ENRIGATORATE GENERAL OF NEW RENEWABLE ENERGY AND ENERGY CONSERVATION
DIRECTORATE OF ENERGY CONSERVATION

ENERGY EFFICIENCY OF BUILDINGS IN INDONESIA

ANDRIAH FEBY MISNA
CONTENT

• Background
• Policy and Regulation on EE in Building
• Program on EE in Building Sector
• Barrier and Proposed Capacity Building
• BACKGROUND
ENERGY DEMAND CONTINUE TO INCREASE

Economic Growth

Energy Growth

Population Growth

The chart is based on Draft National Energy Policy
Energy and Mineral Resources for People’s Welfare

Energy Share Still Dominated by Fossil Energy

National Primary Energy 2012 *)
1.189 Million BOE

<table>
<thead>
<tr>
<th>No</th>
<th>Primary Energy</th>
<th>Total (Million BOE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coal</td>
<td>343</td>
</tr>
<tr>
<td>2</td>
<td>Oil</td>
<td>542</td>
</tr>
<tr>
<td>3</td>
<td>Natural Gas</td>
<td>255</td>
</tr>
<tr>
<td>4</td>
<td>Hydro</td>
<td>32</td>
</tr>
<tr>
<td>5</td>
<td>Geothermal</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td><strong>1.189</strong></td>
</tr>
</tbody>
</table>

Note:
- exclude biomass and non-energy used
- *) temporarily data on December 2013
Final Energy 2012

<table>
<thead>
<tr>
<th>Sector/Year</th>
<th>2000</th>
<th>2005</th>
<th>2010</th>
<th>2012 *)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>193</td>
<td>218</td>
<td>312</td>
<td>305</td>
</tr>
<tr>
<td>Transportation</td>
<td>139</td>
<td>178</td>
<td>255</td>
<td>311</td>
</tr>
<tr>
<td>Household</td>
<td>88</td>
<td>89</td>
<td>82</td>
<td>92</td>
</tr>
<tr>
<td>Commercial</td>
<td>19</td>
<td>25</td>
<td>31</td>
<td>34</td>
</tr>
<tr>
<td>Others</td>
<td>29</td>
<td>29</td>
<td>28</td>
<td>26</td>
</tr>
</tbody>
</table>

Note:
- exclude biomass and non-energy used
- *) temporarily data on December 2013
Energy Intensity in Commercial Buildings

Energy Intensity (kWh/m²/year)

- Hospital
- Mall
- Hotel
- Private Office
- Government Office (AC)
- Government Office (Non-AC)

Source: Energy Conservation Partnership Program and JICA Study, 2010
### ENERGY CONSERVATION POTENTIAL

<table>
<thead>
<tr>
<th>Sector</th>
<th>Potential of EC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>10 – 30%</td>
</tr>
<tr>
<td>Commercial</td>
<td>10 – 30%</td>
</tr>
<tr>
<td>Transportation</td>
<td>15 – 35%</td>
</tr>
<tr>
<td>Household</td>
<td>15 – 30%</td>
</tr>
<tr>
<td>Others (ACM)</td>
<td>25%</td>
</tr>
</tbody>
</table>

*source: Draft National Energy Conservation Master Plan (RIKEN) 2011*

- Low energy efficiency
- High primary energy intensity: 502 BOE/Billion IDR
2. POLICY AND REGULATION RELATED TO ENERGY CONSERVATION IN BUILDING SECTOR
Target: Reducing energy intensity 1%/year in all sectors until 2025

Comparison between Primary Energy Intensity and Final Energy Intensity

<table>
<thead>
<tr>
<th>Year</th>
<th>FE Intensity</th>
<th>PE Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>366</td>
<td>523</td>
</tr>
<tr>
<td>2001</td>
<td>370</td>
<td>535</td>
</tr>
<tr>
<td>2002</td>
<td>352</td>
<td>531</td>
</tr>
<tr>
<td>2003</td>
<td>360</td>
<td>545</td>
</tr>
<tr>
<td>2004</td>
<td>364</td>
<td>527</td>
</tr>
<tr>
<td>2005</td>
<td>340</td>
<td>512</td>
</tr>
<tr>
<td>2006</td>
<td>327</td>
<td>487</td>
</tr>
<tr>
<td>2007</td>
<td>327</td>
<td>487</td>
</tr>
<tr>
<td>2008</td>
<td>302</td>
<td>473</td>
</tr>
<tr>
<td>2009</td>
<td>321</td>
<td>470</td>
</tr>
<tr>
<td>2010</td>
<td>343</td>
<td>509</td>
</tr>
<tr>
<td>2011</td>
<td>339</td>
<td>502</td>
</tr>
</tbody>
</table>

Note: exclude biomass
POLICIES AND MEASURE IN BUILDING SECTOR

I. Law No. 28/2002 concerning on Buildings

II. National Energy Efficiency Standard (SNI) For Building
The Indonesian National Standard (SNI) is commonly used as a reference to build a buildings and offices. Currently the standardization of lighting system, air conditioning system and building envelope has been established.

<table>
<thead>
<tr>
<th>No.</th>
<th>EE STANDARD IN BUILDING</th>
<th>SNI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Energy conservation for building envelope (OTTV &amp; RTTV (\leq 35 \text{W/m}^2))</td>
<td>SNI 03-6389-2011</td>
</tr>
<tr>
<td>2.</td>
<td>Energy conservation for air conditioning system in building (temperature: (24^{\circ}\text{C} - 27^{\circ}\text{C}) and humidity (60% \pm 5%))</td>
<td>SNI 03-6390-2011</td>
</tr>
<tr>
<td>3.</td>
<td>Energy conservation for lighting system in building (standard of lighting intensity for the office, residential, industry, hospital, mall, etc)</td>
<td>SNI 03-6197-2011</td>
</tr>
<tr>
<td>4.</td>
<td>Energy audit procedure for building</td>
<td>SNI 03-6196-2011</td>
</tr>
</tbody>
</table>

III. Regulation of DKI Jakarta’s Governor No. 38/2012 concerning on Green Building:
- Energy efficiency;
- Water efficiency;
- Indoor air quality;
- Waste and soil treatment;
- Construction activities;
2. **PROGRAM ON ENERGY EFFICIENCY IN BUILDING SECTOR**
SOME PROGRAMS ON EE IN BUILDING SECTOR

1. Increasing awareness on EE:
   • Campaign, seminar, workshop
   • National Energy Efficiency Competition

2. Providing free energy audit under Energy Conservation Partnership Program

3. Certification for Energy Manager and Energy Auditor

4. Develop guideline on EE in Building

5. Pilot Project on EE in Building
RESULT OF FREE ENERGY AUDIT IN BUILDING IN 2013

Number of building audited : 60 buildings

- Hotel : 17 unit
- Hospital : 5 unit
- Mall : 3 unit
- Government Office and University : 35 unit

<table>
<thead>
<tr>
<th>Buildings</th>
<th>Energy Consumption (kWh/year)</th>
<th>Energy Potential Saving (kWh/year)</th>
<th>Percentage of Energy Saving(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotel</td>
<td>40.670.016</td>
<td>4.990.852</td>
<td>12.3</td>
</tr>
<tr>
<td>Hospital</td>
<td>3.349.255</td>
<td>921.618</td>
<td>27.5</td>
</tr>
<tr>
<td>Mall</td>
<td>45.837.572</td>
<td>3.596.596</td>
<td>7.8</td>
</tr>
<tr>
<td>Government Office and University</td>
<td>13.683.301</td>
<td>3.603.151</td>
<td>26.3</td>
</tr>
</tbody>
</table>
Active Design

- **No Cost and Low Cost Measures:**
  - Housekeeping
  - Application of Automatic Switch.
  - Re-Adjusting operating hour.

- **Middle Cost and High Cost Measures:**
  - Replacing chiller plant
  - Retrofitting Hydrocarbon refrigerant
  - Replacing lamp with an efficient lamp such as CFL and LED
  - Replacing conventional ballast with electronic ballast.
  - Installing Variable Speed Drive/VSD in pump and fan.
  - Improving Power Quality
  - Implementing Cogeneration (Waste heat for absorption chiller)

Passive Design

- Improve natural daylighting
- Improve natural ventilation
- Decreasing Thermal Load (Installing low-e window glass / Film, shading, vegetation)
Low Energy Office

1. Design of interior that maximizes energy use and sustainability
2. Optimization of natural daylighting technology and energy efficiency
3. Air conditioning system that saves energy
4. Monitoring and evaluation of energy use

Main features of the office: Energy-efficient EECCHI

Directorate of Energy Conservation
Directorate of New and Renewable Energy Conservation and Energy
Ministry of Energy and Mineral Resources
Before

DIREKTORAT KONSERVASI ENERGI
DIREKTORAT JENDERAL ENERGI BARU TERBARUKAN DAN KONSERVASI ENERGI
KEMENTERIAN ENERGI DAN SUMBER DAYA MINERAL

After
DIREKTORAT KONSERVASI ENERGI
DIREKTORAT JENDERAL ENERGI BARU TERBARUKAN DAN KONSERVASI ENERGI
KEMENTERIAN ENERGI DAN SUMBER DAYA MINERAL

Before

After
Increasing Energy efficiency; energy intensity improved from 170 kWh/m²/year to 80 kWh/m²/year

Increasing comfortability

Demonstration of EE Office

RESULT OF RETROFITTED OFFICE SPACE

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Av. Temp (°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:00 – 15:00</td>
<td>&gt; 26</td>
<td>24-26</td>
</tr>
<tr>
<td>Before 9:00</td>
<td>28 - 31</td>
<td></td>
</tr>
<tr>
<td>After 15:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative Humidity (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:00 – 15:00</td>
<td>65</td>
<td>55</td>
</tr>
<tr>
<td>Before 9:00</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>After 15:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise (dB)</td>
<td>57</td>
<td>46</td>
</tr>
</tbody>
</table>
EEI (kWh/m².yr)

- Average Office: 250 kWh/m².yr
- Public Works Bldg: 155 kWh/m².yr

Design Recognition: PLATINUM

Saving 38%

Source: GBCI
BARRIERS IN IMPLEMENTING ENERGY EFFICIENCY IN BUILDINGS

- Fossil fuel subsidy
- Lack of energy saving awareness
- Lack of knowledge on energy efficiency in building sector
- High Initial Investment for energy efficiency technology
- Lack of smart financing mechanism for energy efficiency projects
HOW TO OVERCOME THE BARRIERS

- Removing fuel subsidy
- Increasing awareness on energy efficiency
- Improving capacity and knowledge on energy efficiency in building sector
- Strengthening Research and Development on EE Technology
- Accelerate market transformation through smart financing mechanism on energy efficiency projects

Needed Capacity Building For All Stakeholders
Need to review current standard of EE in Building that have been issued and look at what kind of building codes that have been mandated in Indonesia

Sharing best practices with other countries on EE in Building

Improve capacity of policy maker (national and local level) in developing policy/regulation on building energy performance (labeling/certificate); building code; MEPS, net-zero energy consumption in building through workshop, training, etc.
Thank You!

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www.ebtke.esdm.go.id
www.konservasienergiindonesia.info / www.energyefficiencyindonesia.info
“Every people has the right to obtain energy” (article 19:1)

Government and/or local government are obliged to provide energy through diversification, conservation, and the intensification of energy sources” (article 20:1)

“The Central Government, Local Government, Entrepreneurs and Communities are responsible for Energy Conservation” (article 25:1)
The energy consumers which consume 6000 TOE and more are obliged to implement energy management by:

- selecting energy manager,
- setting energy conservation program,
- implementing energy audit regularly and audit recommendation,
- Reporting energy conservation implementation

Energy efficiency label contains information about the energy consumption level of appliances.
PRESIDENTIAL INSTRUCTION NO. 13/2011
ON ENERGY AND WATER SAVING

- Instructs Ministers, governors, head of regencies, majors, CEO of State Own Company to implement energy and water saving measures.
- The target are: electricity saving 20%; water saving 10%; and fuel saving 10%
- To establish a Task Force in each institution to oversee and monitor the implementation of energy and water saving.
- To establish National Team for Energy and Water Saving.
- To Report energy consumption to the President