Global Network

Europe
- Duisburg (Germany)
- Rome (Italy)

Middle East
- Al Khobar (Saudi Arabia)

Asia & Oceania
- Singapore
- Kuala Lumpur (Malaysia)
- Jakarta (Indonesia)
- Hanoi, Ho Chi Minh (Vietnam)
- Bangkok (Thailand)
- Yangon (Myanmar)
- Manila (Philippines)
- Delhi, Pune, Mumbai (India)
- Shanghai, Beijing (China)

America
- Long Beach (USA)

CEO Mr. Oshita
Smart Infrastructure for Global Environment

JFE offers the world leading technology

- Waste-to-Energy
- Waste Heat Recovery
- Biogas (Sludge Treatment)
- Geothermal Power Plant
JCM Project Development

**Vietnam**
Waste Heat Recovery Power Generation at Cement Factory in Quang Ninh Province  
*FS(2015)*

**Myanmar**
Introduction of Waste to Energy Plant in Yangon City  
*FS(2014), Model Project(2015)*

**Indonesia**
Power Generation by Waste-heat Recovery in Cement Industry  
*PS(2013), Model Project(2014)*
<Project 1>
Power Generation by Waste-heat Recovery in Cement Industry
## Project Summary

<table>
<thead>
<tr>
<th>Counterpart</th>
<th>PT Semen Indonesia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site</strong></td>
<td>Tuban Plant, East Jawa</td>
</tr>
<tr>
<td><strong>Power Generation</strong></td>
<td>28MW</td>
</tr>
</tbody>
</table>

PJ Site: Surabaya, appx100km from Jakarta.
Project Scheme

Indonesian Government

Japanese Government

JCM Agreement

GHG Reductions

Semen Indonesia’s Budget

JCM Subsidy from Japan

International Consortium

✓ Construction
✓ Operation
✓ Maintenance
✓ MRV

✓ Engineering
✓ Equipment Supply

DISCUSSION PURPOSE ONLY
Overview of WHR System

Reduction of grid power supply = Reduction of CO₂

20% 80%

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<table>
<thead>
<tr>
<th>Criterion 1</th>
<th>The project utilizes waste heat from <strong>a cement production facility</strong> by waste heat recovery (<strong>WHR</strong>) system to generate electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criterion 2</td>
<td>WHR system consists of a Suspension Preheater boiler (<strong>SP boiler</strong>) and/or Air Quenching Cooler boiler (<strong>AQC boiler</strong>), <strong>turbine generator</strong> and <strong>cooling tower</strong></td>
</tr>
<tr>
<td>Criterion 3</td>
<td>WHR system utilizes only waste heat and does <strong>not</strong> utilize <strong>fossil fuels</strong> as a heat source to generate steam for power generation</td>
</tr>
<tr>
<td>Criterion 4</td>
<td>WHR system has <strong>not been introduced</strong> to a corresponding <strong>cement kiln</strong> of the project prior to its implementation</td>
</tr>
</tbody>
</table>
| Criterion 5| The cement factory where the project is implemented is **connected to a grid system** and the theoretical **maximum electricity output of the WHR system**, which is calculated by multiplying maximum electricity output of the WHR system by the maximum hours per year (24*365=8,760 hours), is **not greater than** the total amount of **the electricity imported to the cement factory** from the grid system:  
  > During the **previous year before the validation**, if the validation of the project is conducted **before** the operation of the project, or  
  > During the previous year before **the operation** of the project, if the validation of the project is conducted **after** the operation of the project |
| Criterion 6| The WHR system is designed to be connected **only to an internal power grid of the cement factory**. |
# Calculation of Reference Emissions (revised)

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E(A<em>B</em>C*D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity of Electricity</td>
<td></td>
<td>Generation</td>
<td>Operating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generation</td>
<td></td>
<td>Capacity (MW)</td>
<td>day per year</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(days/y)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry Season</td>
<td>28</td>
<td>164.5</td>
<td>24</td>
<td>1</td>
<td>110,544</td>
</tr>
<tr>
<td>Rainy Season</td>
<td>22</td>
<td>164.5</td>
<td>24</td>
<td>1</td>
<td>86,856</td>
</tr>
<tr>
<td>The quantity of</td>
<td>3.69</td>
<td>365</td>
<td>24</td>
<td>1</td>
<td>32,324</td>
</tr>
<tr>
<td>electricity consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The quantity of net</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>165,076</td>
</tr>
<tr>
<td>electricity generation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>by the WHR system which</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>replaced grid electricity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
RE_p = EG_p \times EF_{grid}
\]

\[
= 165,076 \text{ MWh/y} \times 0.903 \text{ tCO}_2 \text{e/MWh}
\]

\[
= 149,063 \text{ tCO}_2 \text{e/y}
\]
Latest News of the Project

Project Inspection Meeting on February 2018

Waste Heat Recovery Benefits

- CO₂ Emission Reduction
- No Additional Fuel Required
- Electricity Reserve for the Community
- Savings on Production Costs

WHR System to other cement factory in Indonesia

More opportunities in further reduction of GHG emission
<Project 2>
Introduction of Waste to Energy Plant in Yangon City
## Project Summary

**First WTE Project with JCM**

**First WTE Project in Myanmar**

<table>
<thead>
<tr>
<th>Counterpart</th>
<th>Yangon City Development Committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site</td>
<td>Mingalardon area, Yangon City, MYANMAR</td>
</tr>
<tr>
<td>Technology</td>
<td>Waste to Energy (WTE) Incinerator : 60ton/day Generator : 0.7MW</td>
</tr>
<tr>
<td>GHG Emission Reduction</td>
<td>4,700t-CO$_2$/year</td>
</tr>
</tbody>
</table>

Facility Opening Ceremony on April 7$^{th}$
Project Scheme

Myanmar Government

September 16, 2015

JCM Agreement

Japanese Government

GHG Reductions

Yangon City’s Budget

JCM Subsidy from G of Japan

Yangon City Development Committee

International Consortium

✓ Operation
✓ Maintenance
✓ Monitoring
✓ Reporting

JFE Engineering Corporation

✓ Construction
✓ Supervisor Dispatch
Benefit of Waste to Energy Project

Baseline Scenario

Power generation (exported to the grid)

Project Scenario

GHG Emission Reduction

Reduction of CO₂ emission from fossil fuel consumption at power plant
Eligibility Criteria – preliminary draft

| Criterion 1 | The project newly installs an incinerator, waste heat recovery boiler, exhaust gas treatment equipment and turbine generator. |
| Criterion 2 | The project incinerates fresh municipal solid waste and generates electricity from steam produced in a boiler which uses heat of incineration. |
| Criterion 3 | The project facility is constructed within the municipality where waste to be incinerated by the project is generated. |
| Criterion 4 | The fraction of energy generated by auxiliary fossil fuels in a construction design document is planned to be not more than 50% of the total energy generated in the incinerator during normal operation. |
| Criterion 5 | Electricity generated is exported to a grid or used for displacing captive fossil fuel fired power generator. |
| Criterion 6 | Emissions of NO₂ and CO at the stack of incinerator are designed to be less than or equal to the following levels: NO₂ (230mg/m³@11%O₂) and CO (42mg/m³@11%O₂). |
Expected GHG Emission Reductions

4,732 tCO₂/year
(2,358tCO₂ accounts for the energy-originated CO₂)

- The calculation is based on the condition of 60t of waste treated per day and operation of 310 days per year, 24 hours per day (operating ratio: 85%).
- The emission factor refers to the latest CDM project in Myanmar (0.8tCO₂/MWh).
2 Phase Timeline toward Paradigm Shift

Small Scale WTE As a Model Project

Larger Scale WTE

Capacity Building, Regulation Setting, Training of WTE Operation, Finance Arranging, etc.

Complete Integrated Waste Management
Going forward
Challenges toward next JCM projects

✓ JCM financing capacity to apply for larger scale project

✓ Discrepancy between JCM subsidy program and project timeline (board approval, public procurement schedule, etc.)

✓ Knowledge building of necessity/obligation for MRV during designated period

✓ Further appeal as finance incentive for various private sectors

✓ ...and more?
Thank you  http://www.jfe-eng.co.jp/en/