



Analysis of Potential Impacts of CO₂ Emissions Limits on Electric Power Costs in the ERCOT Region

Dan Woodfin
Director, System Planning

Board of Directors

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Scope

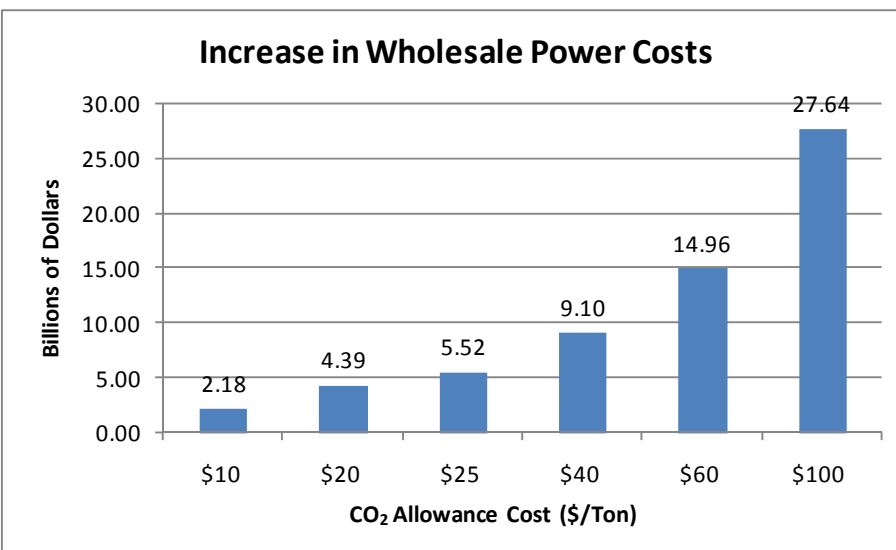
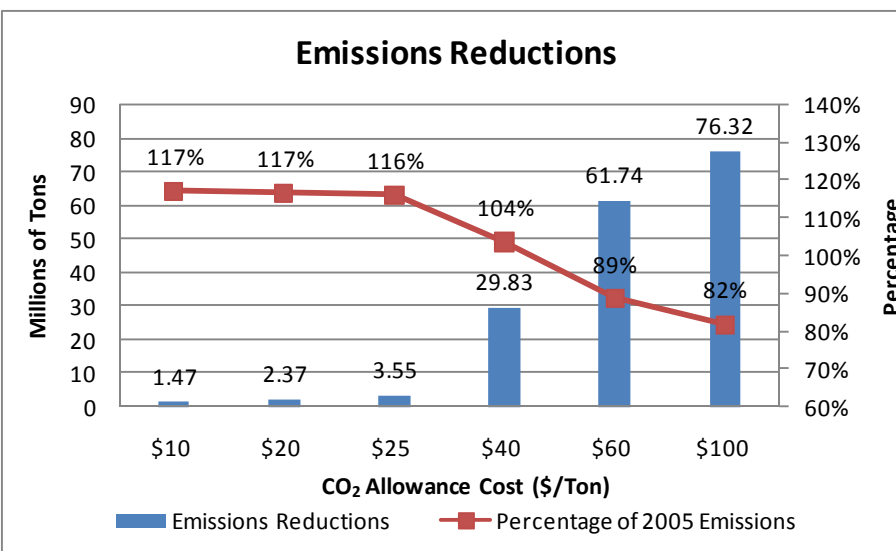
- **ERCOT was requested by PUCT leadership to conduct an “analysis of the likely effects of proposed climate change legislation on electricity prices in the ERCOT market.”**
- **Study was focused on the near-term impacts of this potential legislation.**
- **Longer-term effects, such as changes in the installed generation capacity and changes to the transmission system due to altered generation dispatch as a result of the imposition of carbon allowance costs were not evaluated.**
- **Analysis assumes that the goals of the legislation must be met directly by reductions in CO₂ emissions by ERCOT-region generation.**

Methodology

- **ERCOT performed this analysis by simulating the cost-based, hourly dispatch of all existing and committed generation in ERCOT region to serve the electric load in the region for the year 2013.**
- **Study does not include any market-driven bidding behavior or scarcity pricing, and the wholesale prices and wholesale market costs reported from the simulations are also cost-based as a result.**
- **The simulations were performed for several scenarios defined by:**
 - the level of natural gas prices (\$7 and \$10 per MMBtu);
 - the size of potential reduction in energy use as compared to the forecasted load for 2013 (0%, 2% , 5% and 10% reductions); and,
 - the amount of installed wind generation (the approximately 9,400 MW of existing and committed wind generation capacity and the 18,456 MW of total wind generation capacity based on CREZ)
- **For each scenario, simulations were performed at increasing carbon allowance costs of \$0, \$10, \$25, \$40, \$60 and \$100 per ton of CO₂.**

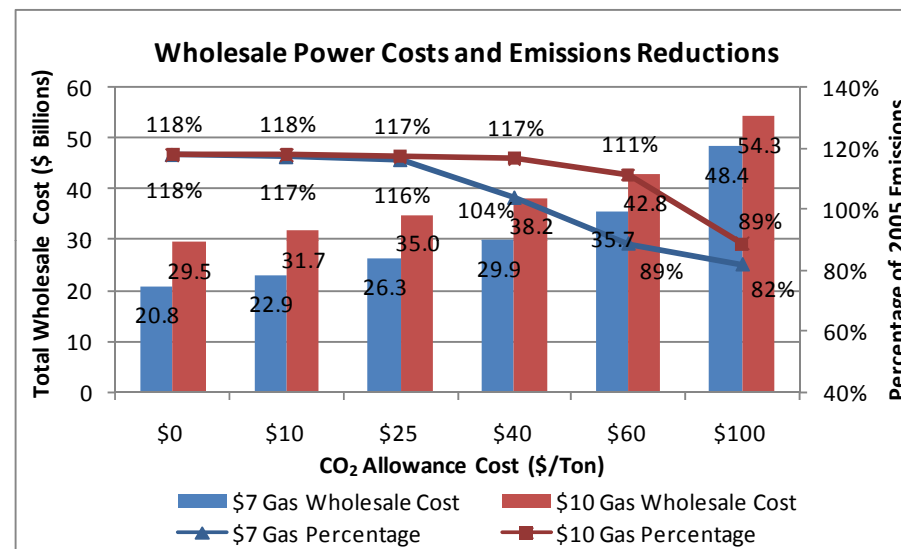
Reference Case

- **\$7/MMBtu natural gas prices**
- **Expected load levels**
- **Existing and committed level of wind and other generation**
- **CO₂ allowance costs must rise to between \$40 and \$60 per ton in order to reduce CO₂ emissions from electric generation in ERCOT to 2005 levels by 2013.**
- **Annual increase in wholesale power costs of approximately \$10 billion**
- **Increase in typical consumer's monthly bill of \$27;**



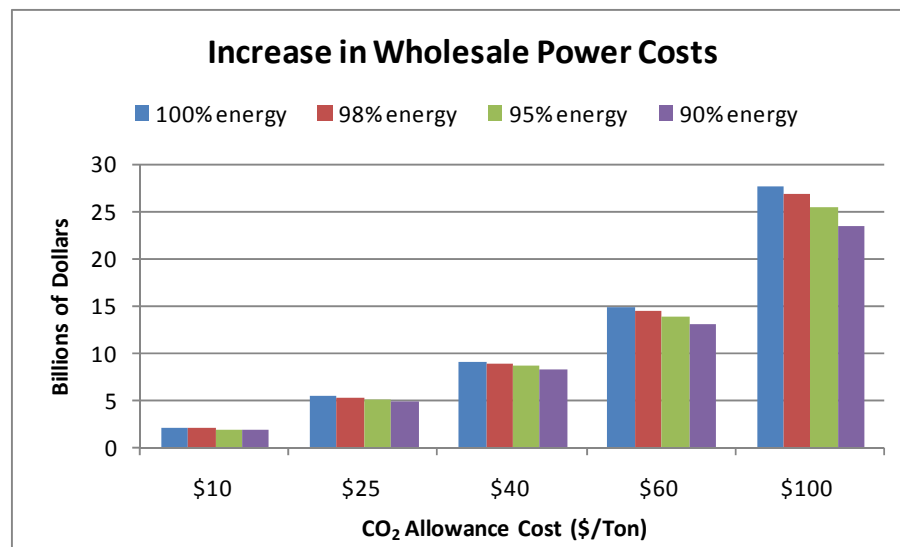
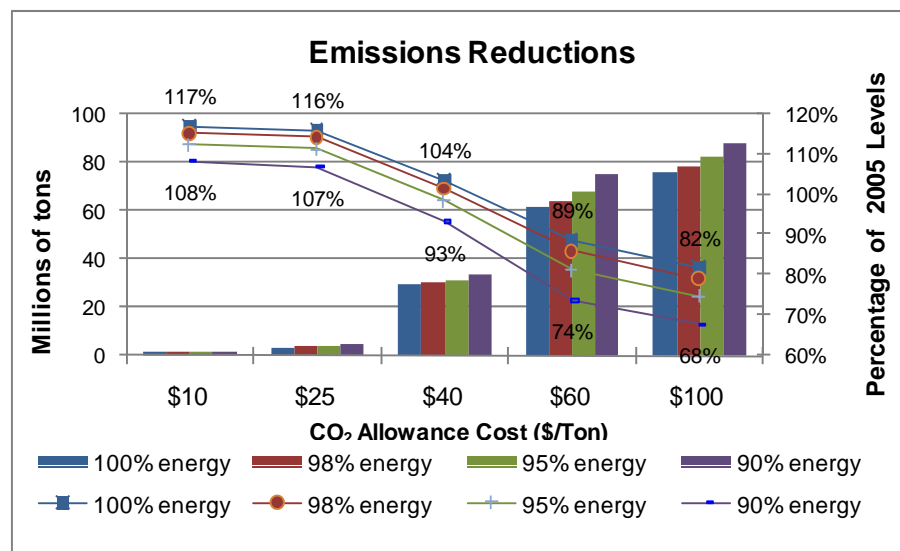
High Gas Prices

- \$10/MMBtu natural gas prices
- Expected load levels
- Existing and committed level of wind and other generation
- Wholesale power costs are higher with higher gas prices at all CO₂ allowance prices
- Higher gas prices require a higher allowance price for CO₂ emissions to be reduced below 2005 levels
- Annual increase in wholesale power costs of approximately \$20 billion



Reduced Energy Use

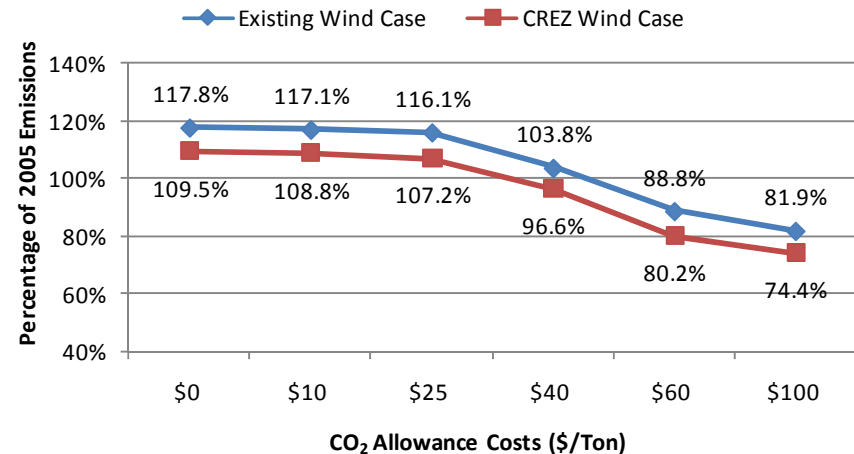
- **\$7/MMBtu natural gas prices**
- **Existing and committed level of wind and other generation**
- **Load reduced by stated percentage**
- **CO₂ allowance costs must rise to between \$25 and \$40 per ton if total energy use was reduced by 10% in order to reduce CO₂ emissions from electric generation in ERCOT to 2005 levels by 2013.**
- **Annual increase in wholesale power costs of approximately \$7 billion (savings of \$3B over reference case)**
- **Increase in typical consumer's monthly bill of \$17**



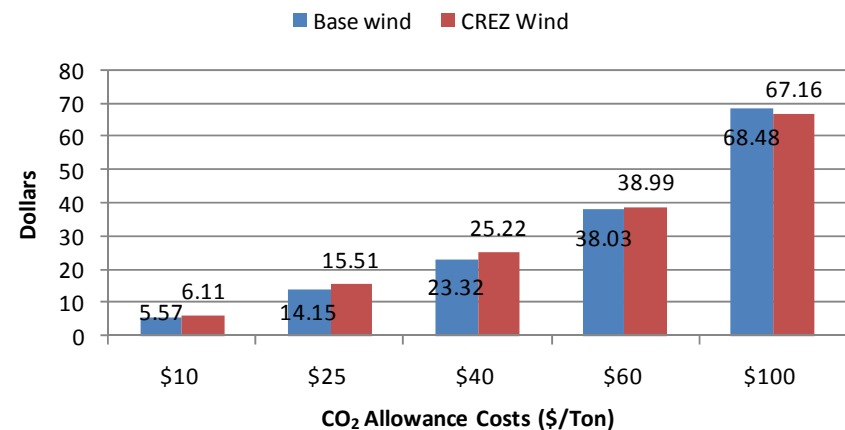
Additional CREZ Generation

- **\$7/MMBtu natural gas prices**
- **Expected load levels**
- **18,456 MW installed wind (compared to 9,400MW)**
- **CO₂ allowance costs must rise to between \$25 and \$40 per ton in order to reduce carbon emissions from electric generation in ERCOT to 2005 levels by 2013.**
- **Annual increase in wholesale power costs of approximately \$7 billion (savings of \$3B over reference case)**
- **Increase in typical consumer's monthly bill of \$22**

Comparison of CO₂ Emissions to 2005 Emissions

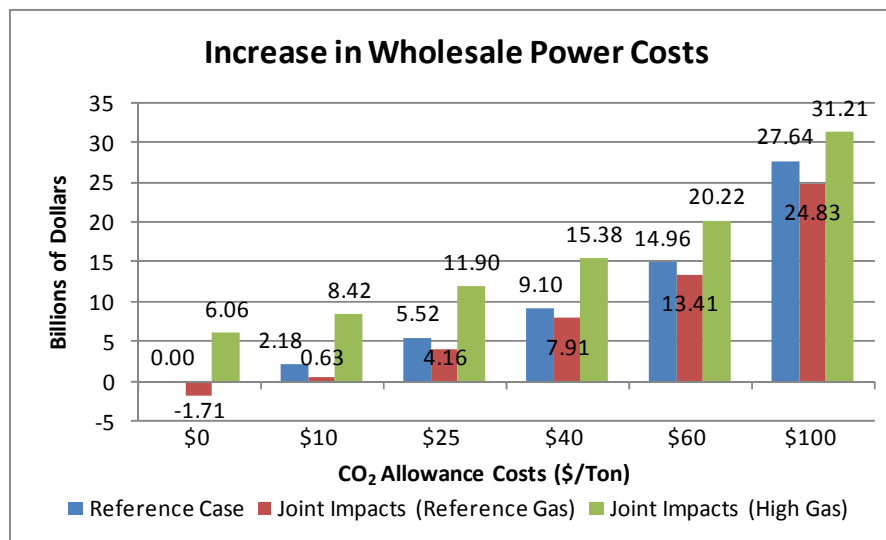
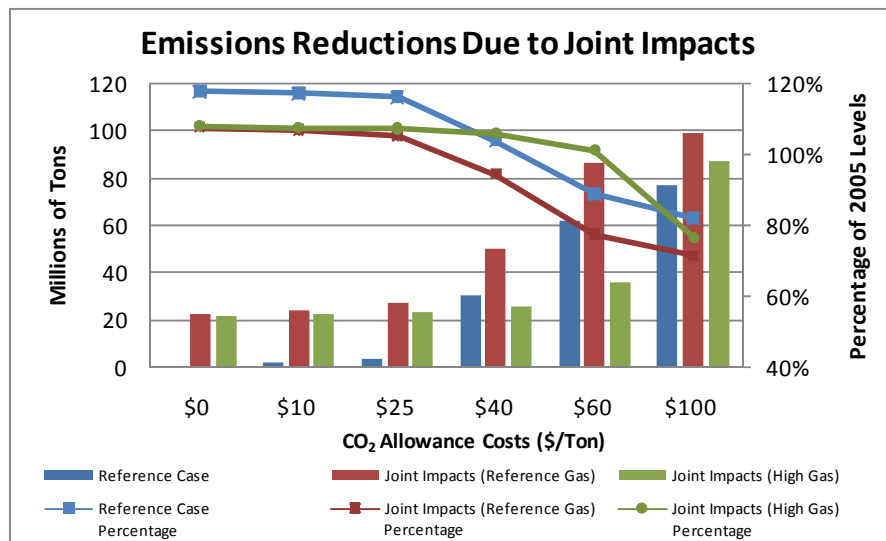


Monthly Bill Increase for a 1,000 kWh customer



Joint Impacts

- The combination of CREZ wind and lower energy usage results in lower increases due to CO₂ emissions limits in wholesale power costs at \$7/MMBtu gas, compared to the reference case.
- The combination of additional CREZ wind generation and 2% lower energy usage does not offset the impact of an increase of natural gas prices from \$7/MMBtu to \$10/MMBtu on the level of allowance costs at which emissions reductions targets would be met.



Questions?