

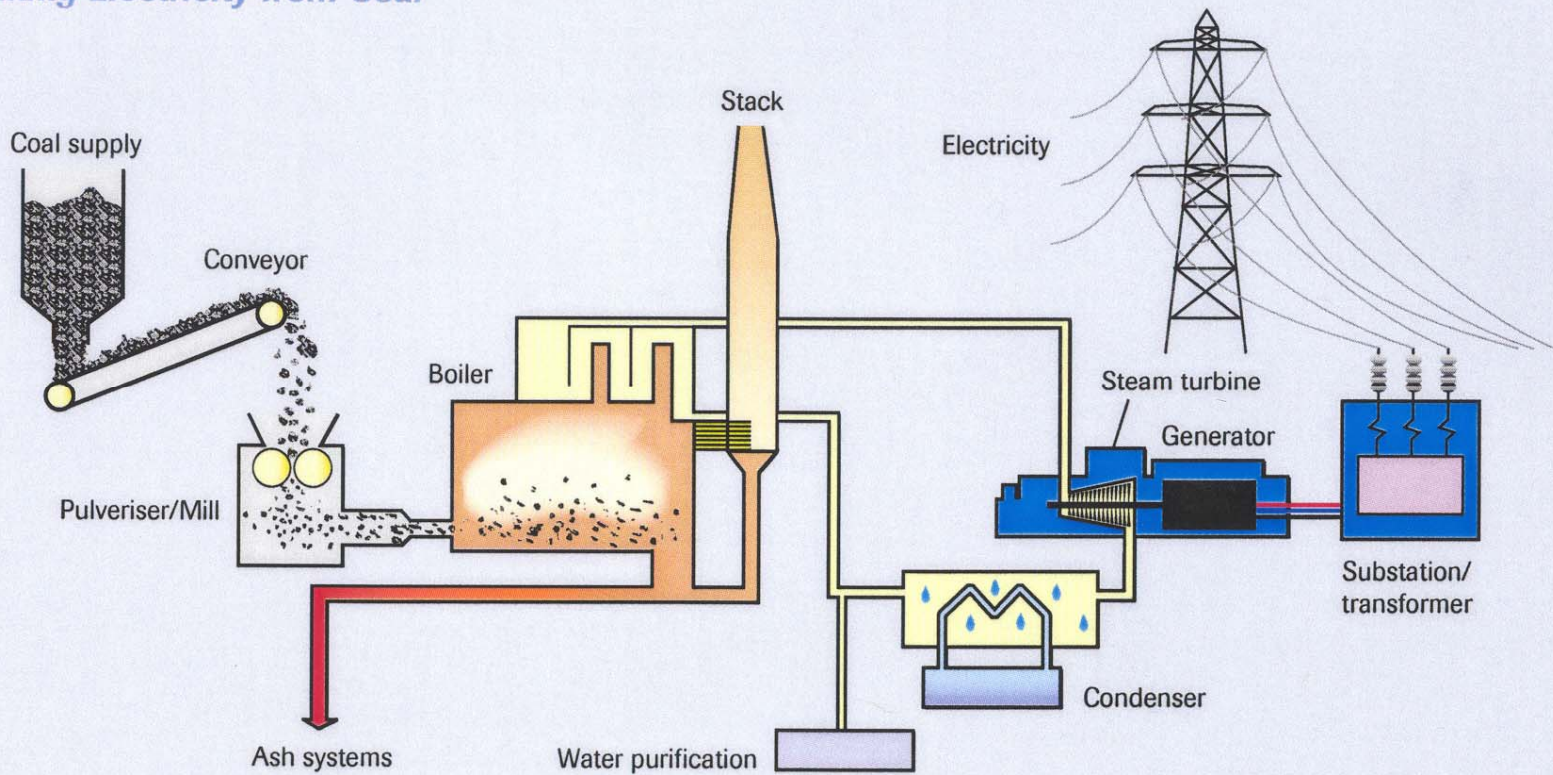
# PLASMA PROCESSING OF MSW AT COAL-FIRED POWER PLANTS

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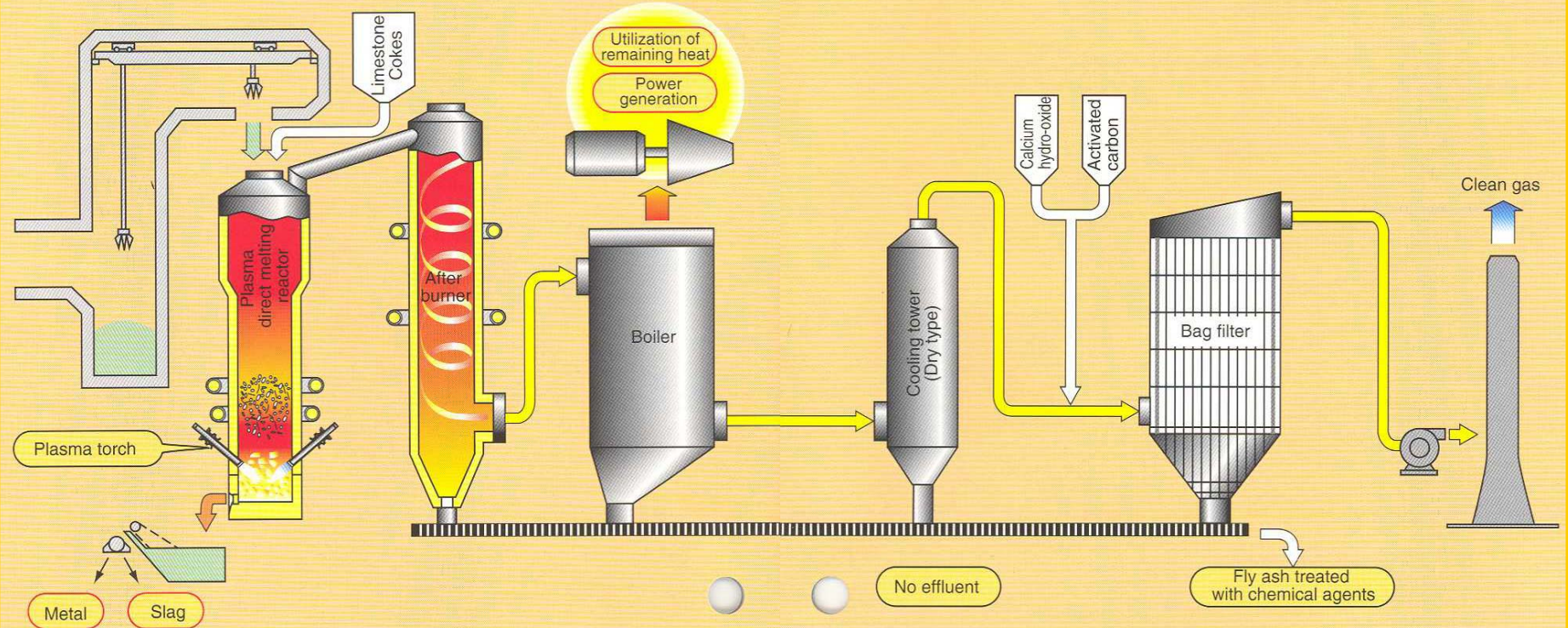
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# Typical Coal Fired Power Plant

*Generating Electricity from Coal*



# Plasma MSW Processing System Schematic

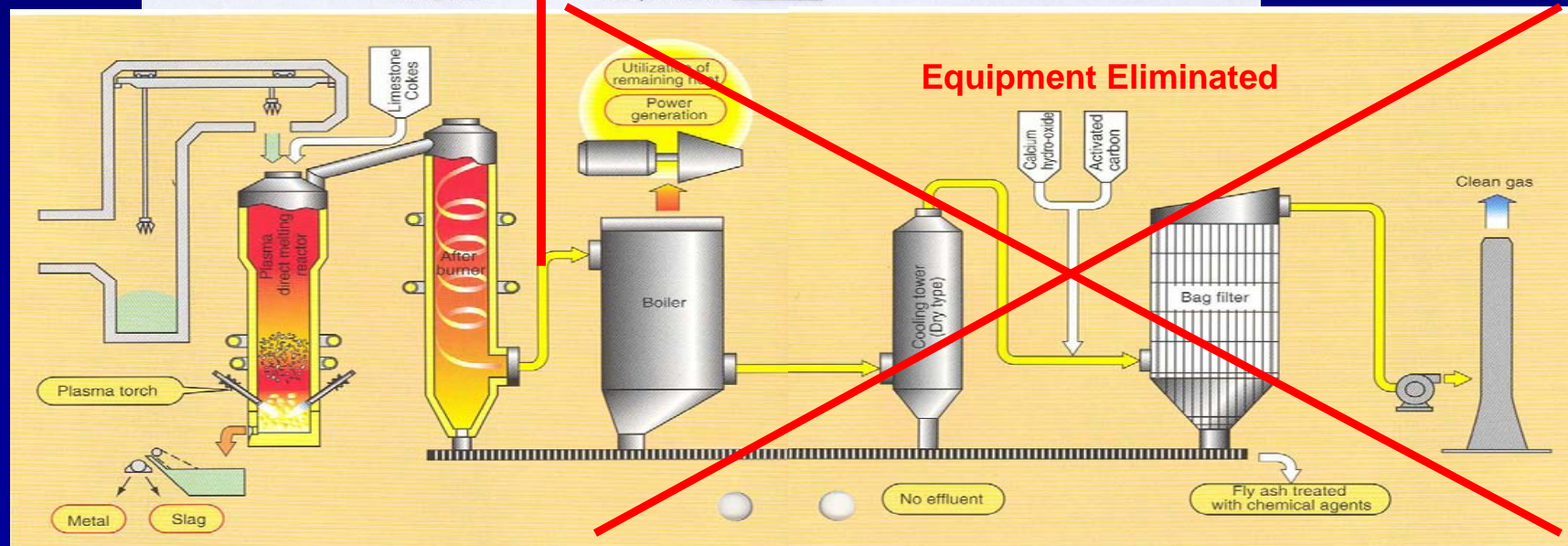
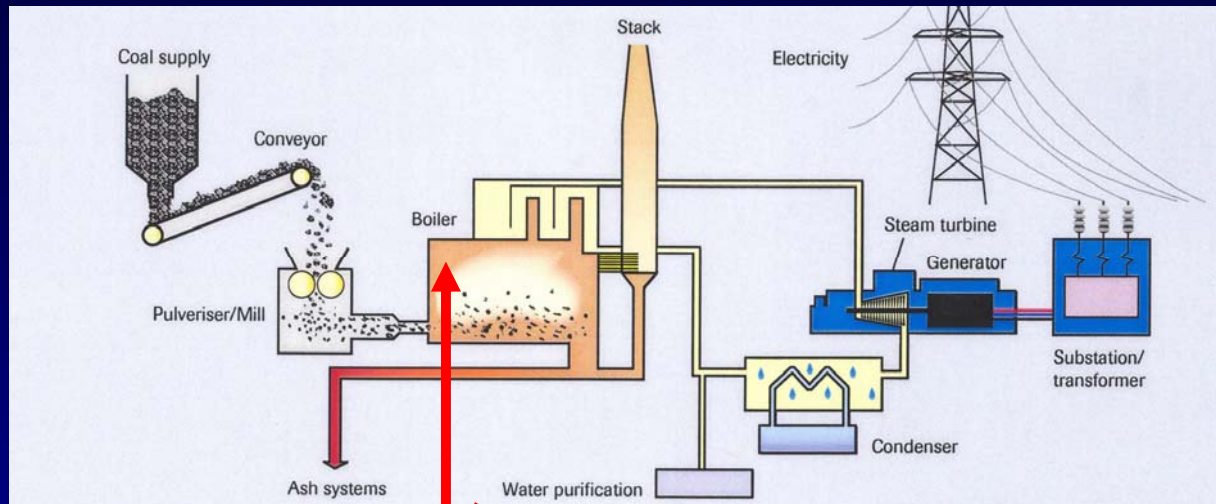


# PLASMA PROCESSING OF MSW AT COAL-FIRED POWER PLANTS

## Concept

- Collocate MSW plasma processing plants (in modules of 1,000 TPD) with existing operational coal-fired power plants.
- The amount of coal supplied to a plant will be reduced, proportionate to the thermal output of the MSW plant.
- The hot gaseous emissions from the plasma plant afterburner system will be fed directly into the coal plant combustion chamber to supplement the combusted coal gases.
- The combined plasma and coal gaseous emissions would produce steam and power equal to the normal coal plant generating capacity.
- MSW would replace large volumes of coal for power generation in a very efficient, cost-effective and environmentally cleaner operation.

# PLASMA PROCESSING OF MSW AT COAL-FIRED POWER PLANTS



# Typical Power Plant Air Emissions

## Air Pollutant Emissions (Pounds per MWH)

Fuel	CO <sub>2</sub>	SO <sub>2</sub>	NO <sub>x</sub>
Coal <sup>(1)</sup>	2249	13	6
Oil <sup>(1)</sup>	1672	12	4
Natural Gas <sup>(1)</sup>	1135	0.1	1.7
MSW Incineration <sup>(1)</sup>	2988	0.8	5.4
MSW Plasma Gasification <sup>(2)</sup>	<1900	<1.0	<2.0

(1) Based on EPA Data

(2) Based on Empirical Data

# PLASMA PROCESSING OF MSW AT COAL-FIRED POWER PLANTS

## Power Plant Advantages

- More efficient coal combustion
  - Significantly higher combustion chamber temperatures from the MSW plasma process
- Significantly cleaner air emissions
  - Cleaner coal combustion gases
  - Cleaner MSW process gases
  - Will help meet the year 2018 requirements of the Clear Skies Act
- Significant cost savings
  - Reduced coal requirements
  - Reduced coal ash landfill requirements
  - Reduced cost for MSW process gas
  - Reduced pollution control equipment needs
    - Cleaner air emissions from the MSW plasma process
- Applicable to existing and planned coal-fired power plants
- Equally applicable to petroleum-fired power plants
- MSW plasma processing technology available today
  - Geoplasma, LLC

# PLASMA PROCESSING OF MSW AT COAL-FIRED POWER PLANTS

## MSW Processing Advantages

- Plant capital costs reduced by over 50%<sup>(1)</sup>
  - Utilize power plant boiler, generation and emission control systems
- More than 50% more electrical energy from MSW gases
  - Large coal-fired generation systems are more efficient (~35%) than smaller generation systems for MSW alone (~20%)
- Significantly lower operating costs
  - Use of power plant systems reduces number of MSW-associated systems
- Salable solid residue
  - Gravel, sand, aggregate for concrete, asphalt and concrete pavers
- Cost-competitive with landfill tipping fees throughout most of U.S.
- Need for landfills is eliminated

(1) Geoplasma, LLC estimated costs



# PLASMA PROCESSING OF MSW AT COAL-FIRED POWER PLANTS

## Summary

By 2020, if all MSW was processed by plasma at coal-fired power plants (1 million TPD), MSW could:

- Supply about 5% of U.S. electricity needs
- Replace about 140 million TPY of coal
- Eliminate about 15 million TPY of coal ash going to landfills
- Provide significantly cleaner coal plant air emissions
- Support the goals of the Clear Skies Act

# YEAR 2020

## SELECTED RENEWABLE ENERGY SOURCES

<u>Source</u>	<u>Quads (10<sup>15</sup> BTU)</u>
Plasma Processed MSW <sup>(1)</sup>	0.90
Geothermal <sup>(2)</sup>	0.47
Landfill Gas <sup>(2)</sup>	0.12
Solar <sup>(2)</sup>	0.09
Wind <sup>(2)</sup>	0.05

(1) Assumed 1 million TPD

(2) Extrapolated from 1999 statistics

# Capital Costs: Incineration vs Plasma Gasification Facilities

