Future Scenario Development for the ERCOT Long-Term Study

Kevin Hanson
Supervisor, Resource Planning

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Initial thoughts on the development of future scenarios for potential use in the long-term study…

- **Attempt to capture a broad range of possible futures**
- **Given specific forecasts of market drivers, scenarios developed will create an internally consistent view of the future**
- **Each future scenario contains a view of the world markets and developments, as well as a specific focus on the impacts to/for Texas**
- **The scenarios attempt to describe potential impacts over the next 20 years for:**
  - Interest and inflation rates
  - Non-Farm Employment in Texas
  - Environmental costs
  - Fuel costs
  - Capital costs for generation expansion
  - Other market drivers

“Green Giant” Scenario

- **US / World Impact**
  - Concerns about the environment are beginning to take center stage
  - "Kyoto 2" has been signed by all countries
  - Strong CO_2 legislation and EE / renewable requirements have been set at high levels worldwide
  - This is also resulting in substantial export of coal from the U.S. resulting in all commodity prices rising

- **Texas Impact**
  - Texas is leading with enhanced oil recovery occurring in West Texas using carbon capture, shale gas production occurs near Dallas, and commodity trading causing the Houston economy to grow.

“Long-Term Recession” Scenario

- **US / World Impact**
  - The world economy is in decline
  - Environmental regulations are eased as economic issues are paramount
  - Fuel prices are low as demand for energy declines
  - Inflation rates are low and interest rates are held at historically low to support fragile economies

- **Texas Impact**
  - Texas is the boom town in this future. Even so, there is no economic growth which results in no load growth
  - Actual load growth turns negative as industries continue to close

“Environmental Instability” Scenario

- **US / World Impact**
  - World wide droughts grow or persist in generally dry regions and many crops failing
  - Environmental concerns mount worldwide
  - Significant efforts to reduce GHG emissions
    - Carbon prices climb drastically causing fossil fuel use to decline
    - Natural gas demand grows as a substitute for coal in coal fired plants
  - Economic disparities become pronounced between countries based on reliance on fossil fuels

- **Texas Impact**
  - Drought continues with some areas being impact by lack of water
  - Water is at premium and rationing begins
  - Desalination projects are being built
  - All low water usage technologies are being considered

"No CO_2 Concerns" Scenario

- **US / World Impact**
  - World concern for the environment declines
  - No or limited national CO_2 program
  - Coal prices increase due to demand both internally and externally
  - US exports of coal increase significantly

- **Texas Impact**
  - Texas demand growth continues at expected levels

“Boom Town” Scenario

- **US / World Impact**
  - World economy is booming
  - This will be marked by high GDP in the US for 4 to 5 years then returning to 2.5% to 3% range thereafter
  - All fuel prices will rise due to demand

- **Texas Impact**
  - Texas growth is strong on all fronts

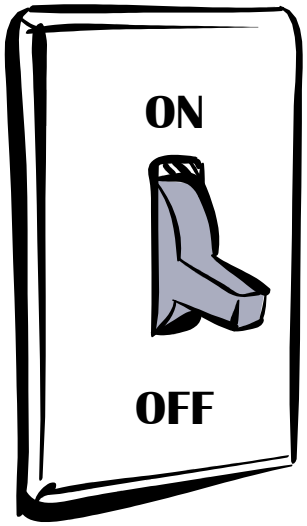
Assumptions

Economy Assumptions	"Green Giant"	"Long-Term Recession"	"Environmental Instability"	"No CO2 Concerns"	"Boom Town"
World GDP (AGR for 20 years)	6%	1%	2%	3%	5%
U.S. GDP (AGR for 20 years)	4%	-1%	4%	2%	5%
Rest of OECD GDP (AGR for 20 years)	4%	-1%	3%	2%	3%
BRIC Countries GDP (AGR for 20 years)	8%	5%	3%	4%	7%
Texas GDP	5%	0%	5%	3%	5%
Non-Farm Employment in Texas in 2030 (millions)	19	9	15	14	19
Interst Rate (LIBOR)	8%	1%	1%	2.5%	5%
U.S. Inflation Rate	4%	0%	6%	2%	3%
U.S. Tax Rate	35%	80%	35%	35%	20%
Commodities					
Crude Oil ($/bbl in 2010$)	$200	$40	$50	$80	$125
Natural Gas ($/mmbtu in 2010$)	$20.000	$4.000	$6.000	$8.000	$12.000
Central App ($/ton minemouth in 2010$)	$300	$50	$45	$150	$150
Cent App heat content (btu/lb)	12,000	12,000	12,000	12,000	12,000
Coal (PRB delivered) ($/mmbtu in 2010$)	$12.500	$2.083	$1.875	$6.250	$6.250
Coal exports from U.S. to rest of world (millions of tons per year)	500	0	50	300	400
Coal (PRB delivered) ($/ton in 2010$)	$150	$35	$20	$75	$100
PRB heat content (btu/lb)	8,800	8,800	8,800	8,800	8,800
Coal (PRB delivered) ($/mmbtu in 2010$)	$8.523	$1.989	$1.136	$4.261	$5.682

Assumptions

Economy Assumptions	"Green Giant"	"Long-Term Recession"	"Environmental Instability"	"No CO2 Concerns"	"Boom Town"
U.S. Emission Costs					
Annual NOx ($/ton)	$1,000	$300	$1,000	$300	$300
SO2 ($/ton)	$300	$60	$3,000	$60	$60
CO2 ($/ton)	$25	$0	$50	$10	$10
2015	$50	$0	$100	$10	$15
2020	$75	$0	$200	$15	$20
2025	$100	$0	$300	$20	$25
Other					
Solar panels allowed by HOAs	Yes	Yes	Yes	Yes	Yes
Capital Cost Assumptions ($/kW in 2010$)					
Nuclear	6,000	5,000	4,000	6,000	6,000
Coal with CCS	5,000	4,000	5,000	3,000	3,000
Supercritical Coal	2,500	2,500	N/A	2,500	2,500
Natural Gas Combine Cycle	1,200	1,000	1,200	900	900
Natural Gas Peaking Facility	1,000	800	1,000	800	800
Wind Turbine	2,500	1,500	1,500	2,500	1,000
Geothermal	3,500	3,000	3,000	3,000	3,000
Solar Farms	5,000	5,000	2,500	5,000	4,500

Questions



Contact Information

For additional information:

- **Email LongTermStudy@ercot.com**
- **Phone 512-248-3152**