



Applicants' Witness Jeffrey Greig

VP and General Manager
Business & Technology Services Division
Burns & McDonnell

Summary
Applicants' Exhibits 23 and 51



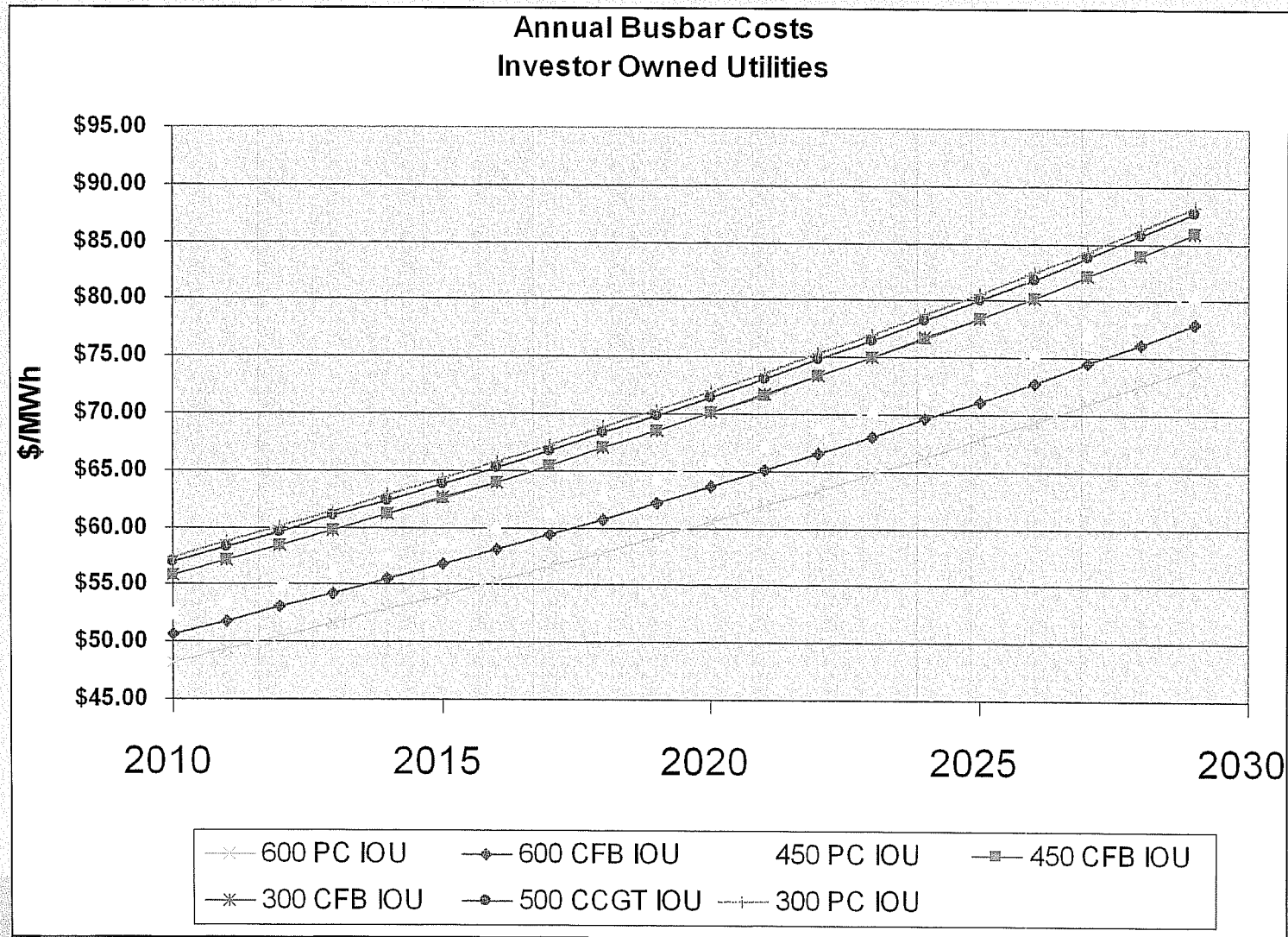
Purpose

- Based on initial planning efforts, Otter Tail and other utilities identified a potential need for additional baseload resources
- Burns & McDonnell (B&McD) was retained to evaluate baseload generation alternatives:
 - *Phase I Report Big Stone Unit II, July 2005*
(Applicants' Exhibit 24-A)
 - *Analysis of Baseload Generation Alternatives, September 2005*
(Applicants' Exhibit 23-A)

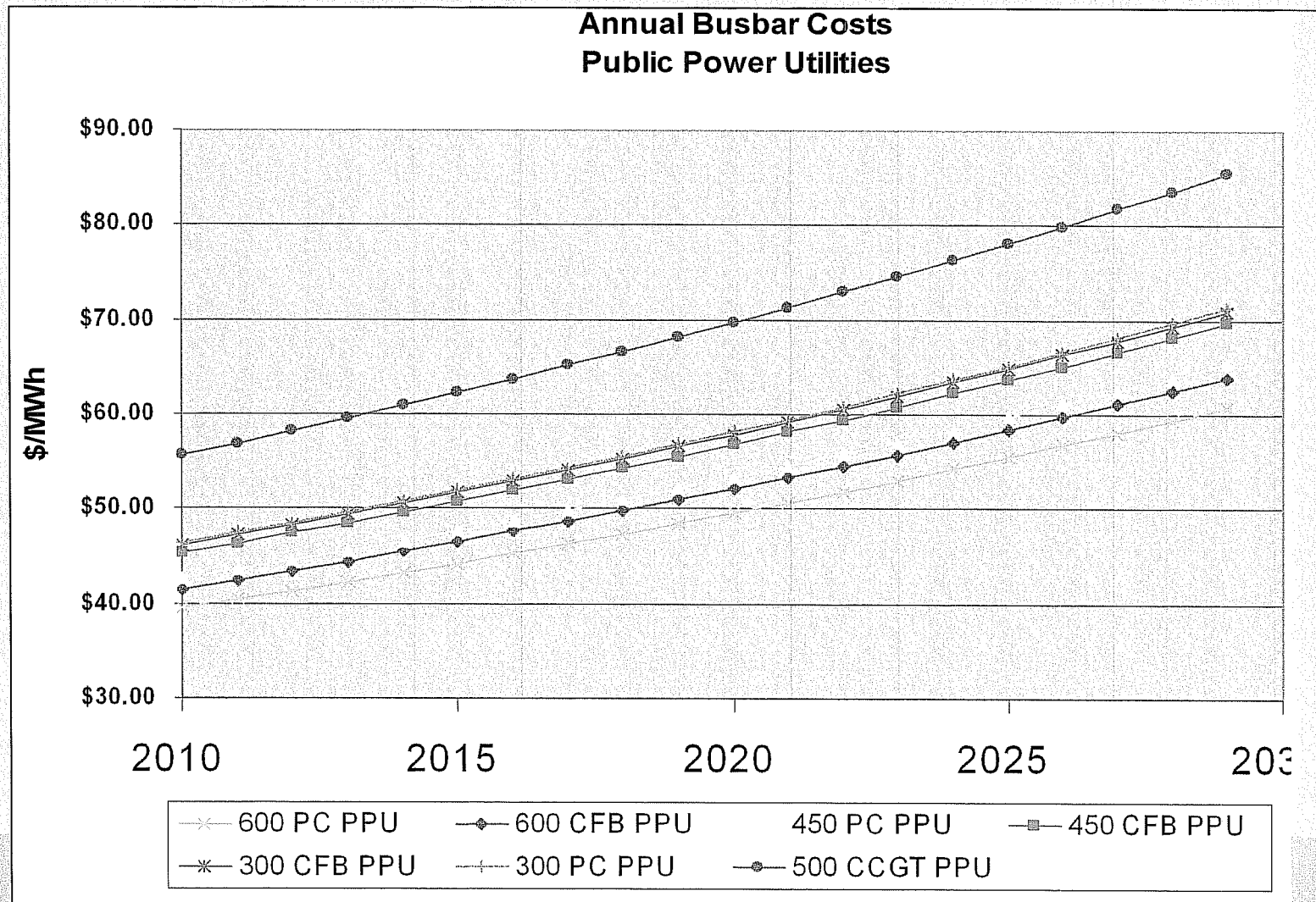
Phase I Report

- Included an economic evaluation of seven baseload generation alternatives:
 - Supercritical Pulverized Coal (PC) Unit
 - 450 MW / 600 MW
 - Subcritical PC Unit
 - 300 MW
 - Circulating Fluidized Bed (CFB) Coal Unit
 - 300 MW / 450 MW / 600 MW
 - Combined Cycle Gas Turbine (CCGT) Unit
 - 500 MW
- Included projected capital and operating costs, performance and emissions estimates, and financing structures and costs

Phase I Results – Investor Owned



Phase I Results – Public Power



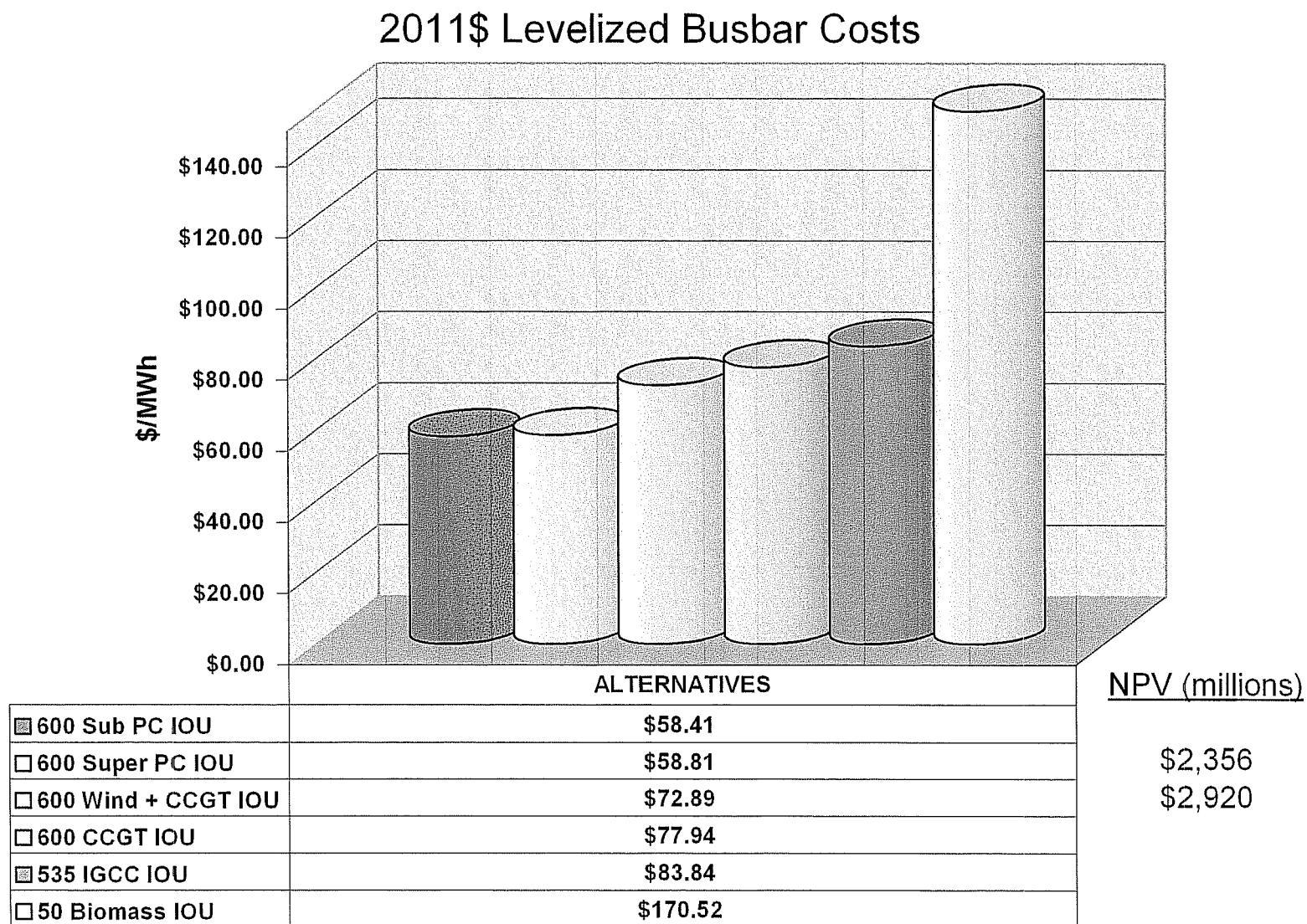
Phase I Conclusions

- Pulverized coal (PC) units had economic advantage over CFB units
- 600 MW Unit had economic advantage over smaller unit sizes, due to economies of scale
- 600 MW PC Unit had a significant economic advantage over 500 MW gas-fired CCGT for baseload generation

Analysis of Baseload Generation Alternatives

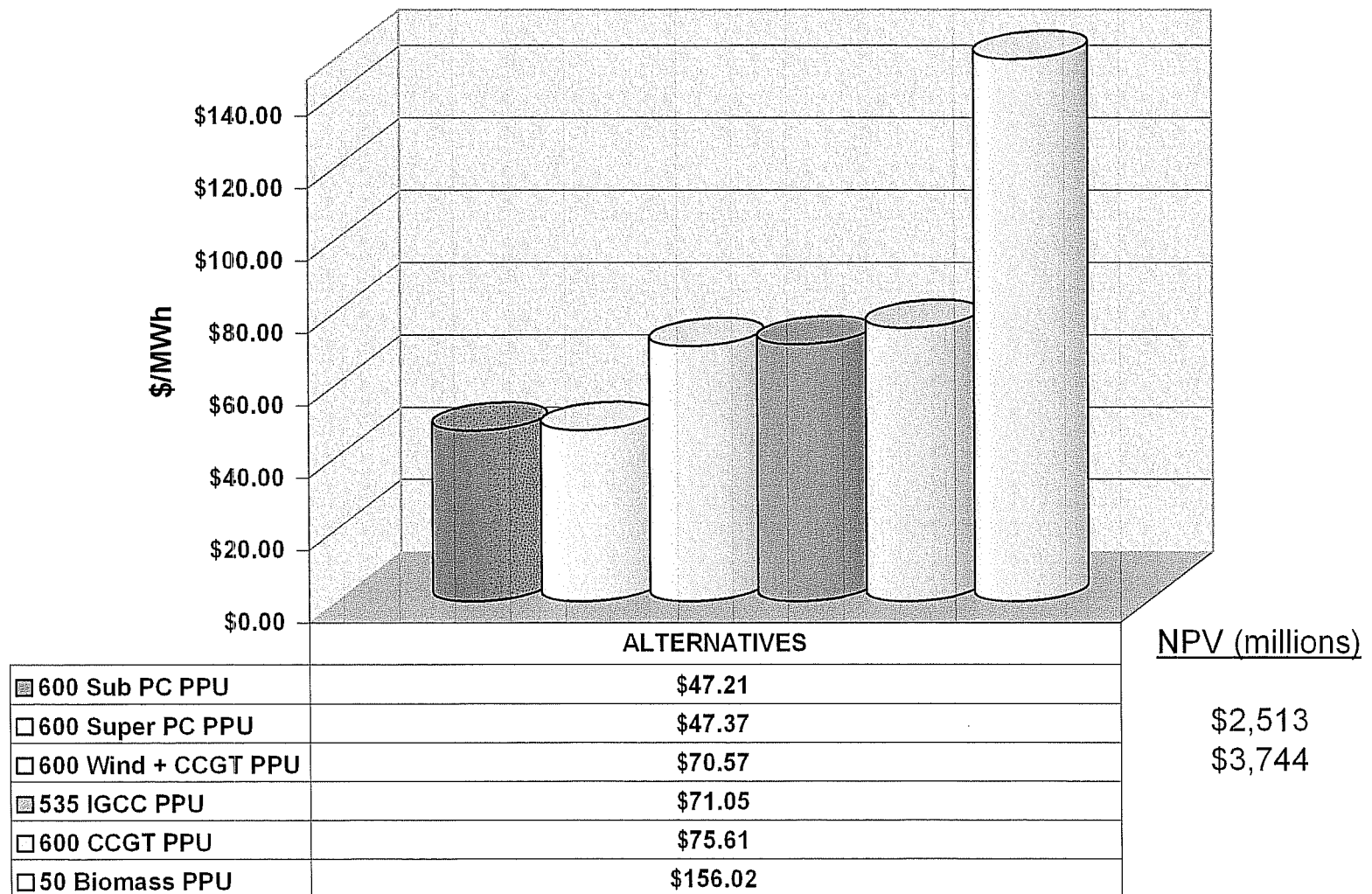
- Further Economic Evaluation of Six Baseload Generation Alternatives:
 - 600 MW Supercritical Pulverized Coal (PC) Unit
 - 600 MW Subcritical PC Unit
 - 600 MW Combined Cycle Gas Turbine (CCGT) Unit
 - 600 MW CCGT + 600 MW Wind Case
 - 535 MW Integrated Gasification Combined Cycle (IGCC) Unit
 - 50 MW Biomass Facility
- Included Projected Capital and Operating Costs, Performance and Emissions Estimates, and Financing Structures and Costs
- Included Carbon Sensitivity

Results – Investor Owned



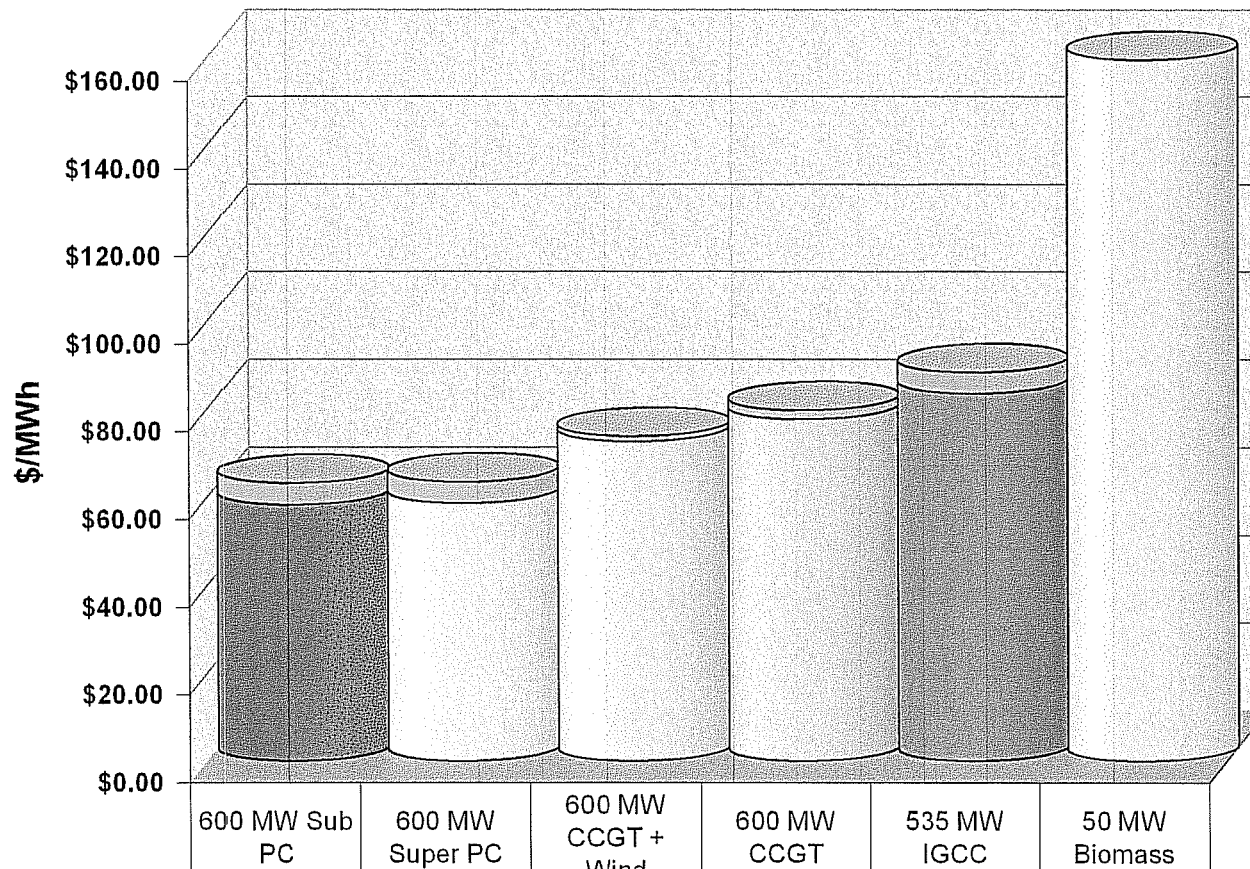
Results – Public Power

2011\$ Levelized Busbar Costs



\$3.64/ton CO₂ Sensitivity – Investor Owned

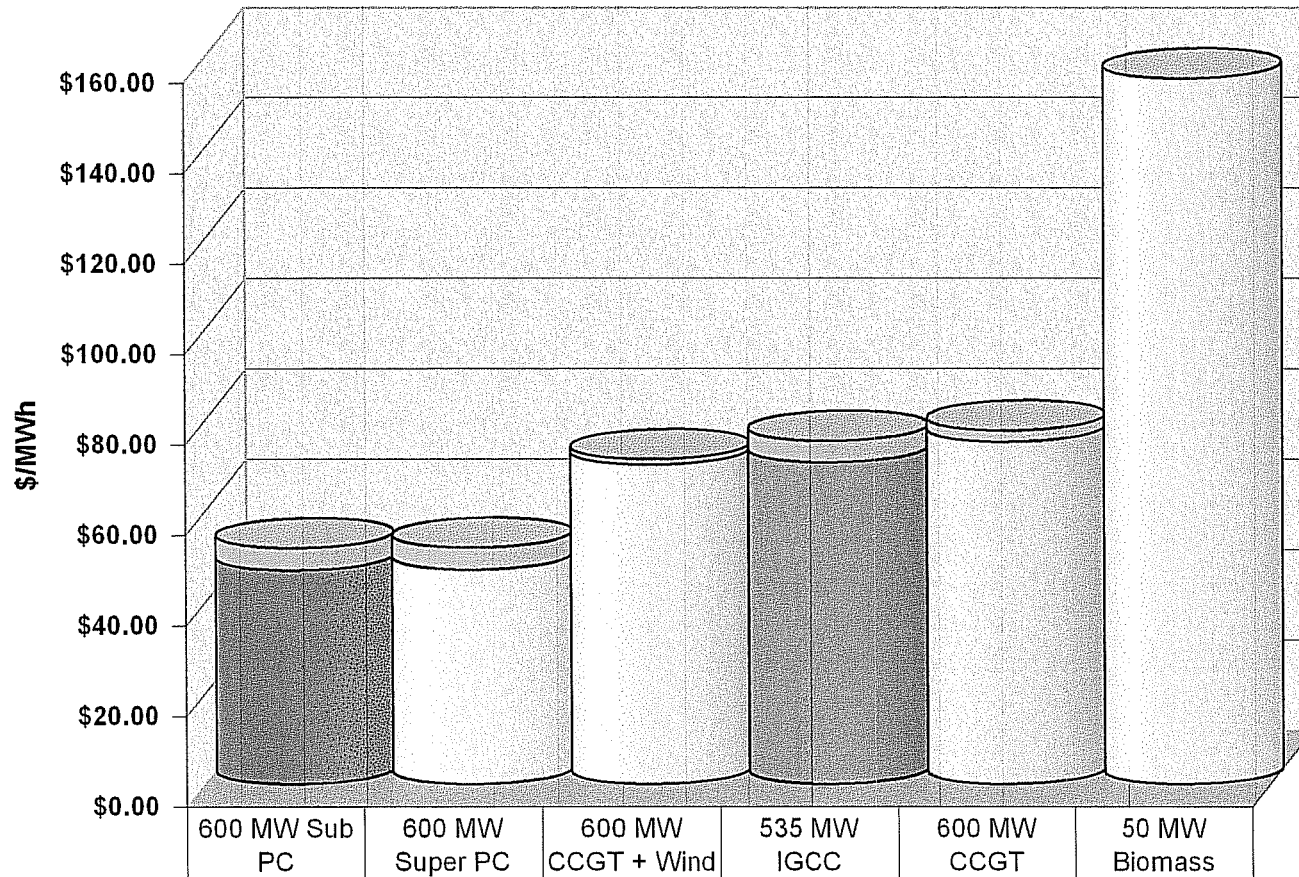
2011\$ Levelized Busbar Costs



	600 MW Sub PC	600 MW Super PC	600 MW CCGT + Wind	600 MW CCGT	535 MW IGCC	50 MW Biomass
Total Busbar Cost	\$63.39	\$63.69	\$74.08	\$79.98	\$88.67	\$170.52
Carbon Tax	\$4.98	\$4.88	\$1.19	\$2.04	\$4.83	\$0.00
Busbar Cost w/o Carbon Tax	\$58.41	\$58.81	\$72.89	\$77.94	\$83.84	\$170.52

\$3.64/ton CO₂ Sensitivity – Public Power

2011\$ Levelized Busbar Costs



Baseload Generation Conclusions

- Confirmed that 600 MW PC Unit represents low-cost baseload generation alternative
 - Conclusion did not change with inclusion of high-end Minnesota PUC carbon value
 - Conclusion did not change with or without extension of the Production Tax Credit for wind
- Supercritical and subcritical units had similar economics
 - Applicants selected supercritical to minimize emissions

Baseload Generation Study Criticism

- Intervenor's say 600 MW CCGT Plus Wind Case should have been given capacity credit for wind
 - 600 MW CCGT & 600 MW PC are baseload resources
 - Wind is not a baseload resource
 - Wind was added to CCGT analysis to enhance CCGT economics
- Purpose of B&McD Studies was to evaluate baseload alternatives
 - Applicants performed system-level studies for their Integrated Resource Plans

Intervenors Criticism (continued)

Table 1
Net Present Value Busbar Cost (millions)

<u>Resource Alternative</u>	Combined ^[2] B&McD Cases	
	No CO ₂	PUC High CO ₂ ^[1]
Coal 600 MW	\$2,452	\$2,686
600 MW Wind + 600 MW CCGT - NO PTC	\$3,425	\$3,483
600 MW Wind + 510 MW CCGT - NO PTC	\$3,357	\$3,414
600 MW Wind + 600 MW CCGT - WITH PTC	\$3,163	\$3,221
600 MW Wind + 510 MW CCGT - WITH PTC	\$3,095	\$3,153

Notes:

[1] PUC High CO₂ Case is based on a \$3.64/ton carbon tax in 2005 and escalated at 2.5%.
Results in a 2005 levelized cost of \$4.50/ton in 2005\$.

[2] Investor owned and public power NPV results combined 38.67%/61.33%
based on respective ownership shares.