

Montana Energy Future
Symposium

Bozeman, Montana

*Experience with Gasifying
ND Lignite*

*The Great Plains Synfuels Plant
Dakota Gasification Company*



Twenty-One Years of Operation at Great Plains Synfuels

- The Successes
- The Challenges
- Relevance of Great Plains to the future of lignite & sub-bituminous coal gasification



The Great Plains Synfuels Plant



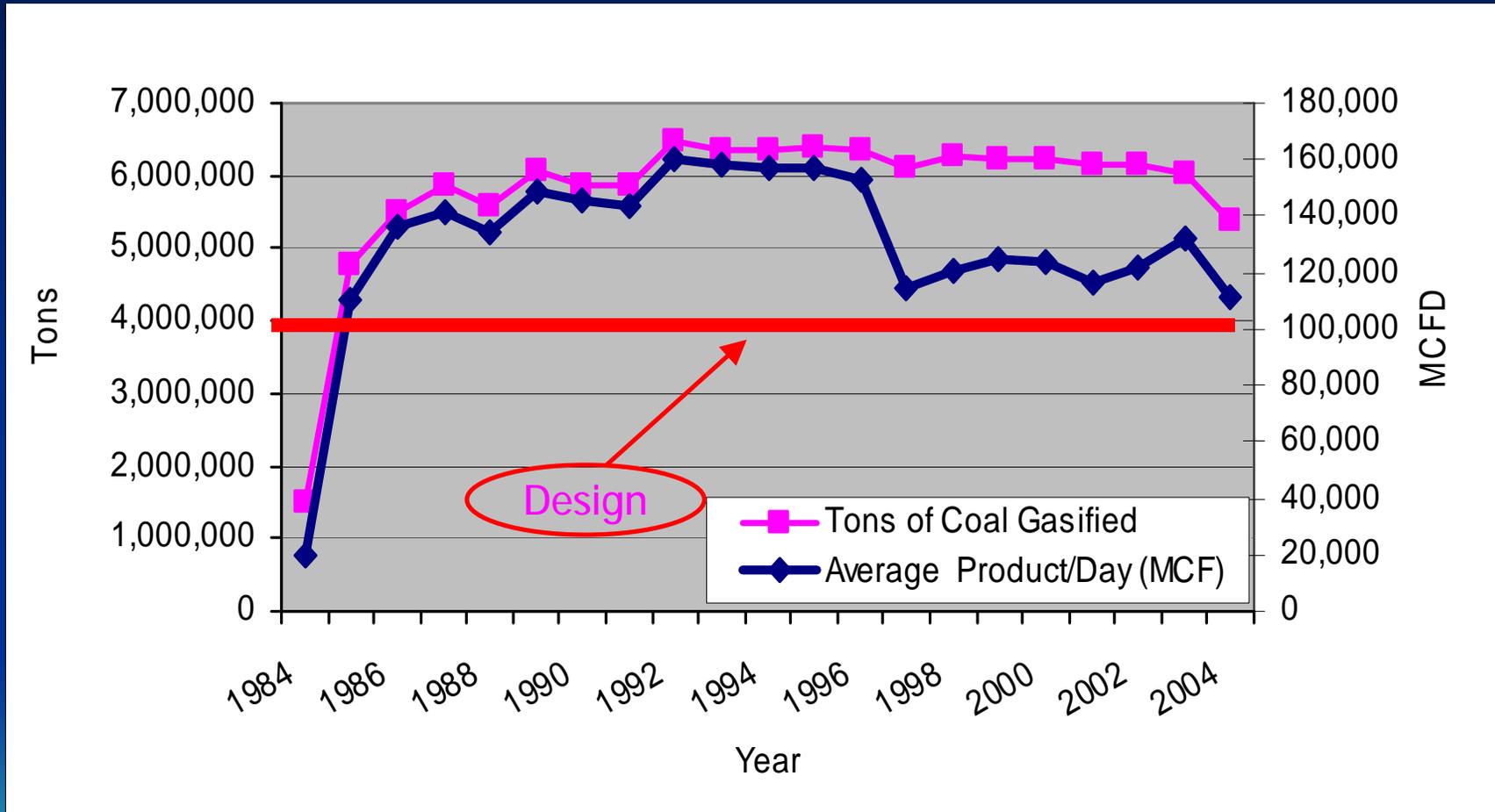


**First
success...**

*You do what it
takes to get to
work!*

Bismarck, ND...Oct 5, 2005

Dakota Gasification Great Plains Synfuels Plant Production



Availability?

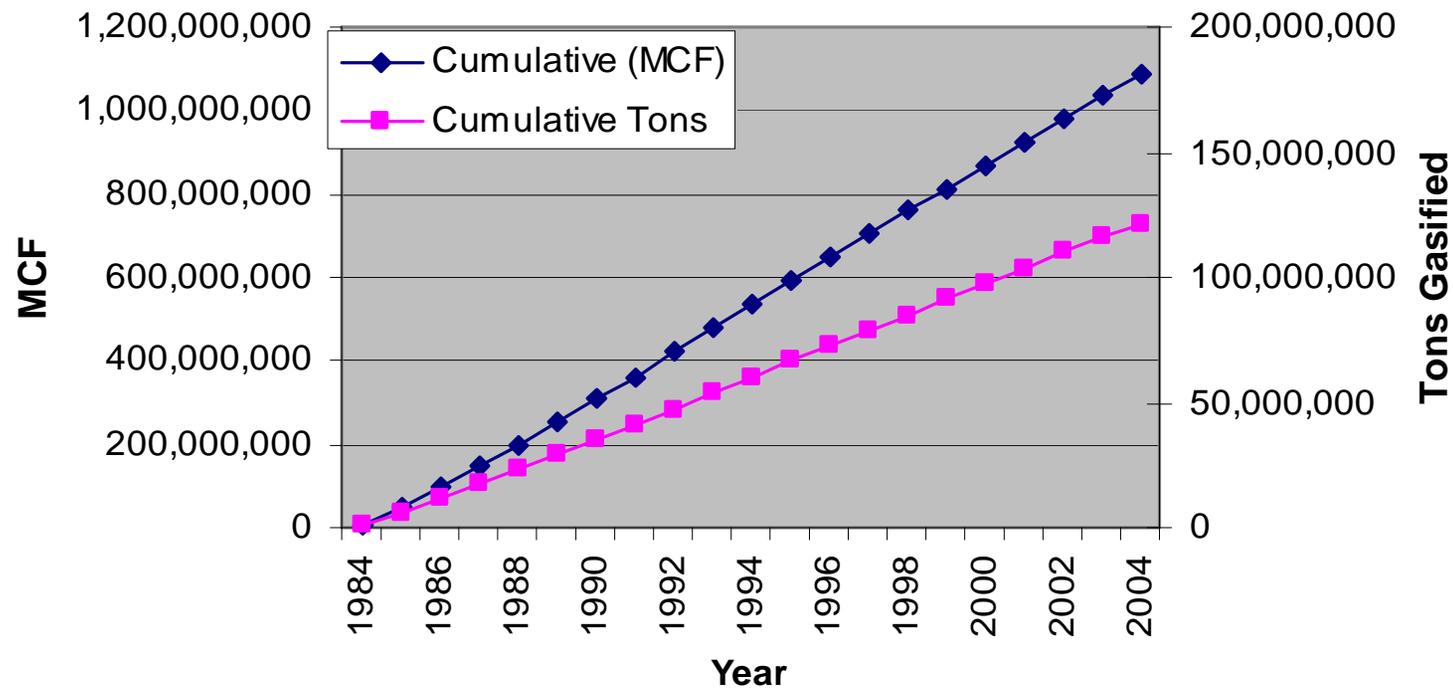
>90% of up-rated Capacity

Reliability?

>98.7% Since July, 1984



Great Plains Synfuels Plant History of SNG Production & Lignite Consumption



Typical Freedom Mine Feedstock Great Plains Synfuels Plant Gasifiers

As Received (wt %)

q Moisture	36.8
q Ash	6.5
q Volatile Matter	26.6
q Fixed Carbon	29.4
q Btu/lb (typical)	6900
q Ash Softening Temp (°F)	2280



Typical Freedom Mine Feedstock to Great Plains Synfuels Plant Gasifiers

Dry Ash Free Basis (wt %)

- Carbon 73.2
- Hydrogen 4.7
- Nitrogen 1.08
- Sulfur 1.18
- Oxygen 19.84

Typical Freedom Mine Feedstock to Great Plains Synfuels Plant Gasifiers

Metals (ppm)

q	Gold	< 1
q	Lead	1
q	Mercury	0.072
q	Uranium	30

Typical Freedom Mine Feedstock to Great Plains Synfuels Plant Gasifiers

Typical Ash Analysis (wt %)

q	Aluminum Oxide	14.3
q	Barium Oxide	1.17
q	Calcium Oxide	29.9
q	Iron Oxide	11.1
q	Magnesium Oxide	12.4
q	Potassium Oxide	0.45
q	Silicon Oxide	20.4
q	Sodium Oxide	8.5
q	Titanium Oxide	0.57

Synthetic Natural Gas Analysis

(volume %)

- Methane 95.1
- Hydrogen 3.4
- Carbon Dioxide 1.1
- Nitrogen 0.08
- Carbon Monoxide 0.01
- Argon 0.2
- GCV, Dry 974
- Molecular Weight 15.96



Plant Integrity and Durability has Been Excellent

- q **Common process and utility systems operated for 20 years without turnaround maintenance required**
- q **Original process design successful with exception of sulfur removal technology and syngas effluent piping from methanation unit**
- q **Sasol-Lurgi MK-IV gasifier physical modifications to accommodate our lignite were relatively modest**

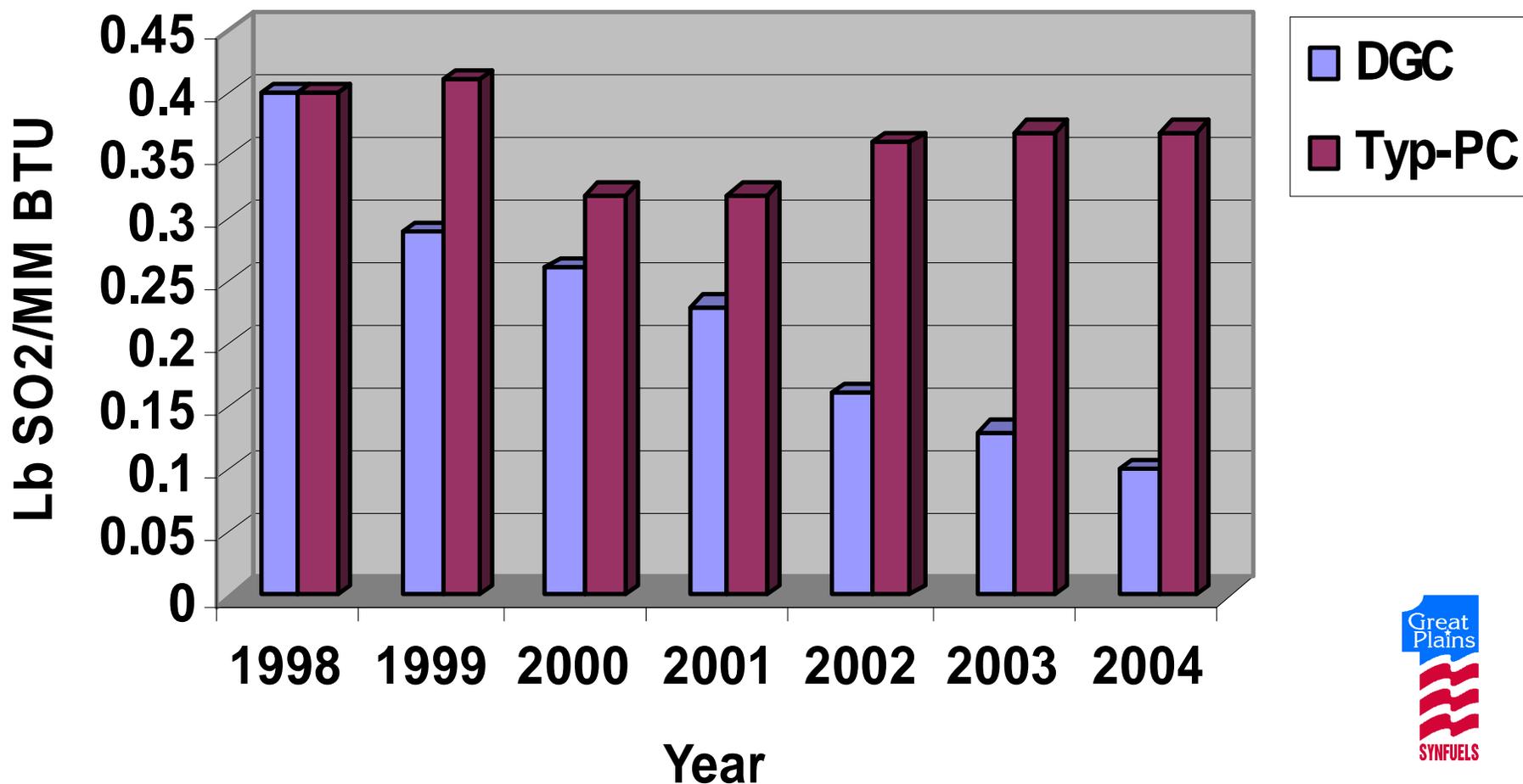


Environmental Status

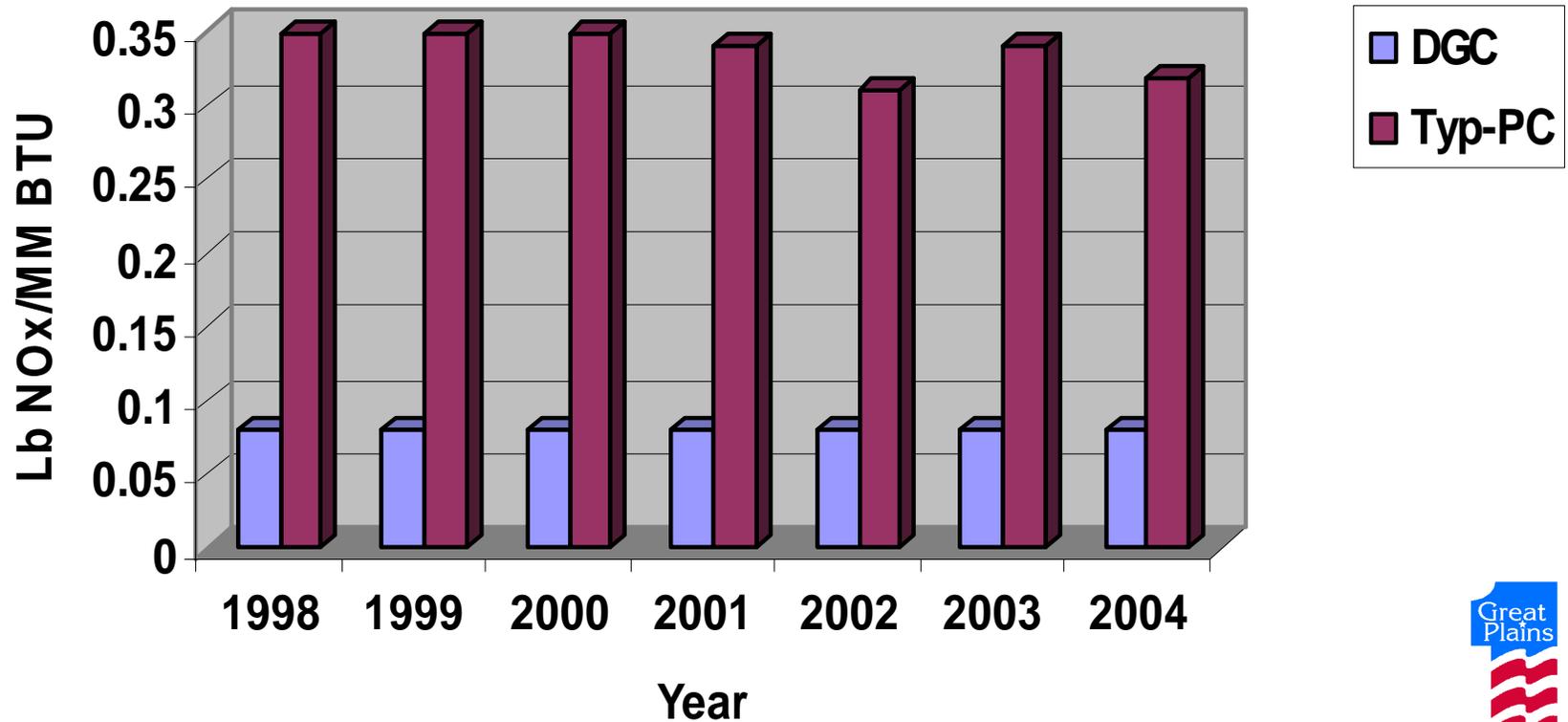
- ✓ Zero Liquids Discharge Design
- ✓ EPA Title V Compliant



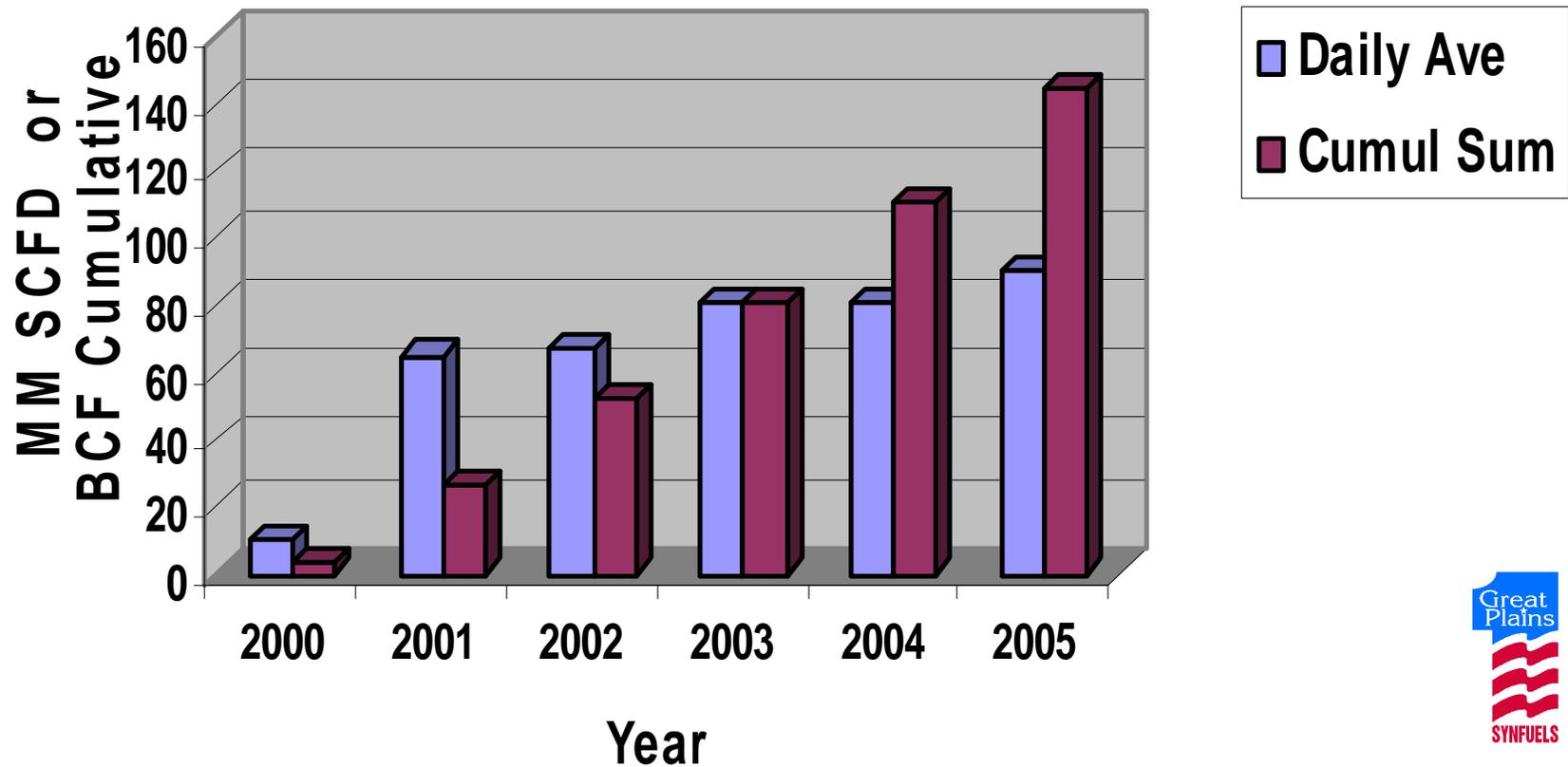
Sulfur Dioxide Emissions



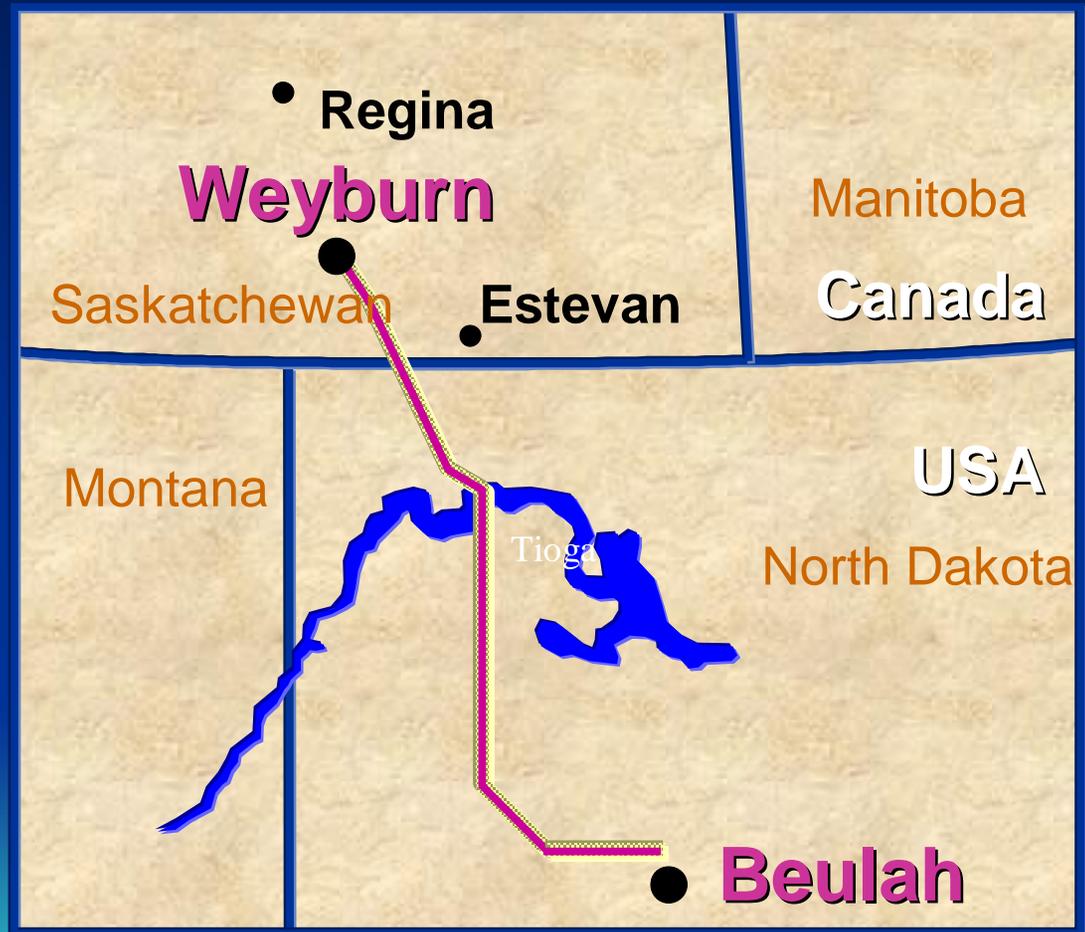
Nitrogen Oxide Emissions



Carbon Dioxide Sales

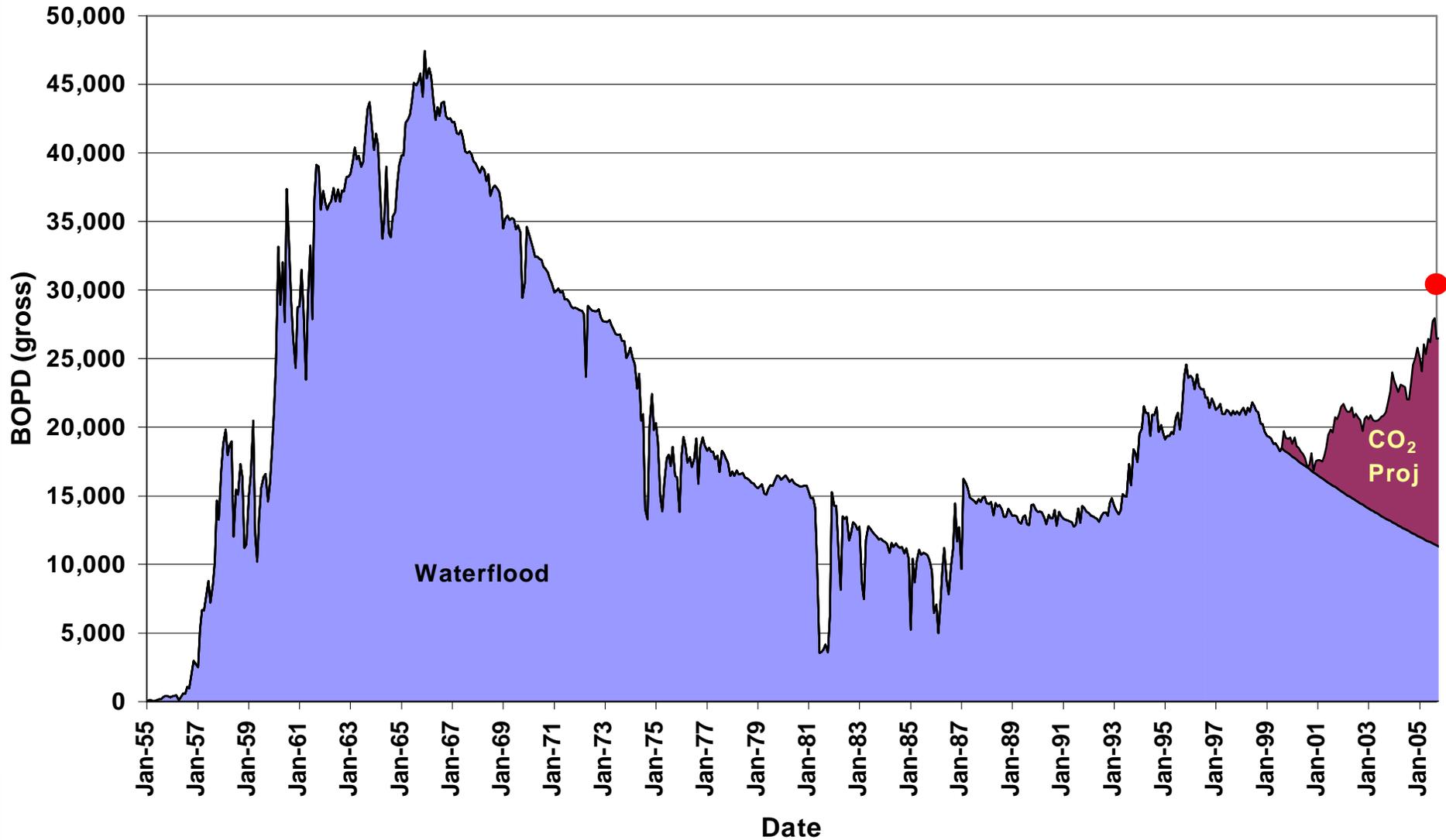


CO₂ PIPELINE TO CANADA



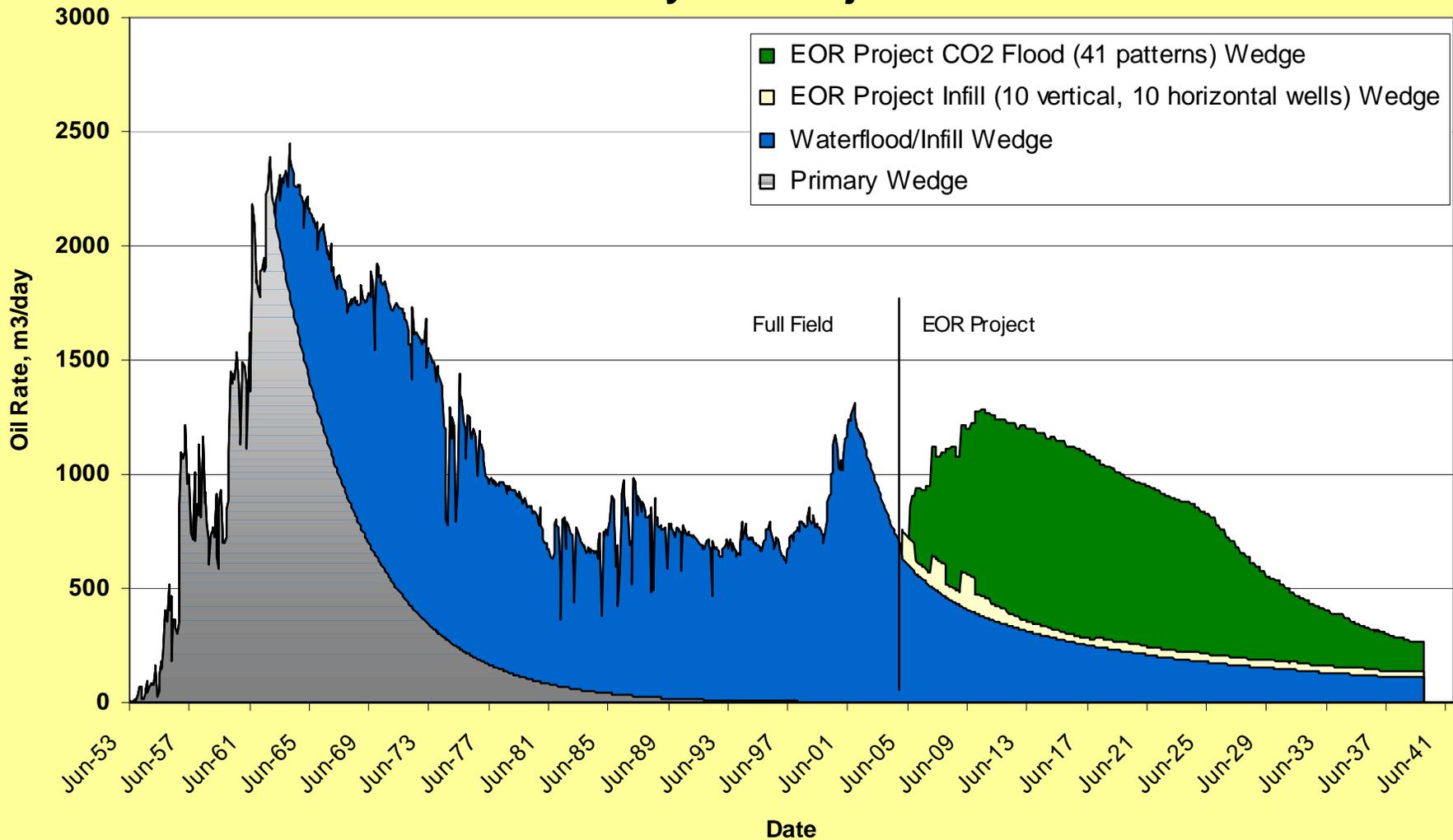
● Bismarck

Weyburn Unit Oil Production



Field History & EOR Forecast (Simulated)

Midale CO₂ Flood Project Field History and Project Forecast



The Challenges



Issues Associated With Low Severity Gasification of Lignite

- Tar & tar-oil recovery and utilization
- Phenolics – recovery and purification
- Process water – quantity, quality, treatment and utilization
- Environmental issues – ash, plant odors, process water



Is the Great Plains experience relevant to the future of low-rank coal gasification



It Depends on...

- q Your Specific Situation
- q Application Needed for Chemicals or liquid fuels Production?
- q For IGCC...?
- q Polygeneration?

In Conclusion . . .

- We've made it work well – with many interesting challenges along the way
- Key Success Factor: A highly competent staff with a 'production optimization' mindset
- Great Plains experience valuable to minimize commercialization cost of future low-rank coal gasification plants



Questions?

