Coal Combustion Products: Global Perspective

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Changing Operating Environment
Typical layout of power station

Co-Firing

Coal supply

Conveyor

Pulveriser/Mill

Boiler

Mod. furnace

Ash systems

Water purification

Steam turbine

Generator

Substation/transformer

Condenser

Carbon capture

Electricity

Generating electricity from coal.

Graded

Fine

Graded

Coarse

Un-Grade

Surplus to repositories on-site

CCP - A valuable Resource
Focus for presentation

• Globally
  – Coal resources, future demand for energy changing/increasing
  – CCP production and utilization
  – Definitions, utilisation pathways, now and future

• Changing paradigms
  – Globally traded commodity
  – Legal uncertainty and impacts on investment
Coal: An Extensive Resource
CCPs only come from...
LARGEST COAL RESERVES

North America

Russia

Europe

China

Australia
“Coal currently supplies around 30% of primary energy and 41% of global electricity generation. Coal use is forecast to rise over 50% to 2030, with developing countries responsible for 97% of this increase, primarily to meet improved electrification rates.”

(WCI, 2012)
Recoverable and valued resource
Resource utilization

• Utilization dates back to 1920’s
• First published papers in 1950’s – for sulfate resistant properties
Application/uses...current

Road stabilisation

ash - a valuable resource

Concrete structures

Shotcrete

ash - a valuable resource
Application/uses...current
Consistent terminology
Terminology proliferation!

- Globally various terms have been used to describe CCPs
  - Coal ash,
  - pulverized fuel ash,
  - CUB’s,
  - CCB’s,
  - CCR’s, and
  - CWR,
  - with an ever-extending list of new terms
Ash Development
Association of Australia

Visit the web sites of the members of the WWCCPN
The members of the WWCCPN can tell you all about the use of CCP's in each country by clicking on their flags.
World Wide Coal Combustion Products Network

- Stimulate sharing/transfer of technical information;
- Coordinate the international development of appropriate codes, specifications and guides;
- Promote internationally consistent appropriate regulations; and
- Facilitate awareness and understanding of the environmental, economic, engineering, manufacturing and societal benefits derived from the use of CCPs.
Figure 2 – Cooperation activities of World Wide Coal Combustion Products Network
<table>
<thead>
<tr>
<th>Country/Region</th>
<th>CCPs Production (Mt)</th>
<th>CCPs Utilisation (Mt)</th>
<th>Utilisation Rate %</th>
<th>CCPs Production/person (Mt)</th>
<th>CCPs Utilisation/person (Mt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>13.1</td>
<td>6.0</td>
<td>45.8%</td>
<td>0.60</td>
<td>0.27</td>
</tr>
<tr>
<td>Canada</td>
<td>6.8</td>
<td>2.3</td>
<td>33.8%</td>
<td>0.20</td>
<td>0.07</td>
</tr>
<tr>
<td>China*</td>
<td>395.0</td>
<td>265</td>
<td>67.1%</td>
<td>0.29</td>
<td>0.20</td>
</tr>
<tr>
<td>Europe (EU15)</td>
<td>52.6</td>
<td>47.8</td>
<td>90.9%</td>
<td>0.11</td>
<td>0.10</td>
</tr>
<tr>
<td>India*</td>
<td>105.0</td>
<td>14.5</td>
<td>13.8%</td>
<td>0.09</td>
<td>0.01</td>
</tr>
<tr>
<td>Japan</td>
<td>11.1</td>
<td>10.7</td>
<td>96.4%</td>
<td>0.09</td>
<td>0.08</td>
</tr>
<tr>
<td>Middle East &amp; Africa</td>
<td>32.2</td>
<td>3.4</td>
<td>10.6%</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>United States of America</td>
<td>118.0</td>
<td>49.7</td>
<td>42.1%</td>
<td>0.37</td>
<td>0.16</td>
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<tr>
<td>Other Asia*</td>
<td>16.7</td>
<td>11.1</td>
<td>66.5%</td>
<td>0.05</td>
<td>0.03</td>
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<tr>
<td>Russian Federation</td>
<td>26.6</td>
<td>5.0</td>
<td>18.8%</td>
<td>0.19</td>
<td>0.04</td>
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<tr>
<td><strong>Total/s</strong></td>
<td><strong>777.1</strong></td>
<td><strong>415.5</strong></td>
<td><strong>53.5%</strong></td>
<td></td>
<td></td>
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</table>
Resource utilization options
Beneficial vs. Non-Beneficial

Utilization strategies can be classified into three main groups:

- **Non-Beneficial** use or placed into onsite repositories are viewed as having limited value add and is generally an economic burden to the generator.
- **Simple Transform Manufactures** (STM) or simple utilization strategies may require limited processing or blending or are directly produced for value added product/s.
- **Elaborate Transform Manufactures** (ETM) or advanced utilization strategies typically will require significant processing to extract a high value add product/s.
Globally traded commodities
Harmonized System

• Established to maintain a comprehensive trade nomenclature to capture all goods with a view to facilitating international trade.

• The “Harmonized System” (HS) classifies goods for the benefit of border and customs agencies charged with administration of trade in accordance with international agreements.
WCO – HS website
Extract from HS for coal ash...

- Materials classified under subheading 2621.90 include the following five products, which are listed in the Explanatory Notes to heading 26.21:
  - Ash and clinker of mineral origin (e.g., coal, lignite or peat ashes)
  - Kelp and other vegetable ash
  - Bone ash
  - Crude potassium salts
  - Ash and residues resulting from the incineration of municipal waste
Criteria for change..

• For any proposal to be considered by the WCO HS Committee and its Review Sub-Committee, the value of annual global trade in CCPs must be more than
  – USD $50 million just to secure a separate ‘Sub Heading’.
  – USD $100 million a HS Heading could be considered
Global Trade 2010

• More than **3.5 Mts** of CCPs traded globally or cross border
• Generated over **USD $101** million
• 6 countries reporting trade of CCPs, only 4 countries were able to determine value attributable for these transactions
• The long-term trend in trade and value are both increasing
Submission to WCO

• Consultation is continuing between Network WCO HS Committee

• Define CCPs using methods/tests to correctly differentiate
Legal certainty
What is a ‘waste’ vis what is not a ‘waste’?

• Waste legislation has evolved from a philosophy of using ‘catch-all’ material classifications to (properly) allow regulators to regulate against environmental harm

• Exemption mechanisms in legislation mostly exempts ‘wastes’ from certain requirements of the legislation (transport) – not from being a ‘waste’!

• This (partial exemption) has product and liability issues for these materials (read companies!) – where the risk is taken largely on a traditional acceptance basis rather than a strict legal basis
Definitions

• Industrial waste is generally referred to as the type of waste produced by industrial activity, such as that formed by factories, mills and mines.

• ...‘waste’ can be more narrowly defined as any substance which is unwanted or unusable material.

• ...‘legal certainty’ underpins all corporate commercial decision-making processes where investments lead to secure associated ‘property rights’.
What does this all mean...

- A substance is not precluded from being waste for the purposes of [legislation] merely because it can be reprocessed, re-used or recycled
  - How is this consistent with ‘resource conversation’, ‘sustainability principles’ [Buntland et al]
Uncertainty issues

• Jurisdictional approaches [inconsistent] towards wastes
  – Absence of appropriate legislation and assessment criteria to allow for appropriate reclassification of industrial by-products

• Uncertain legal framework, lead to exposures to potential contingent liabilities

• Uncertainty leads to low investment
<table>
<thead>
<tr>
<th>Countries</th>
<th>Defined as Waste</th>
<th>Defined as Hz. Waste</th>
<th>Basel Conv’n adopted</th>
<th>REACH Adopted</th>
<th>Int'l Treaty on Mercury</th>
<th>Utiliz. Env. Condit</th>
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<td>Yes$^3$</td>
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<td>Yes</td>
<td>Ref</td>
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Table 4 – Environmental Classification Systems adopted by Country
Conclusions
Summary

- Coal continues to be a significant resource
- Technology shifts towards ‘clean coal’
- Production 780 Mt, utilization 415 Mt
- Cross border trade $101 million – growing
- Creating ‘legal certainty’ underpins investment
- Efforts continue through WCO HS to support legal status
Thank you, welcome any questions you may have.