-subsidy.com/





# **Financial Incentives**

#### **ESCO Fund**

- Gov Co-Investing Scheme
- Joint capital promote investment in EE&RE projects
- 10-50% of total investment but not more than 50 million baht / project

#### **Revolving Fund (Soft Loan)**

- Low interest loan not more than 4% via financial institutes
- Loan period 7 years with one year grace period
- Up to 50 million baht



#### **Incentives pass BOI**

Except duty about import devices and machineries for power operation 8 years





#### **Investment Grant**

To promote investment in renewable energy technologies of 20-30%, solar hot water, solar drying and waste.



- Food waste

- Feasibility study about preliminary design.
- Using a combination of solar and heat waste





#### **Smart Building in Thailand**



Info: www.usgbc.org/LEED/Project/CertifiedProjectList.aspx



# Current situation & Implementation of Smart building in Thailand





#### Award



#### **Thailand Energy Award**







อาคารอ<u>แ</u>ร้กษ์พลังงาน กรมพัฒนาพลังงานทดแทน และอนุรักษ์พลังงาน **กระทรวงพลังงาน** 

#### Energy efficiency in Building







#### **Case Study**





#### **Before**

WWR = 90% OTTV = 92.38 w/m<sup>2</sup> RTTV = 16.5 w/m<sup>2</sup> A/C = 250 TR SEC = 75.27 kWh/m<sup>2</sup>-yr Initial Cost = 10,313 Baht/m<sup>2</sup>

#### **Improve Office Building 4 floors and 4,000** m<sup>2</sup>

-Envelope

- Reduce glass area
- Cover light weight
- brick wall
- -Add awning
- Add attic insulation

Reduce Initial Cost 9.87 % Reduce Electric power 14.22 %

<u>After</u> WWR = 31.50% OTTV = 47.8 W/m<sup>2</sup> RTTV = 11.2 W/m<sup>2</sup> A/C= 112 TR SEC = 64.57 kWh/m<sup>2</sup>-yr Initial Cost = 9,295 Baht/m<sup>2</sup>





#### **Case Study**





#### <u>Before</u>

WWR = 63% OTTV = 89.31 w/m<sup>2</sup> RTTV = 3.50 w/m<sup>2</sup> A/C = 615 TR SEC = 83.15 kWh/m<sup>2</sup>-yr Initial Cost = 11,204 Baht/m<sup>2</sup>

#### Improve Educated Building 8 floors and 10,000 m<sup>2</sup> -Envelope - Reduce glass area - Cover light weight brick wall Reduce Initial Cost 1.2 %

Reduce Electric power 24 %

<u>After</u>

WWR = 44% OTTV = 43.14 w/m<sup>2</sup> RTTV =3.50w/m<sup>2</sup> A/C= 565 TR SEC= 62.89 kWh/m<sup>2</sup> -yr Initial Cost = 11,074 Baht/m<sup>2</sup>





# **Case Study**





Before		After
WWR = 12 %	Improve Shopping Mall	WWR = 12%
OTTV = 41.71 w/m <sup>2</sup>	<b><u>2 floors and 29,650</u></b> m <sup>2</sup>	OTTV = $38.20 \text{ w/m}^2$
$RTTV = 7.66 \text{ w/m}^2$	-Envelope	RTTV = $7.66 \text{ w/m}^2$
A/C = 681 TR	Change normal glass to	A/C = 598 TR
SEC = 94.58 kWh/m <sup>2</sup> -yr	tinted glass	SEC = $93.94 \text{ kWh/m}^2$ -yr
Initial Cost = 15,000 Baht/m <sup>2</sup>		Initial Cost =15,238 Baht/m <sup>2</sup>
	Increased Initial Cost 1.59 % Reduce Electric power 0.7 %	ดาระทรวงพลังงาน MINISTRY OF ENERGY









## Next step ... Smart Grid

#### Objective

Reduce imports of foreign technologyResearch and development of new forms of energy





Thanks picture from Horizon Digital Economy Research





www.dede.go.th

