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Presentation to

KSU Intersession Course/Workshop Energy, Environmental Impacts and Sustainability

Overview of Coal-Fueled Power Plants



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Agenda

- What Is Coal?
- Electricity from Coal
- Why Coal?
- Future of Coal



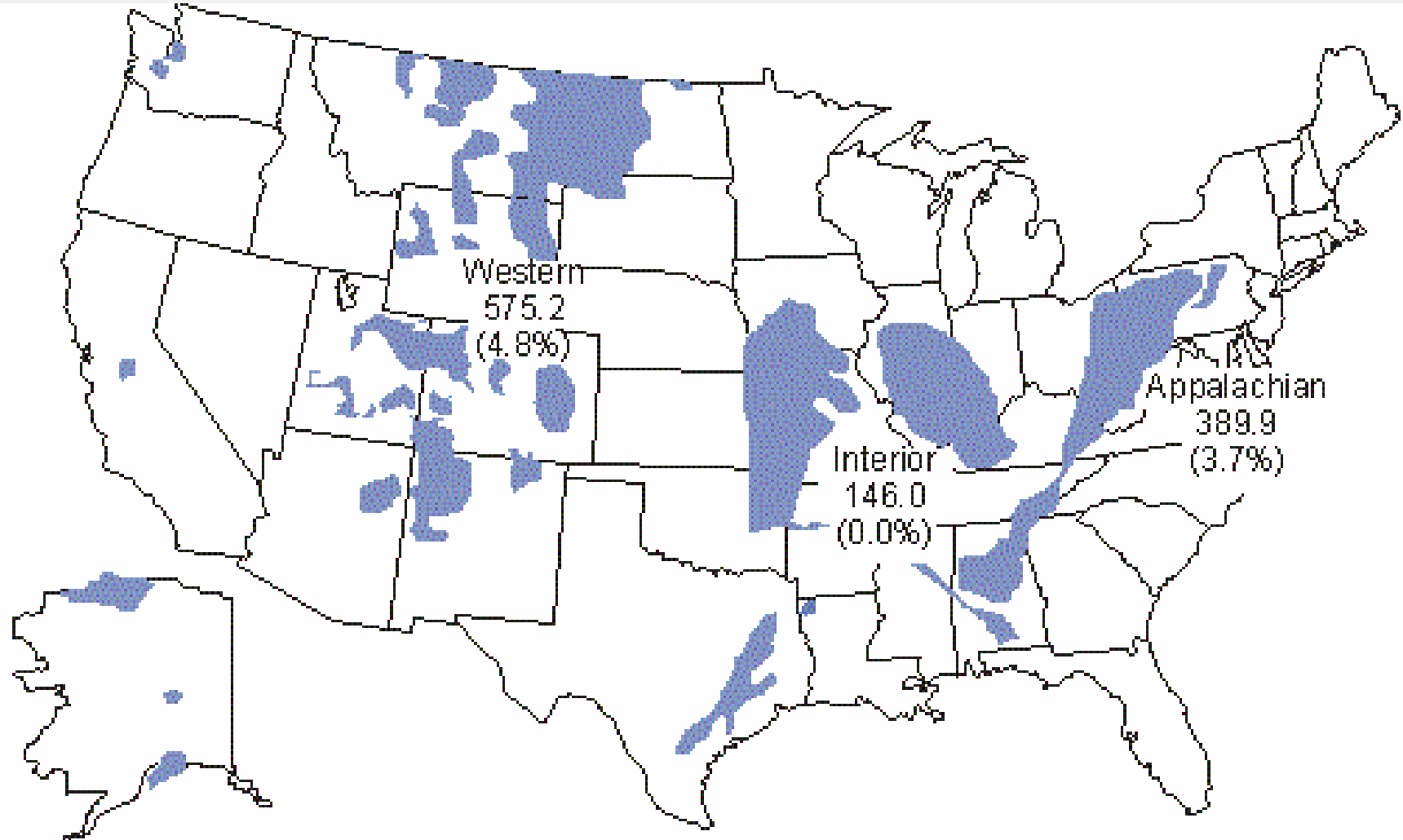


Coal Plant – Jeffrey Energy Center





US Coal Regions



Sources: Energy Information Administration, Annual Coal Report, 2004, DOE/EIA-0584(2004) (Washington, DC, September 2005).



Unit Trains



Sources: University of Wyoming at smtc.uwyo.edu/coal/images/coaltrain3.jpg

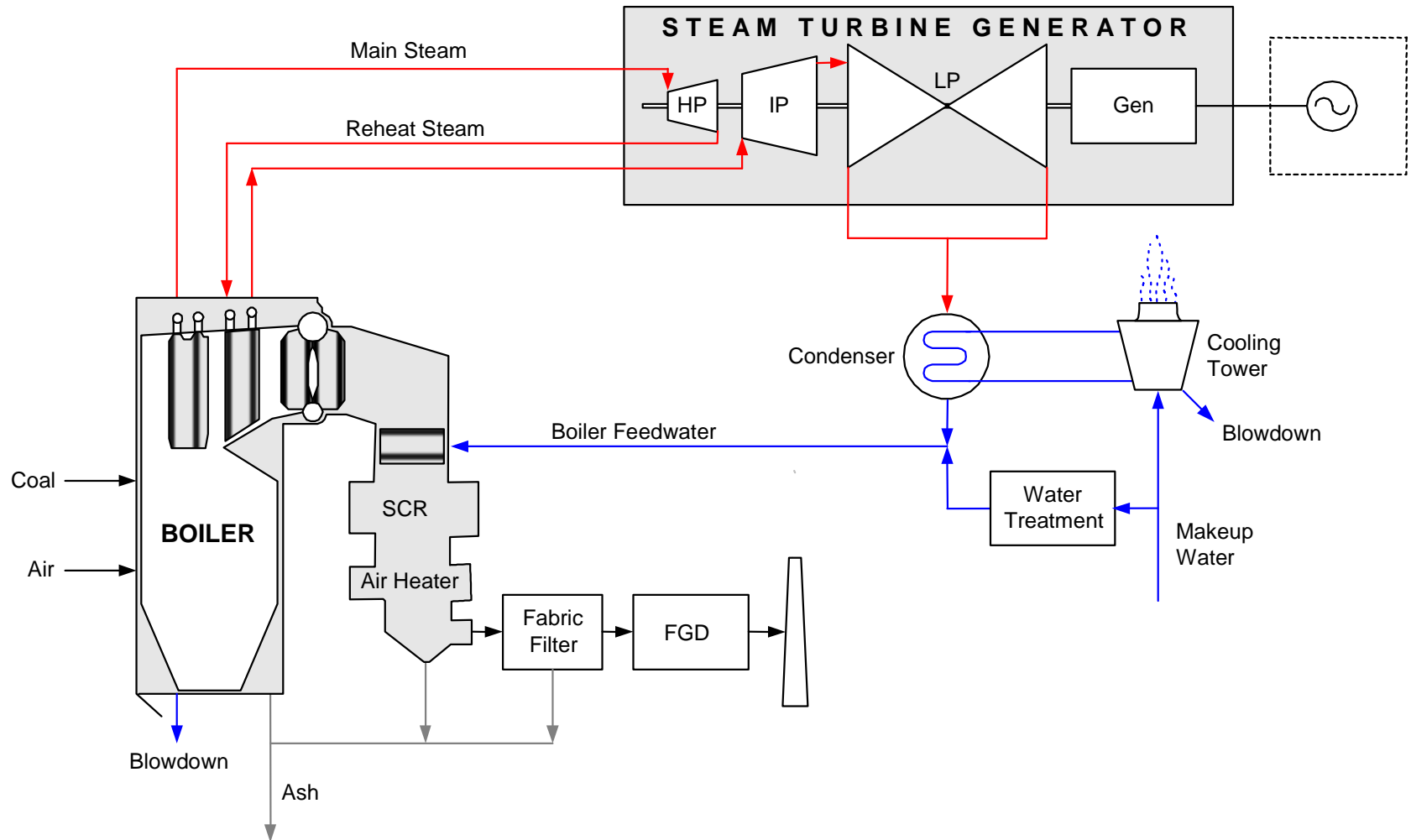


Electric Generation from Coal

- Conventional Combustion
 - Pulverized Coal
 - Circulating Fluidized Bed
 - Others
- Gasification
 - Integrated Gasification Combined Cycle (IGCC)

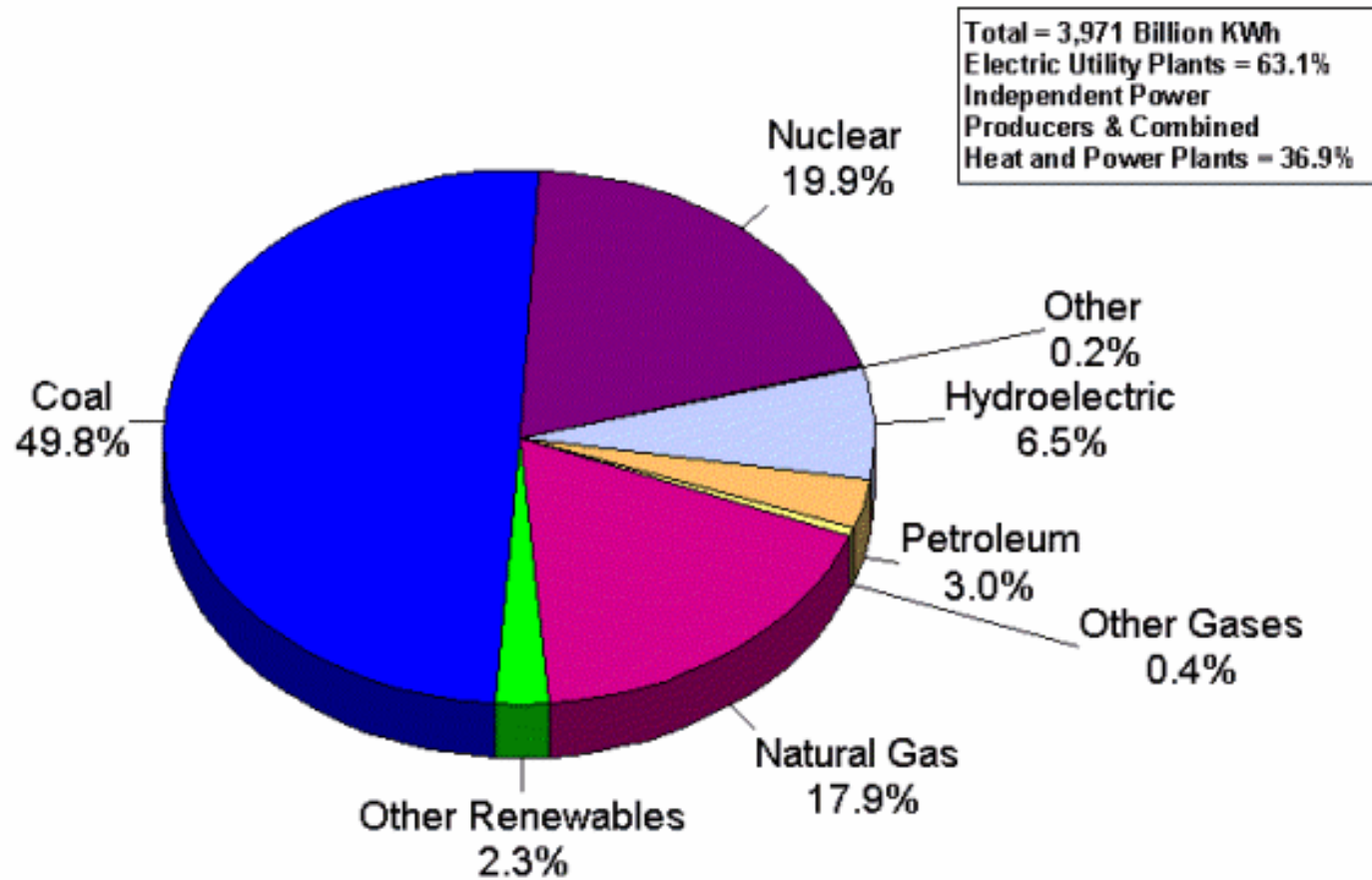


Coal Boiler Schematic





US Generation by Fuel - 2003



Note: Conventional hydroelectric power and hydroelectric pumped storage facility production minus energy used for pumping.

Sources: US DOE EIA, Energy Information Administration, Form EIA-906, "Power Plant Report."



Representative Emissions and Water Usage

Description	NO _x , lb/MBtu	SO ₂ , lb/MBtu	PM, lb/MBtu	Water Usage
Coal – Combustion	0.07	0.090	0.018	Higher
Coal – IGCC	0.05	0.012	0.014	Base
NGCC	0.06	Trace	0.012	Base
Biomass	0.10	Trace	0.018	Higher
Wind	None	None	None	None
Solar	None	None	None	None



Representative Costs

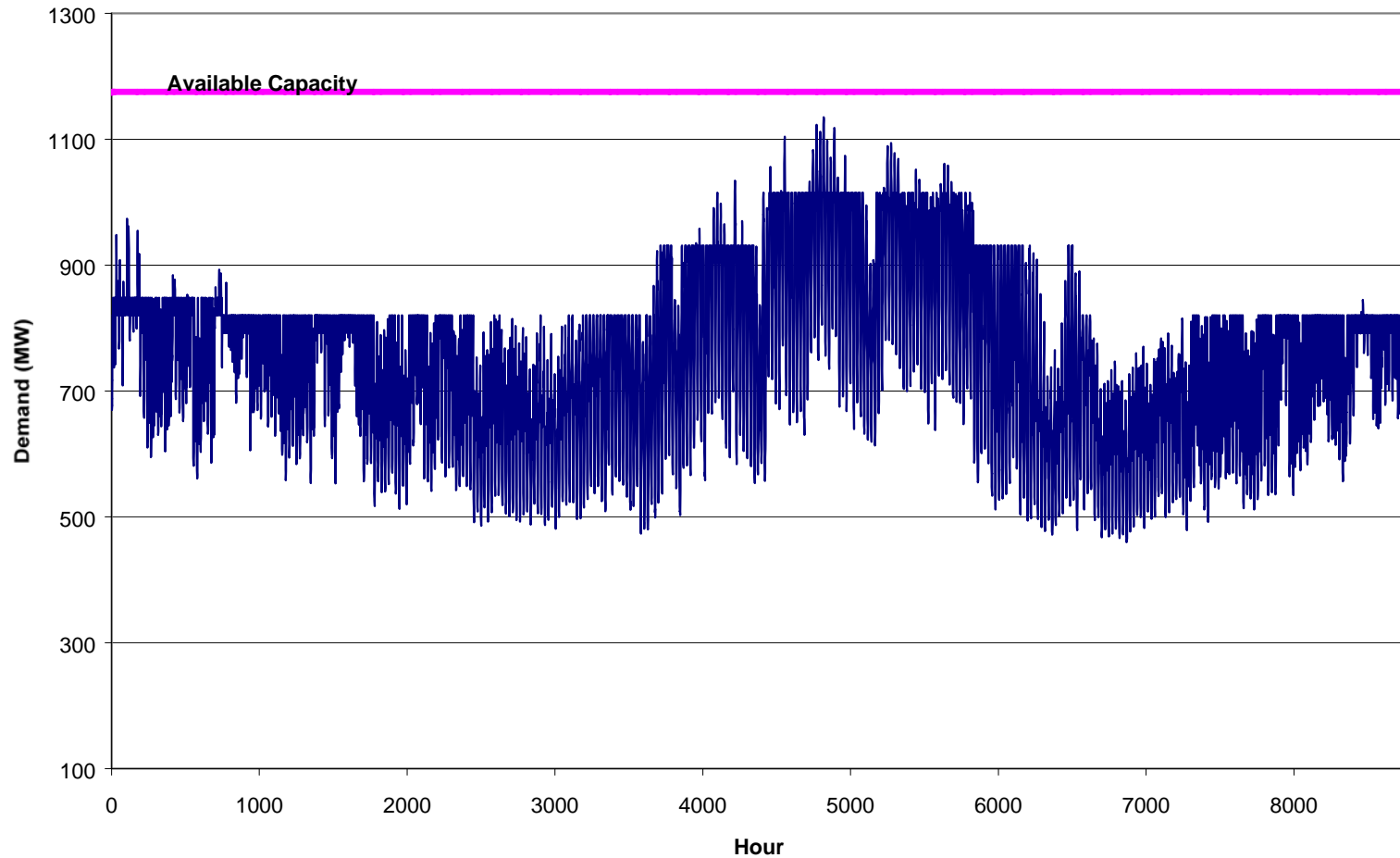
Description	Direct Capital Cost, \$/kW	Busbar Cost, ¢/kWh
Coal – Combustion	1,200 - 1,400	5.0
Coal – IGCC	1,400 – 1,825	5.5
NGCC	450 – 700	7.5*
Biomass	2,000 - 2,750	8.0*
Wind	1,300 - 1,500	6.0
Solar	4,000 – 5,000	11.5

* Highly fuel cost dependent



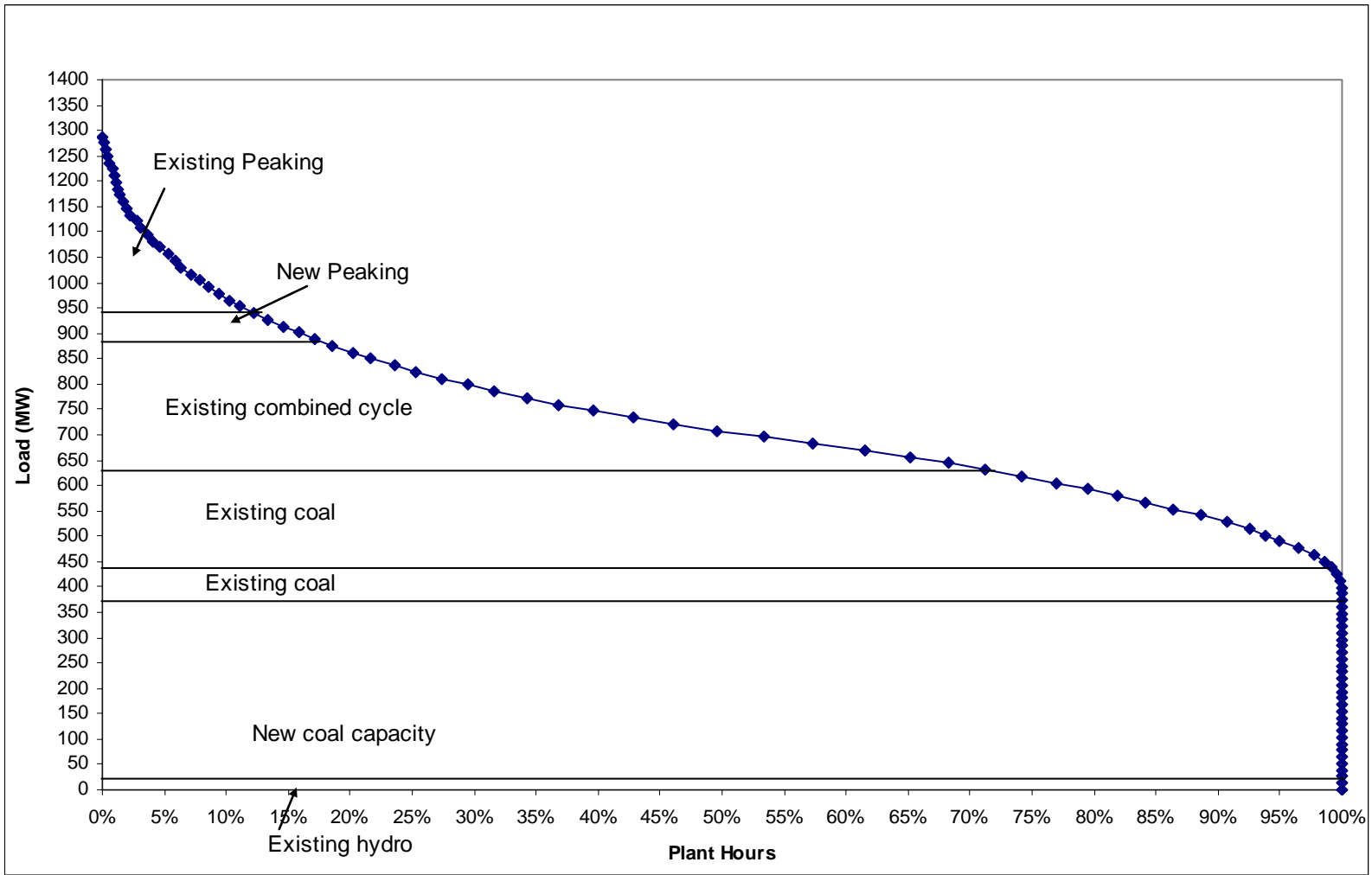
Typical Annual Demand Profile

Year 1





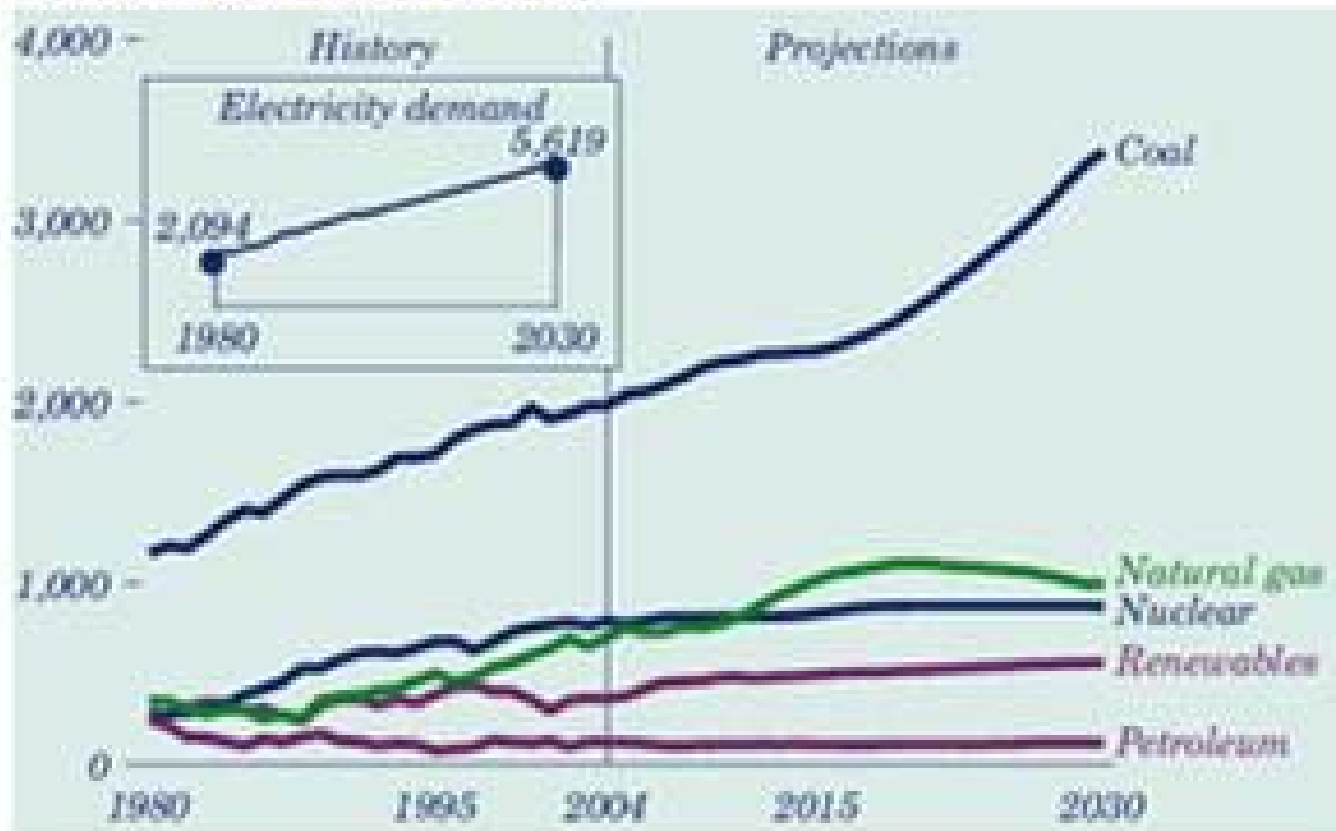
Typical Load Duration Curve





The Future of Coal – Large Capacity Additions

*Figure 5. Electricity generation by fuel, 1980-2030
(billion kilowatthours)*



Sources: US DOE EIA, "Annual Energy Outlook 2006 (Early Release)"

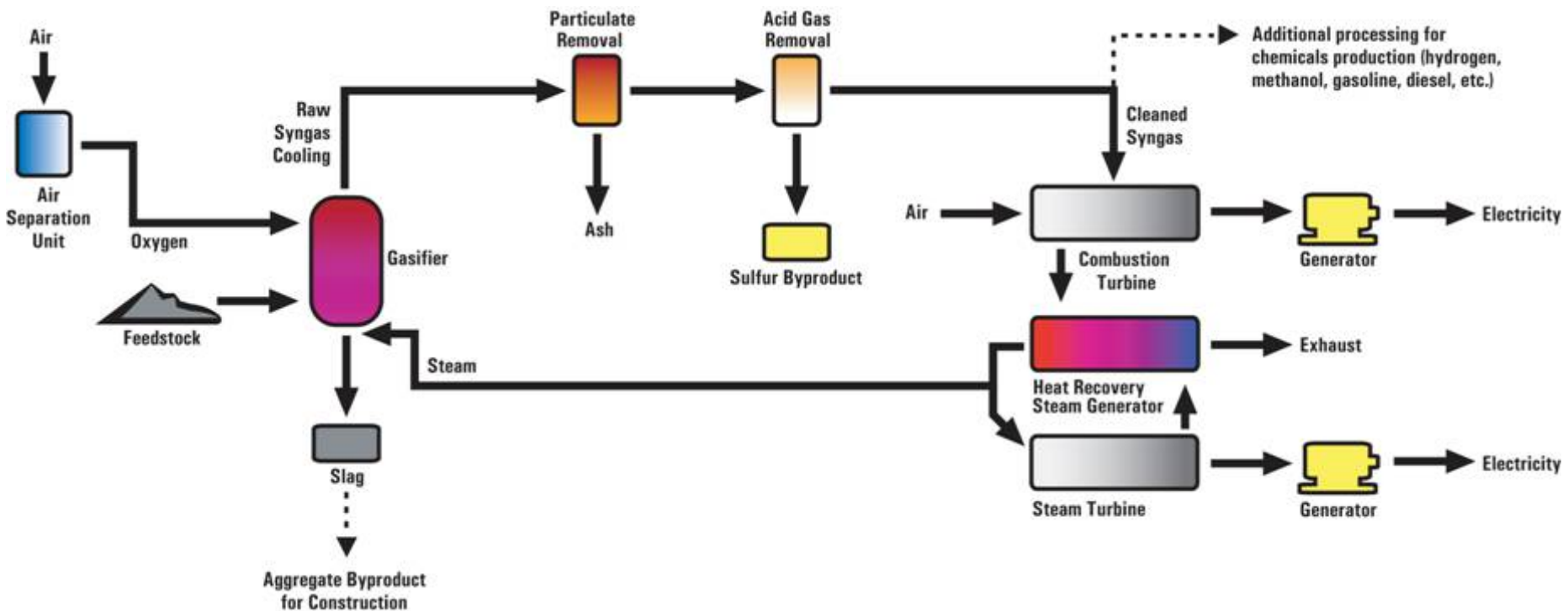


The Future of Coal - Emissions

- Permittable Emissions Limits
 - SO_x
 - CO₂
 - Mercury
- Tighter limits increase capital and operating costs of conventional technologies.
- Tighter limits provide opportunities for newer technologies, namely IGCC



Future of Coal - IGCC Process Schematic





The Future of Coal - IGCC

Benefits

- Low Emissions and High Efficiency
- Low Emissions From High Sulfur Coal
- Lower Cost Mercury Removal
- Lower Water Use
- Lower Cost CO₂ Removal
- Expect Less Resistance to Permitting

Challenges

- Higher Project Cost
- Uncertainty in Cost and Schedule
- Commissioning Duration
- Availability
- Financing



Summary

- Coal Is a Sensible Choice for Current and Future Power Projects
- Conventional Coal Is Currently More Proven and Lower Capital Cost
- IGCC Has Advantages in Performance and Emissions Reduction Capabilities, Including CO₂ and Hg
- IGCC Expected to Face Some Obstacles to Market Acceptance in Short Term
- IGCC Expected to Become Increasingly Popular Choice Over the Next 5 to 15 Years



Questions

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