



# Coal Ash- Understanding a Valuable Commodity

**VA Coal & Energy Alliance & SSEB Meeting  
May 23, 2016**

# RCRA 1976 – Energy Goal & Objective

- **RCRA -42 U.S. Code § 6902 - Objectives and national policy**
- **Objective** “The objectives of this chapter are to promote the **protection of health and the environment** and to **conserve valuable material and energy resources by**”... “**providing technical and financial assistance to State and local governments and interstate agencies** for the development of solid waste management plans (including resource recovery and resource conservation systems) which will promote improved solid waste management techniques (including more effective organizational arrangements), new and improved methods of collection, separation, and recovery of solid waste, and the environmentally safe disposal of non-recoverable residues;”
- “The Congress finds **with respect to materials**, that ...**millions of tons of recoverable material which could be used are needlessly buried each year**” and that “the **recovery and conservation of such materials can reduce the dependence of the United States on foreign resources and reduce the deficit in its balance of payments.**”

# CCP Resource Recovery

- Coal Ash History Meets The Goal of RCRA- Best Resource Recovery Story - “Untold”
- 2014 Data - 129.7M Ton Produced; 62.4M Ton Utilized – 48%
- Resource Produced For Construction
  - Sand & Gravel - 914 Million Ton (up 7.5%%)
  - Cement - 89.1 Million Ton (up 9.1%)
  - Gypsum - 33.7 Million Ton (up 4.7%)
  - CCPs - 129.7 Million Ton (up 13% due to Scrubbers)

# CCR Resource Impacts

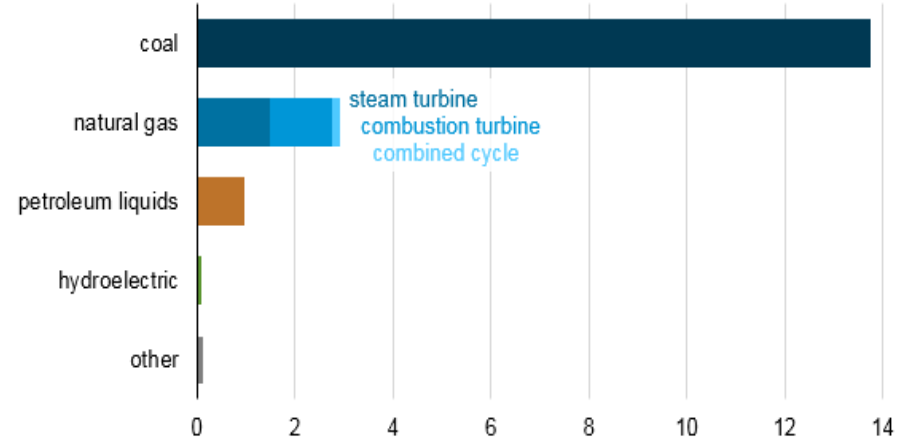
- Regulatory Climate & E&P Tech Have Rapidly Changed The CCR Resource Markets
- Focus Today Is On Regulatory Impacts
  - MATS, MACT, CCR, ELG, CPP Etc.
  - 2015 & 2016 Hard Hit Years On Plant Closings
  - 60 GW Reduction By EOY 2016
  - 19.6 GW Announced For Shutdown by 2025
  - Compliance Costs & Methods Indirectly Reduce Ash Quality & Resource Recovery



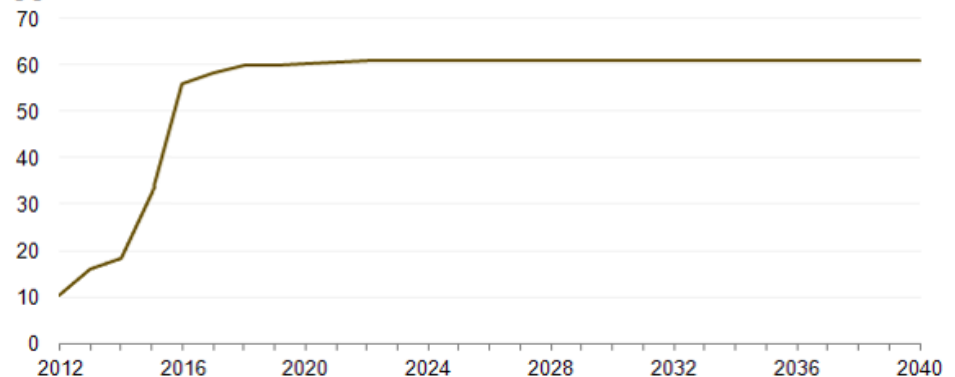
# Capacity Reductions Impact CCRs

- Total 310 GW Current Capacity
- 48-60 GW Closing-Primary MATS & MACT
  - Capacity Factor <45%
  - Units < 200MW
  - Av Age 54 Yr
  - Most w/o SO2 Controls
- Announced Unit Closing-19.6 GW - CCR & ELG Regulation – Ash Volume 5M TPY Reduction

Electricity generating capacity retired in 2015 by fuel and technology  
gigawatts



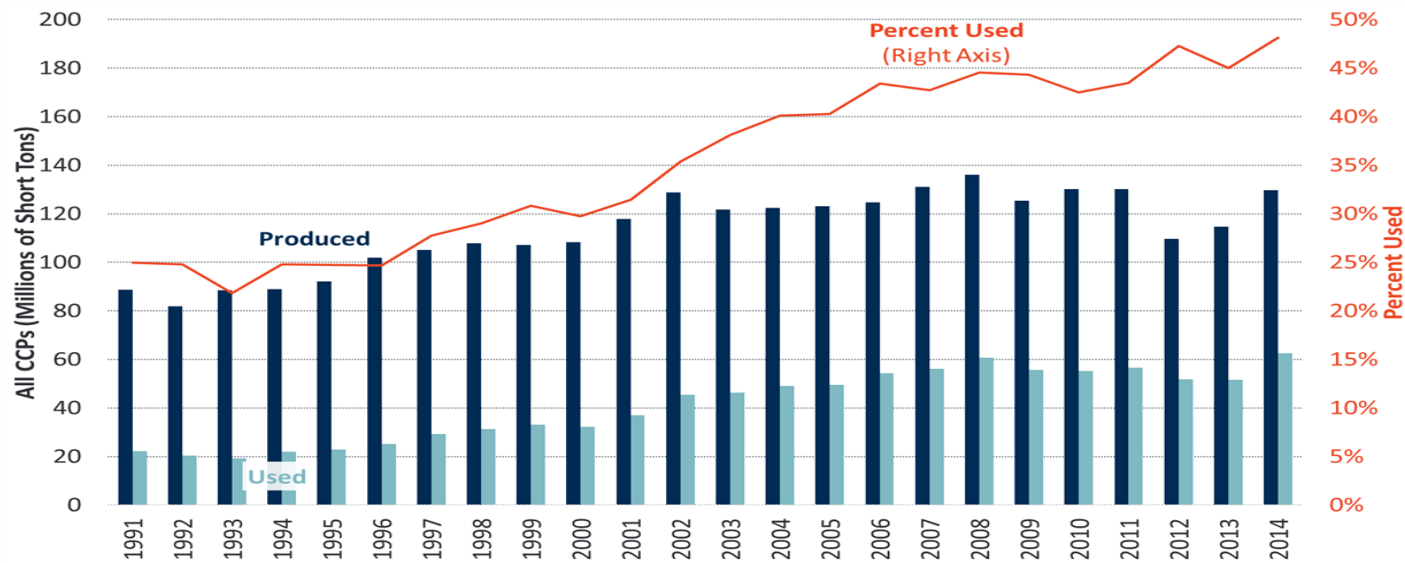
Projected cumulative retirements of coal-fired generating capacity (2012-40)  
gigawatts



**Source:** EIA Annual Energy Outlook 2014 Reference Case and Annual Electric Generator Report

# CCP Production & Use History

- CCP Production 129.6 MM Ton- Fly Ash, Bottom Ash & FGD
- Fly Ash & Bottom Ash Production Down- FGD Production Up
- Utilization Rebounding After Regulatory Clarity- Subtitle D
- EPA Support For Fly Ash In Concrete & Gypsum In Wallboard



SOURCE: American Coal Ash Association Production and Use Survey

# CCP - Cost Control Value

Utilization of CCPs has increased during recessions, but dropped during a period of regulatory uncertainty

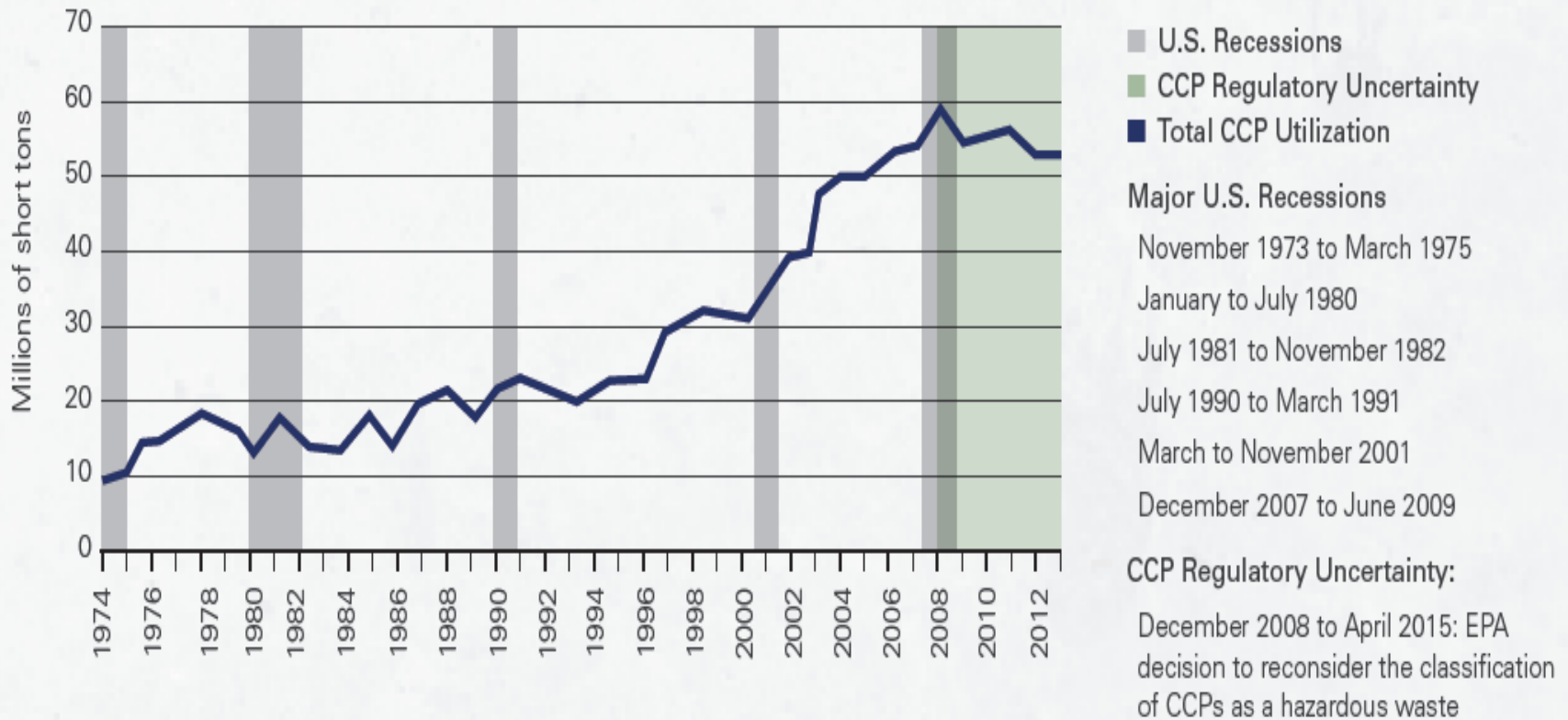
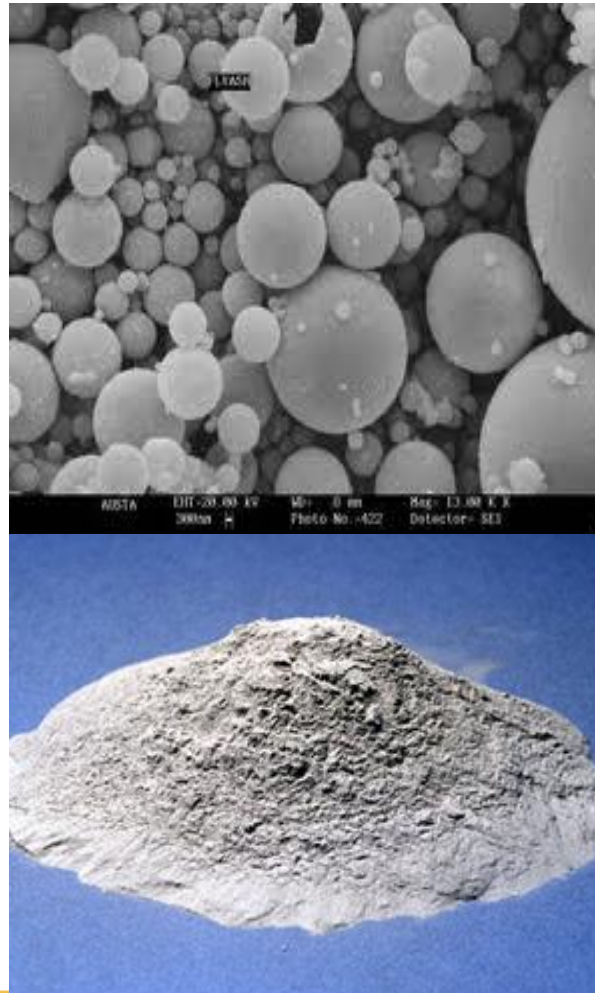


Figure 2. Regulatory uncertainty led to a decline in CCP markets

SOURCE: ARTBA CCP Production and Use Historical Analysis, 2015

# Economic Impacts & Uses

- CCP Value - \$6-\$14B/Year
- CCPs – 3%-New Home Costs- <1/2 \$\$ Of Replaced
- Cement-\$80-\$110
- Fly Ash- \$20-\$90
- Gypsum - \$5-\$35
- Life-cycle Costs Decrease w/ CCPs
- Highway Concrete Lifespan Extension

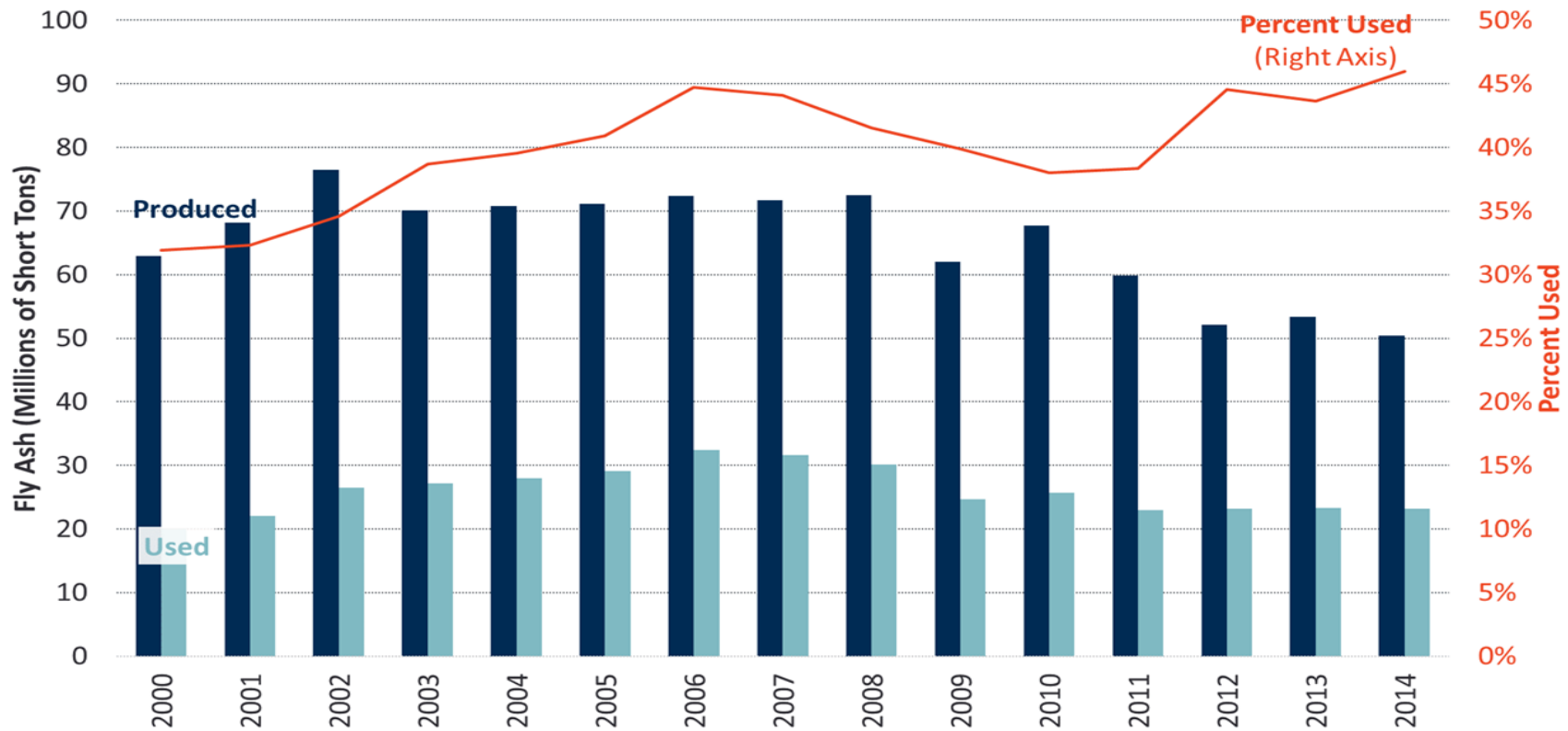


- Ready Mixed Concrete
- Wallboard
- Roofing Shingles
- Carpet Backing
- Lightweight Plastics
- Lightweight Aggregates
- Agriculture Sulfur Source
- Oil & Gas Drilling



# Fly Ash Production & Use

- 2014 Fly Ash Use In Concrete – 13.1 M Ton vs. 12.3M Ton (6.5% Inc)



# Bottom Ash Resource Use

- De-icing Skid Control
  - Salt Replacement
  - \$5-\$15 vs \$50-\$70
- Bottom Ash LWA
  - Processed to replace LWA
  - Typical Block -35 – 38 lb
  - Bottom Ash LWA Block – 28-32 lb
  - Product priced in \$15-\$30/t
  - Replaced product - \$30-\$50/t
  - Avoids Mine Operation
  - Avoids Kiln Operation
  - Avoids Disposal



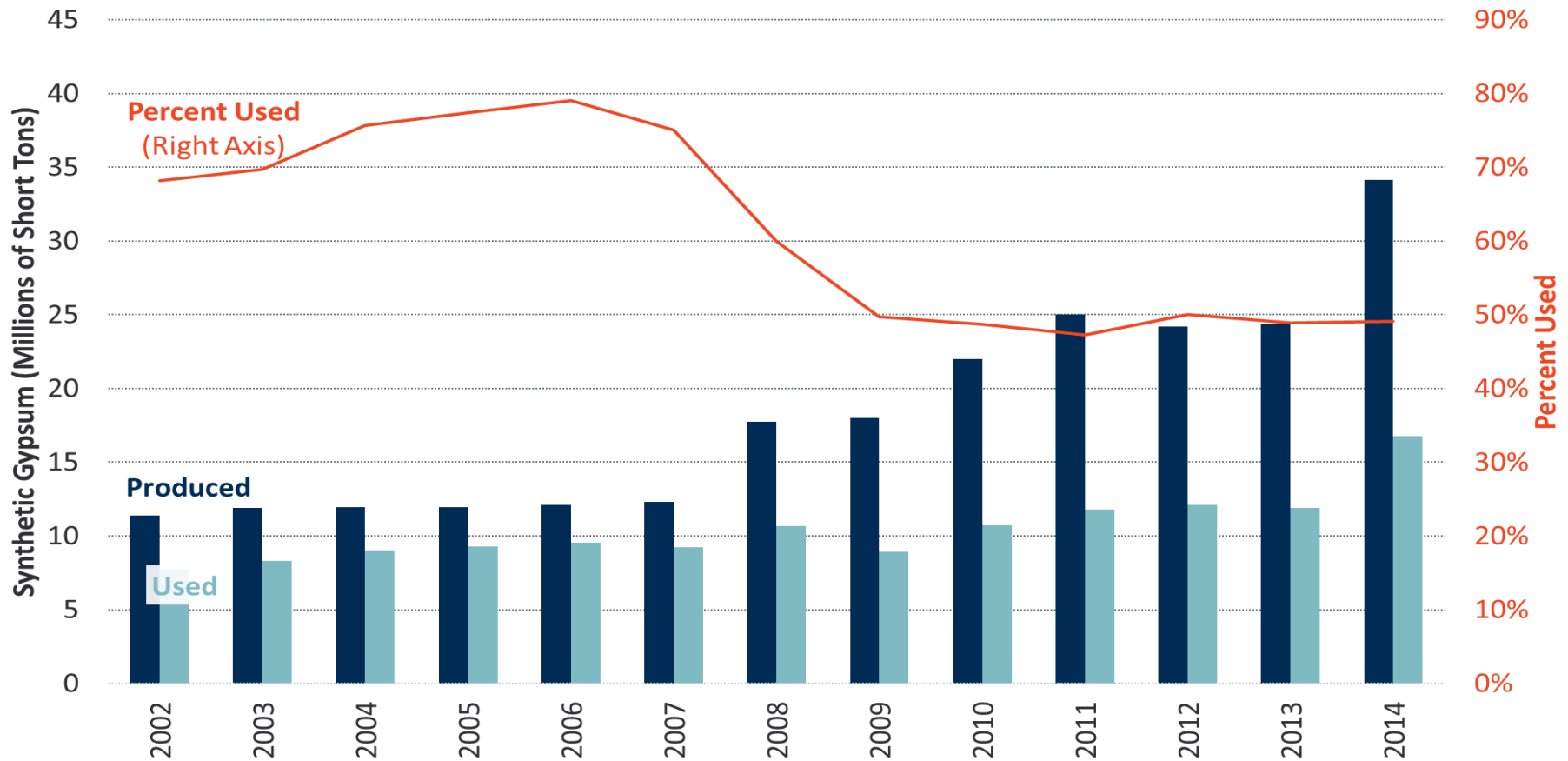
# Gypsum Utilization

- Wallboard Manufacture
  - 50% Of Production
  - \$1-\$10/Ton
- Cement Manufacture
  - 5% Added to All Cement S
  - Set Control
  - \$1-\$10/Ton
- Agriculture Application
  - Sulfur Nutrient Defficiency
  - Crops Consume 16-18 lb/ac
  - 90% Purity vs Mined @ 70-80%
  - \$15-\$35/Ton



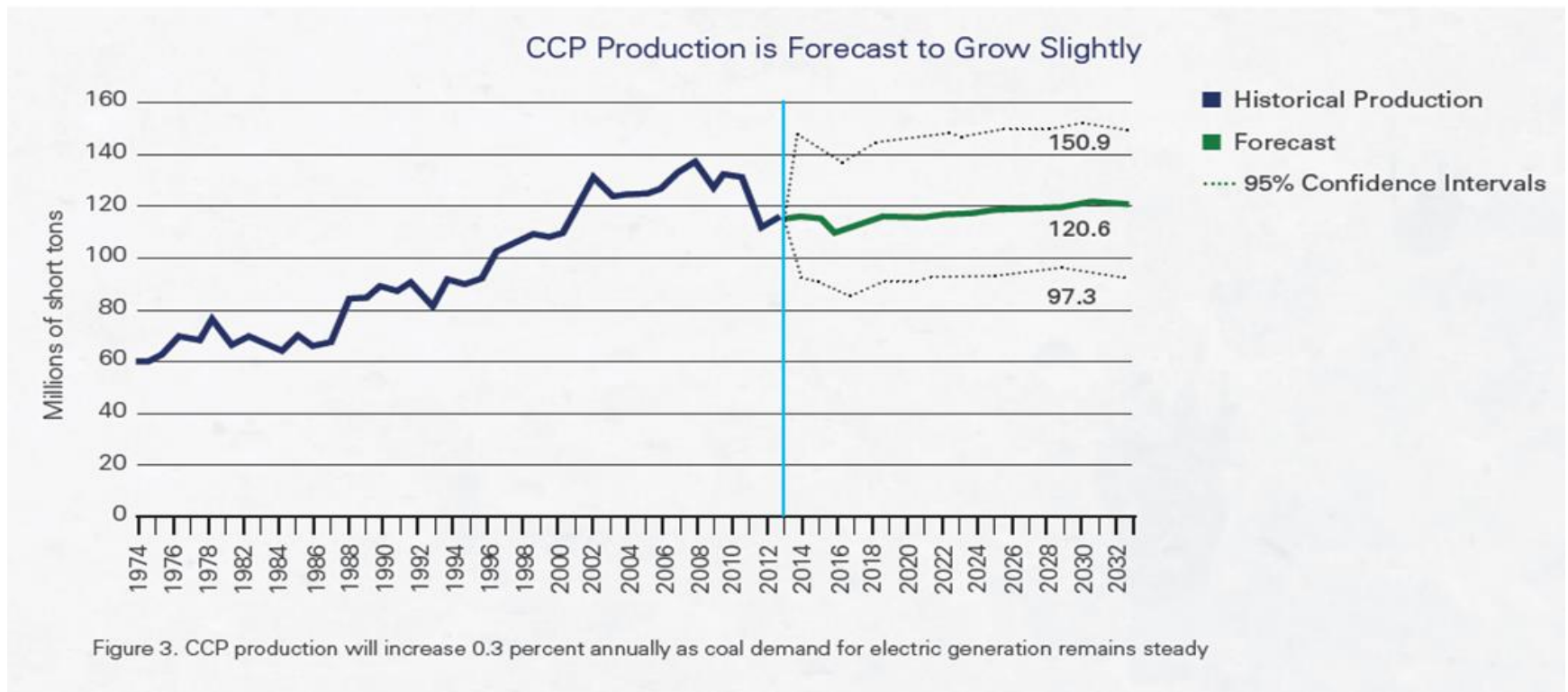
# FGD Gypsum Production & Use

- Half Of Wallboard Manufactured In US Utilized Recovered CCP Gypsum



# 2015 Projected CCP Production

- Coal Remains ~30% Fuel Mix – Announced Closings Equate To 5M TPY
- Production Volume & Reclaimed CCPs Offer Resources For Needs
- Certain Markets Impacted By Loss Of Plants Or CCP Quality



SOURCE: ARTBA CCP Production and Use Historical Analysis, 2015



# Summary Impacts On CCP

- Coal Use Will Be Impacted By Cheap Natural Gas (Capacity Factor) & Regulatory Impacts (Closures)
- CCP Use As A Valued Resource Continues
  - Volumes Impacted In Certain Markets
  - Quality Impacted By Regulation
  - Beneficiation Technologies Applied To Reclaim
  - Reclaim Of Impoundment & Landfill Ash Ensures Long Term Availability With Beneficiation
  - Transportation Longer Distances Required
  - At 30% Of Fuel Mix – Volumes Meet Demands

# QUESTIONS

## 2014 Coal Combustion Product (CCP) Production & Use Survey Report

### Beneficial Utilization versus Production Totals (Short Tons)

2014 CCP Categories	Fly Ash	Bottom Ash	Boiler Slag	FGD Gypsum	FGD Material Wet Scrubbers	FGD Material Dry Scrubbers	FGD Other	FBC Ash	CCP Production / Utilization Totals
Total CCPs Produced by Category	50,422,238	12,478,705	2,694,056	34,123,820	12,596,231	1,255,775	344,551	15,768,766	129,684,142
Total CCPs Used by Category	23,181,723	6,063,028	1,706,621	16,750,990	1,163,434	275,999	0	13,285,766	62,427,561
1. Concrete/Concrete Products/Grout	13,126,930	609,558	0	423,613	0	0	0	0	14,160,100
2. Blended Cement/ Feed for Clinker	3,391,272	1,197,398	0	1,308,208	120,509	0	0	0	6,017,388
3. Flowable Fill	84,734	2,672	0	0	0	0	0	0	87,406
4. Structural Fills/Embankments	2,805,515	1,928,492	51,659	1,586,234	311,183	0	0	0	6,683,084
5. Road Base/Sub-base	365,868	306,936	12,992	0	0	0	0	0	685,796
6. Soil Modification/Stabilization	176,112	720,791	0	0	0	0	0	0	896,903
7. Mineral Filler in Asphalt	68,707	0	9,758	5,197	0	0	0	0	83,662
8. Snow and Ice Control	0	736,397	101,359	0	0	0	0	0	837,756
9. Blasting Grit/Roofing Granules	0	127,114	1,530,853	0	0	0	0	0	1,657,968
10. Mining Applications	1,392,935	41,330	0	813,419	578,244	229,766	0	13,151,161	16,206,855
11. Gypsum Panel Products	0	0	0	11,221,836	0	0	0	0	11,221,836
12. Waste Stabilization/Solidification	279,323	475	0	16,390	0	0	0	134,605	430,794
13. Agriculture	62	10	0	1,332,708	0	0	0	0	1,332,781
14. Aggregate	0	181,107	0	0	0	0	0	0	181,107
15. Oil/Gas Field Services	512,100	4,708	0	0	0	46,233	0	0	563,041
16. Miscellaneous/Other	978,165	206,039	0	43,384	153,498	0	0	0	1,381,086

### Summary Utilization to Production Rate

CCP Categories	Fly Ash	Bottom Ash	Boiler Slag	FGD Gypsum	FGD Material Wet Scrubbers	FGD Material Dry Scrubbers	FGD Other	FBC Ash	CCP Utilization Total
Totals by CCP Type/Application	23,181,723	6,063,028	1,706,621	16,750,990	1,163,434	275,999	0	13,285,766	62,427,561
Category Use to Production Rate (%)	46%	49%	63%	49%	9%	22%	0%	84%	48%
2014 Cenospheres Sold (Pounds)	4,862,361	Data in this survey represents 180 GWs of Name Plate rating of the total industry wide approximate 302 GW capacity based on EIA's July 2015 Electric Power Monthly.							

#### Notes:

These are estimates for entire U.S. utility and IPP sectors calculated by dividing the survey respondents data by the portion of the overall industries coal burn they represent, as reported in the July 2015 EIA Electric Power Monthly (58%).