CLEAN COAL TECHNOLOGY (PHILIPPINES)
By: Ed Cruz
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CLEAN COAL TECHNOLOGY (CCT)

“Developed Technology that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

Highly Efficient Low Emission Coal Fired Power Plants
What do we need to know about CCT? SC? USC? CCS? HELE?

- First Super Critical Coal Fired Power Plant soon in the Philippines (SBPL) 500MW
- First Super Critical Power Plant in Indonesia unit3 (815MW x1) PAITON
- Keephil3s3 (1 x 495MW) & Genesee 3 (1 x495MW) in CANADA

**Principal factors determining the Efficiency/ GHG emissions from a fossil fuel power plant:**

- Type of technology (choice of fuel)
- Thermal efficiency
- Mode of operation

**Managing Waste from Coal Plants?**
CO2 emissions arises at the typical coal fired plant.

Presently operating plants – 800 to 1000 gCO₂/kWh

Cumulative emissions from same plants – 950 to 1250 gCO₂/kWh

average 2kgCO2/ kg Coal

Cumulative emissions from newer plants – 750 to 850 gCO₂/kWh
Figure shows power generation efficiency and CO2 reduction rates for various steam conditions of SC/USC units. Efficiency improves from 538 degree C class to 625 degree C is relatively +5% and CO2 reduction is -4.5%.
Comparison of new designed Supercritical boiler to Subcritical.

<table>
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<th>Subcritical unit (Drum type boiler)</th>
<th>Supercritical and Ultra-supercritical units (Once-through type boiler)</th>
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<tr>
<td><strong>Supercr</strong>-heater</td>
<td><strong>Super</strong>-heater</td>
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<tr>
<td>Drum</td>
<td><strong>Feed-water</strong></td>
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<td><strong>Riser pipes</strong></td>
<td><strong>Economizer</strong></td>
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<td>$\rho_2$</td>
<td><strong>Furnace Wall tube</strong> (Water-cooled)</td>
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<td><strong>Burners</strong></td>
<td><strong>Density $\rho_1 &gt; \rho_2$</strong></td>
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<td><strong>Boiler water circulation</strong></td>
<td><strong>Down-comers</strong></td>
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- Boiler-water is led to drum through the economizer.
- Boiler-water is supplied to furnace wall through down-comer and heated up in the furnace. Heat addition generates a steam-water mixture and returns to drum. In the drum, the steam is separated from boiler water and supplied to super-heater. Superheated steam is supplied to turbine for power generation.
- In circulation, gravity acting on the density difference between the sub-cooled water in the down-comer and steam water mixture in the heating tube circuit produces the driving force for circulation.
- Maximum capacity of the plant is limited up to about 600MW due to the limitation of the drum sizing.

- Fluid (feed-water) at supercritical pressure experiences a continuous transition from water-like to steam-like characteristics. The fluid passed through the economizer in liquid phase flows to the furnace wall tubes and is heated-up in the furnace and changed to vapor (steam) phase and connected to super-heater. Superheated steam is supplied to turbine for power generation.
- No two phases state occurs in the furnace and drum is not required.
Supercritical Technology

What is Supercritical Pressure?

Critical point in water vapour cycle is a thermodynamic state where there is no clear distinction between liquid and gaseous state of water.

Water reaches to this state at a critical pressure above 22.1 MPa and 374 °C.
Philippine Coal Plant User’s Group

SOCIAL ACCEPTABILITY OF COAL-FIRED POWER PLANTS
THE PHILIPPINE EXPERIENCE
By: Edgardo B. Cruz
2016 POWER CAPACITY AND GENERATION

INSTALLED CAPACITY
- Renewable Energy: 32%
- Coal: 35%
- Oil-based: 17%
- Natural Gas: 16%

GROSS GENERATION
- Renewable Energy: 24%
- Coal: 48%
- Oil-based: 6%
- Natural Gas: 22%

Source: Philippine Department of Energy
GAINING SOCIAL ACCEPTABILITY

Strategies and Approaches
KEY STRATEGIES AND APPROACHES

1. Identify and regularly engage stakeholders who have high levels of interests and influence in causing the possible stoppage or disruption of the project.

2. During construction phase, require contractors to give preference to applicants from the host communities for jobs that require locally available skills.

3. Work with legitimate community leaders.
KEY STRATEGIES AND APPROACHES

4. Be sensitive to the aspirations of the local community by conducting joint planning exercises and regular consultations.
KEY STRATEGIES AND APPROACHES

5. Build the community’s ownership of the project by offering relevant social and economic benefits to its leaders and local residents.
EDUCATION

Classroom building donations
Facility donations (science laboratories, computer laboratories, etc.)
Participation to annual Brigada Eskwela
5-year K-12 development program (equipment donation and teachers' training)
Recycling of wooden pallets into armchairs
College scholarships
Computer lab donation
Energy Education Center
Confidential
HEALTH AND WELL-BEING

- Medical and dental missions
- Capacity-building of barangay health workers
- Establishment of a computer-based community management health information system
- Construction of barangay health center and donation of health equipment
- Automated weather station
HEALTH AND WELL-BEING

 Updating of disaster preparedness and management plan of host barangays
 Donation of disaster response equipment
 Installation of directional signages based on attendant hazards
ENTERPRISE DEVELOPMENT

- Skills training for women and out-of-school youth
- Hiring of local community in plant operations
- Crafts project with host communities
- Sustainable fishing project with local fisherfolks
KEY STRATEGIES AND APPROACHES

6. There will always be groups not in favor of our project. Let’s treat them as oppositors, but not as enemies.

7. Build the trust of the community by urgently addressing their concerns.
Building Relationships with LGUs and Regulatory Agencies
There are continuous efforts to educate the public on the real impact and available mitigating measures for coal.

Through these efforts, the industry hopes convince skeptics that with the advent of CCTs there has already been a paradigm shift in coal-fired power generation from an environmental perspective.

The industry urges the government through regular discussions to continue with current incentives to the holders of coal operating contracts to further lure investors to invest in the development of the resource.
Energy Regulations (ER) 1-94 of the Philippines Department of Energy
ER1-94: FINANCIAL BENEFITS TO THE HOST COMMUNITIES

Through this regulation, host communities of coal-fired power plants get financial benefits from the operation of the power stations.

The host communities are entitled to the one-centavo per kilowatt-hour (P0.01/kWh) of the electricity sales of the generation facilities and/or energy resource development projects located in all barangays, municipalities, cities, provinces and regions.
POLICY OBJECTIVES

To recognize and provide recompense for the contribution made by the host local government units or region.

To lessen conflict of rights among host local government units, community and people affected, the energy resource developers or power producers, and the appropriate agencies of the national government.

To promote harmony and cooperation among host local government units, the energy-resource developers or power producers and the appropriate agencies of the national government.
ALLOCATION OF FUNDS

Priority shall be based on the following radiating order, namely:

- Resettlement Area
- Host Barangay
- Host Municipality
- Host Province
- Host Region
UTILIZATION OF FUNDS

The funds will be used for projects that can be classified under the following:

- Electrification (50%)
- Education at livelihood projects (25%)
- Reforestation, Health at Environment Enhancement (25%)
REQUIREMENTS OF FUND AVAILMENT

Proposal containing the following information among others:
- detailed cost estimate
- number of potential beneficiaries of household connection

Board resolution by electric cooperatives/distribution utilities requesting funding assistance for the propose project

Resolution from concerned LGUs requesting funding assistance for the proposed projects
CAMPAIGNS TO SUPPORT COAL-FIRED POWER GENERATION

The Philippine coal industry has several campaigns that are intended to address issues being raised by anti-coal groups.

- Example: study tours for stakeholders, government agencies and the media.

Besides campaigns, there are regular forums and public discussions that push for social acceptability and continued development of coal power projects through the PCPUG and AFOC-Philippines.
THANK YOU !