Natural Gas and China's Environment

IEA-China Conference on Natural Gas

9-10 November 1999

Beijing, China

Jeffrey Logan

Battelle Memorial Institute

Overview

- **Background**
- **Drivers of Greater Gas Use**
- **Benefits of Reaching 10%**
- **Economic Issues**
- **Reform Priorities**

History of Natural Gas in China

- **Largely ignored:**
  - Cheap coal
  - Difficult geology
  - Economies of scale/lack of infrastructure
  - Institutional bias

Natural Gas in China

- **Renewed interest:**
  - Relatively clean
  - More domestic gas than once thought
  - Energy imbalance
  - Expanded demand-side uses

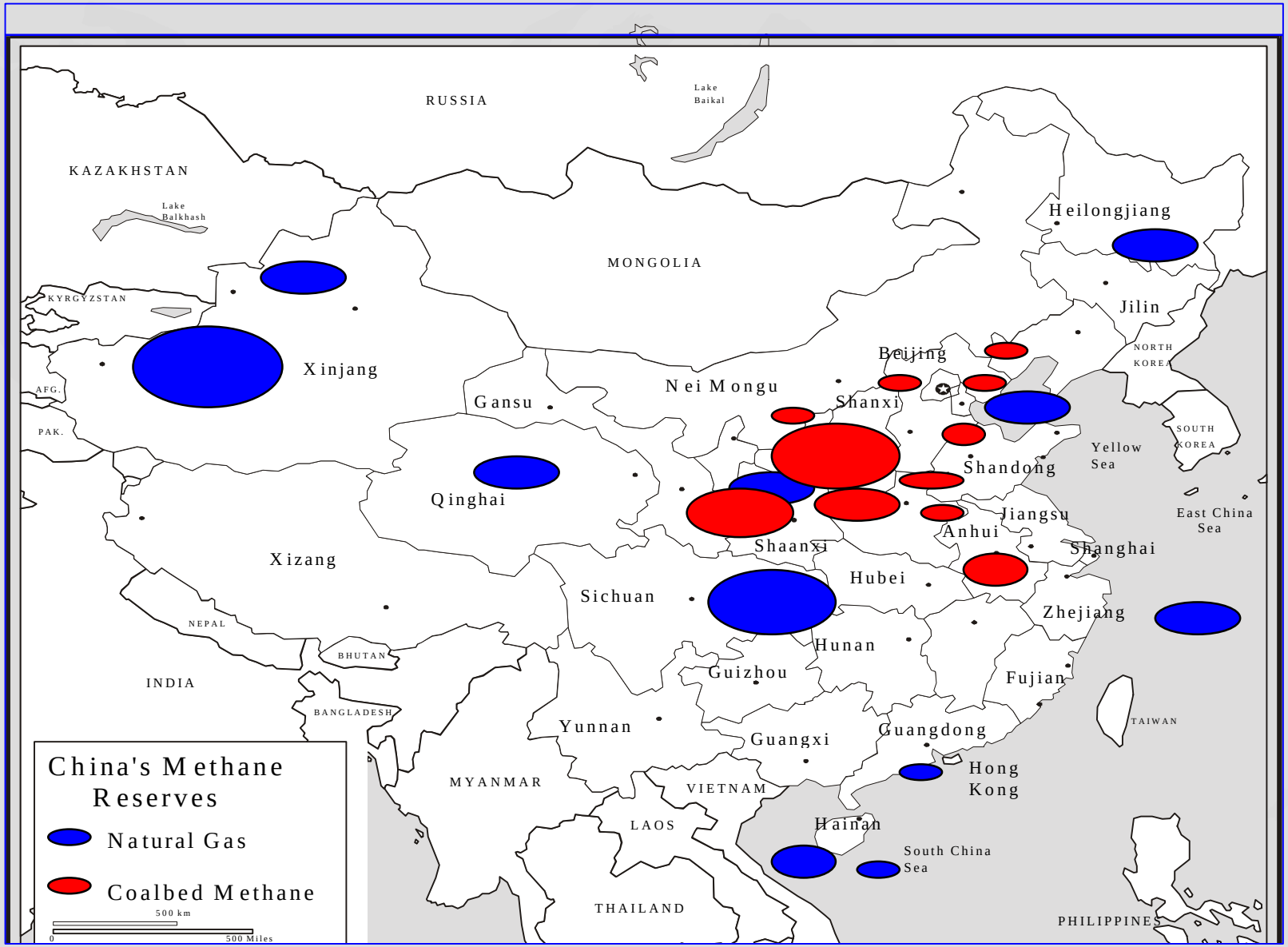
Commercial Energy Use in China

(percent of total demand in 1998)

	Coal	Oil	Gas	Nuclear	Hydro
China	73	23	2	<1	2
U.S.	25	40	26	9	1
Russia	17	21	55	5	2
India	57	32	8	1	3
World	40	24	26	7	3

- Source: British Petroleum Statistical Review of World Energy, 1999.

Methane-Rich Gas Resources in China



Source: Battelle Memorial Institute.

China's Environment

- **8% of GDP lost due to pollution (World Bank)**
- **China has 7 of world's 10 most polluted cities (WHO)**
- **GHG emissions may surpass U.S. by 2030**

Emissions from Power Generation in China

Plant Type	SO_2 (g/kWh)	NO_x (g/kWh)	CO_2 (g/kWh)	Efficiency (%)
Coal (PC)	8-20	3-5	860	37
Gas (CC)	~0	0.5-2	370	50
IGCC	0.1-1	0.5-1	790	42
Oil (CC)	1-2	2-3	540	49
Coal w/ Scrubber	1-2	4.7	880	36

Note: PC = Pulverized Coal; CC = Combined-Cycle

- Source: Battelle Memorial Institute.

Efficiency of New Coal and Gas Technologies

Sector	*Coal Efficiency*	*Gas Efficiency*
Power Generation	37	50
Industry (Boilers)	75	83
Residential (Stoves)	35	50

- Source: Larwence Berkeley Laboratory and Battelle Memorial Institute.

Boosting Gas Use to 10 Percent of Total Energy by 2020

- **Current estimates: 4 to 8 percent**
- **About 200 BCM per year needed to reach 10 percent**
- **Accelerated reform essential**
- **Economic vs. environmental priorities**

China's Gas Supply Forecast
(Billion Cubic Meters)

	2000	2010	2020
Domestic Production	**25**	**50-100**	**60-130**
Imported Pipeline	**0**	**10-20**	**20-40**
LNG	**0**	**5-10**	**5-15**
CBM	**1**	**5-10**	**10-15**
TOTAL	**26**	**70-140**	**95-200**

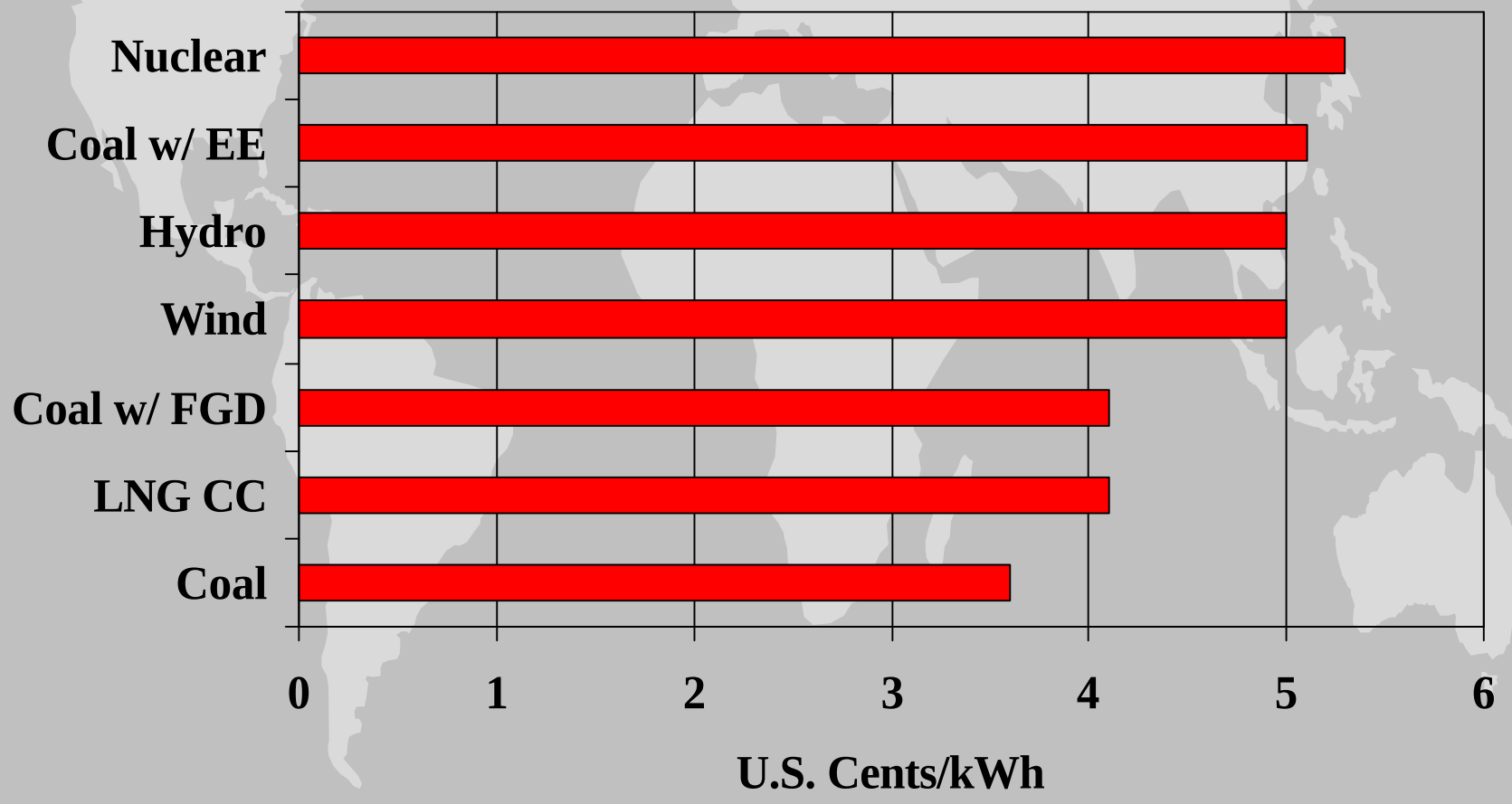
- Source: China Energy Research Institute, Royal Institute of International Affairs, EIA, Battelle.

Benefits of Reaching 10 Percent

Annual Saving in	*Million Tons*
Sulfur Dioxide	3
Particulates	1
Carbon Dioxide (C)	70
Solid Wastes	34
Coal	200

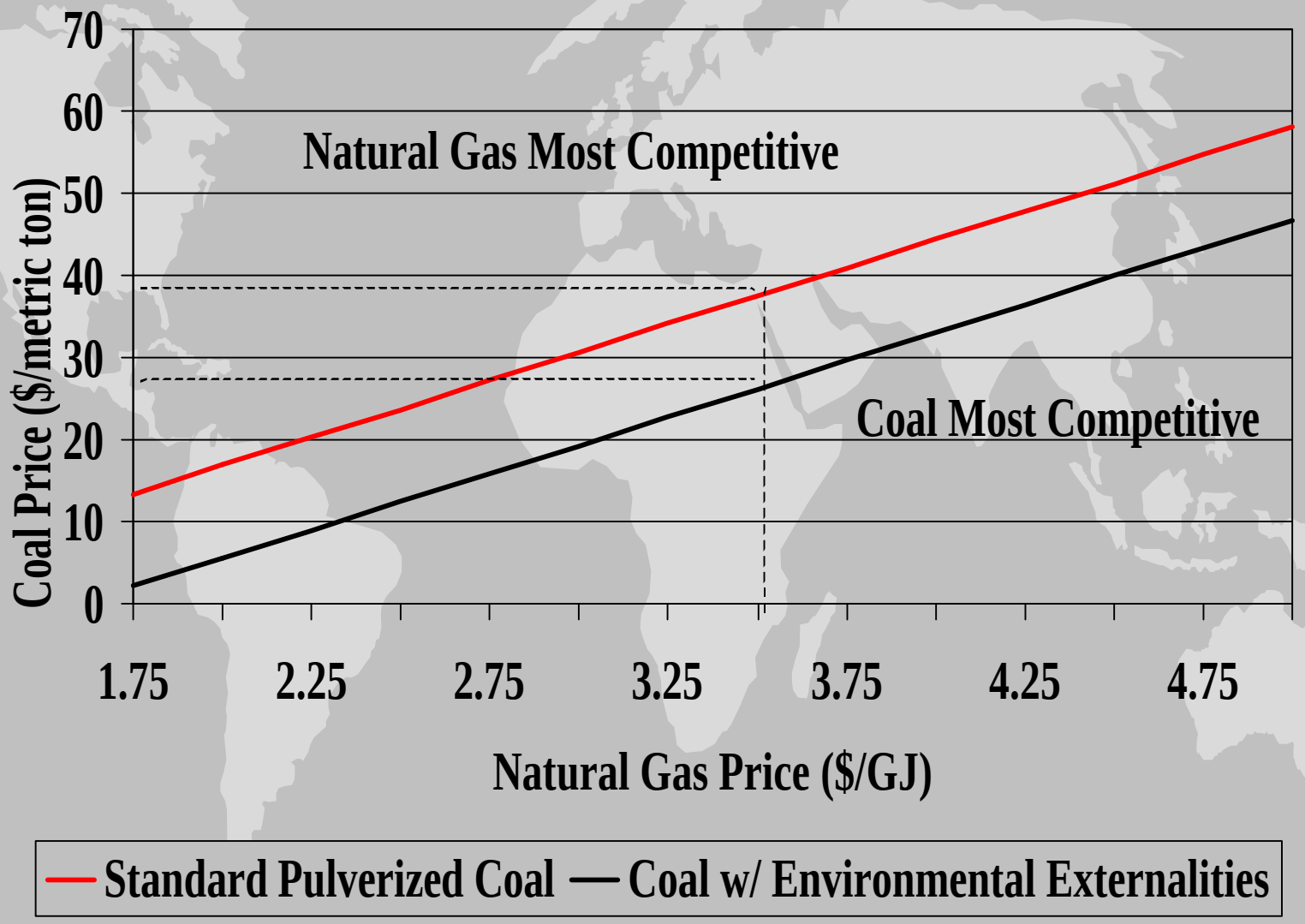
- Source: Battelle Memorial Institute.

Levelized Cost of Power Generation in Southern China



- Source: Battelle Memorial Institute.

Fuel Economics for Power Generation in China



- Source: Battelle Memorial Institute

Priority Issues

- **Gas pricing**
- **Financing infrastructure**
- **Environmental policy**
- **Access to quality fields and data**
- **Technology development**
- **Natural gas champion**