The Future of Coal Ash

NRMCA
April 15, 2010

Ken Ladwig
Senior Research Manager
262-754-2744
262-385-7820
keladwig@epri.com
• Established in 1973
• Objective, tax-exempt, collaborative research
• Participating companies provide over 90% of North American electricity generated.
• Independent, nonprofit center for public interest energy and environmental research
EPRI Coal Combustion Product Research

- CCP Research Program initiated in 1980 – 30 years of experience and results
- Provides utilities with information and technologies for management of CCPs
- Provides scientific information to inform policy regulatory decisions
- Current focus is to help ensure sustainable CCP management practices combining environmentally sound disposal and continued beneficial use
What Are CCPs?

• Fly Ash
• Bottom Ash
• Boiler Slag
• Flue Gas Desulfurization Materials
  – FGD Gypsum
  – Scrubber Sludge
  – Spray Dryer Absorber Material
  – FBC Ash
CCP Generation and Collection
CCP Annual Production - 2008

136 million short tons

- Fly Ash, 72.5
- FGD Gypsum, 17.8
- Bottom Ash, 18.4
- Boiler Slag, 2.0
- SDA, 3.5
- FBC, 9.5
- Scrubber Sludge, 13.0
- Other, 1.5

ACAA, 2009; SDA data from EPRI, 2007
Fly Ash

Composition - Major Constituent Medians (39 plants)

Data from EPRI (1987)
Fly Ash

Composition - Trace Constituents (39 plants)

Concentration (mg/Kg)

Hg  Cd  Se  Mo  As  Pb  Ni  Cr  Mn  Ba  Sr

Data from EPRI (1987); mercury from EPRI database

© 2010 Electric Power Research Institute, Inc. All rights reserved.
Fly Ash

Management

• Collected dry with electrostatic precipitator or fabric filters
• Transported either wet (to ponds) or dry (to silos)
• 55 - 60% disposed
  – landfills and ponds
• 40 - 45% utilized
  – concrete
  – structural fills
  – cement
Fly Ash Use - 2008

30.1 Million Tons (42%)
Environmental Benefits of Using Fly Ash

- Energy Savings
- Water Savings
- Reduced CO₂ Emissions
- Reduced Need for Disposal Sites
- Conservation of Natural Resources; Reduced Use of Virgin Materials
# Environmental Benefits of Using Fly Ash in Concrete

<table>
<thead>
<tr>
<th>Point of Impact</th>
<th>Annual Savings*</th>
<th>Equivalent to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (trillion Btu)</td>
<td>55</td>
<td>• Annual energy use for 0.6 million households</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 16% of annual wind power generation in the U.S.</td>
</tr>
<tr>
<td>Water (billion gal)</td>
<td>1.2</td>
<td>• 11% of domestic water withdrawals for Arizona in 2000</td>
</tr>
<tr>
<td>CO₂ equiv. (million tons)</td>
<td>9.6</td>
<td>• Removal of 1.7 million cars from roadways</td>
</tr>
<tr>
<td>Land Space (million yds³)</td>
<td>13</td>
<td>• Land area about the half the size of New York’s Central Park (25 ft thick)</td>
</tr>
<tr>
<td>Financial (billion $)</td>
<td>1.7</td>
<td>• Annual full-time salary of 44,000 average Americans</td>
</tr>
</tbody>
</table>

*Based on 2007 data for beneficial use of CCPs.
Fly Ash Production and Management Trends

ACAA, 2010
Potential Threats to the Future Use of Fly Ash in Concrete

• Changing Air Emissions Controls (Clean Air Act)
  – \( \text{NO}_x \), Mercury, \( \text{SO}_3 \), Hazardous Air Pollutants (HAPs)
• Regulations/Hazardous Waste Designation (RCRA)
• Environmental Risk/Public Perception
• Acetate De-Icers
• Biomass Co-Firing
• Advanced Coal Generation Technologies (IGCC)
• Changes in US Energy Portfolio; Increased Renewables, Nuclear, Natural Gas
NO\textsubscript{x} Control

Potential Issues – Ammonia; Unburned Carbon
Mercury Control

Potential Issues – Activated Carbon, Mercury, Halides
SO$_3$ Control

Potential Issues – Sodium; Alkalinity; Trace Constituents
Regulatory Background

- 1980  Bevill Amendment
- 1988  First Report to Congress
- 1993  First Regulatory Determination
  - fly ash, bottom ash, boiler slag, FGD products
- 1999  Second Report to Congress
- 2000  Second Regulatory Determination
  - comanagement with “low volume” wastes
Current Regulatory Schedule

- Kingston Dike Failure (Dec 2008)
- Proposal Sent to OMB and Others for Interagency Review (Oct 2009)
- Alternatives
  - Subtitle D (Non-Hazardous)
  - Subtitle C (Hazardous)
  - “Hybrid” Approach
- Proposal by May?
- Final Rule?
Some Regulatory Options

- Hybrid Approach
  - Disposal hazardous; Some CCP uses exempt
  - Liability concerns may significantly limit all CCP use
- Wet C
  - Wet handled CCPs hazardous; dry non-hazardous
  - Less impact on CCP use?
- Wet Management Phaseout
  - Could be combined with other options
- D Prime
Key Issues in the Regulatory Decision

- Damage Cases (including new cases)
- Refined Risk Assessment
- Impact on CCP Use
- Impact on Power Plant Operations
- Length of Phase-in Period
- Cost
- Federal Enforceability

States, CCP marketers, trade groups, utilities, and others assert that hazardous waste designation will reduce or eliminate use of CCPs
Changes that Could Increase the Future Use of Fly Ash in Concrete

- Improved Combustion Technology
- Conversion to Dry Handling
- Increased Disposal Costs
- Regulatory Restrictions on “Unencapsulated” Uses
- Improved Beneficiation Technologies
- High Volume Fly Ash Concrete Research
- Sustainability Initiatives
  - CO₂ credits
  - “Green” labeling
Together…Shaping the Future of Electricity

www.epri.com/ccp