Study Assumptions

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Economic study assumptions/drivers, ranges, and futures

- MISO's & ATC's new PROMOD models
- Input assumptions/drivers
- ATC's new Futures & Matrix

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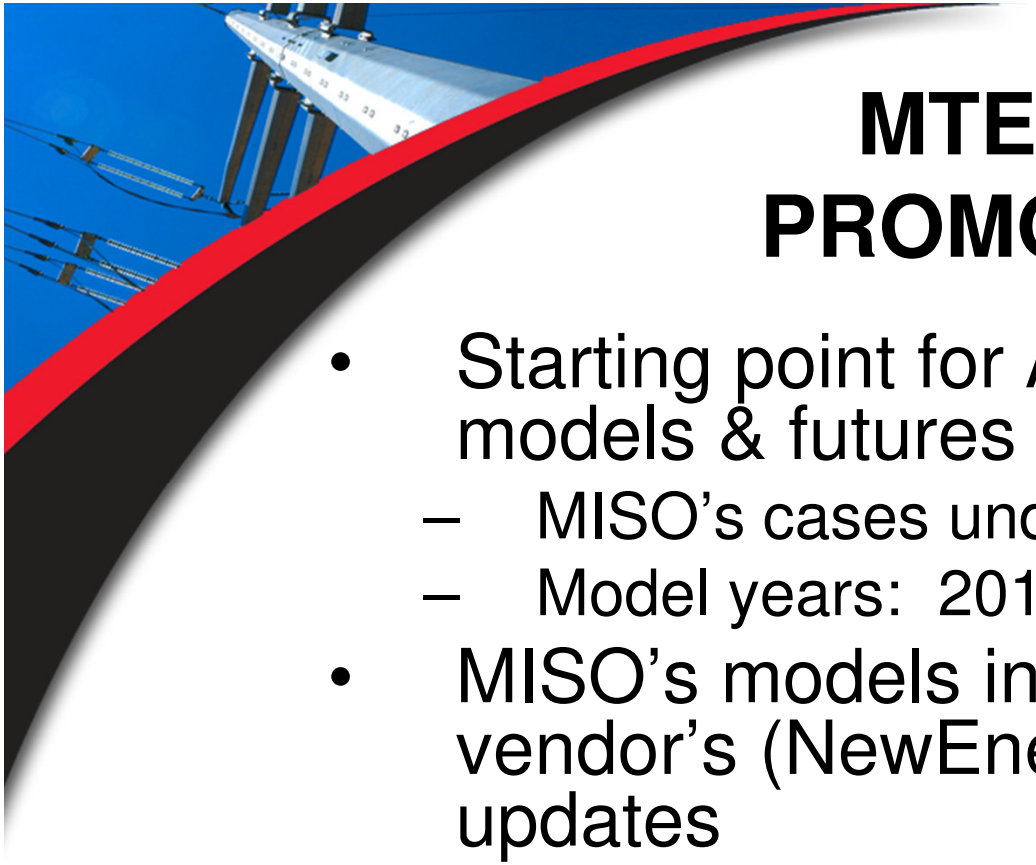

MTEP09 & ATC's New PROMOD Cases & Futures

- Starting point for ATC's new PROMOD models & futures MISO's MTEP09 cases
  - MISO's cases under development
  - Model years: 2013, 2018 & 2023
- MISO's models include the PROMOD vendor's (NewEnergy Associates) latest updates
- Will update ATC's futures using our "bounding case" (Strategic Flexibility) approach
- Seeking your input on "bounding" model assumptions/drivers for the futures

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Key Drivers

- Peak Load & Energy Growth Rates
- Natural Gas Costs (coal costs?)
- CO_2 Tax
- Amount & Location of Renewables
- Amount of Low-Cost Generation, particularly within ATC
- Internal/External transmission & CapX 2020
- Others?

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Peak Load & Energy

- Appropriate “bounds” for load & energy
  - ATC’s 2007 futures:
    - Mid @ 2% per yr (peak demand and energy),
    - Lower @ 0.5% => -75%,
    - Upper @ 3% => +50%.
  - MISO’s current cases
    - Mid @ 2% per yr for ATC
      - 1.5% for MISO overall
    - MISO “Low” -25% => 1.5% for ATC (Environ. future)
  - Impact of Governor's Task Force on Global Warming recommendations?
  - Different peak load & energy growth rates?
  - Amount, cost & location of demand response?

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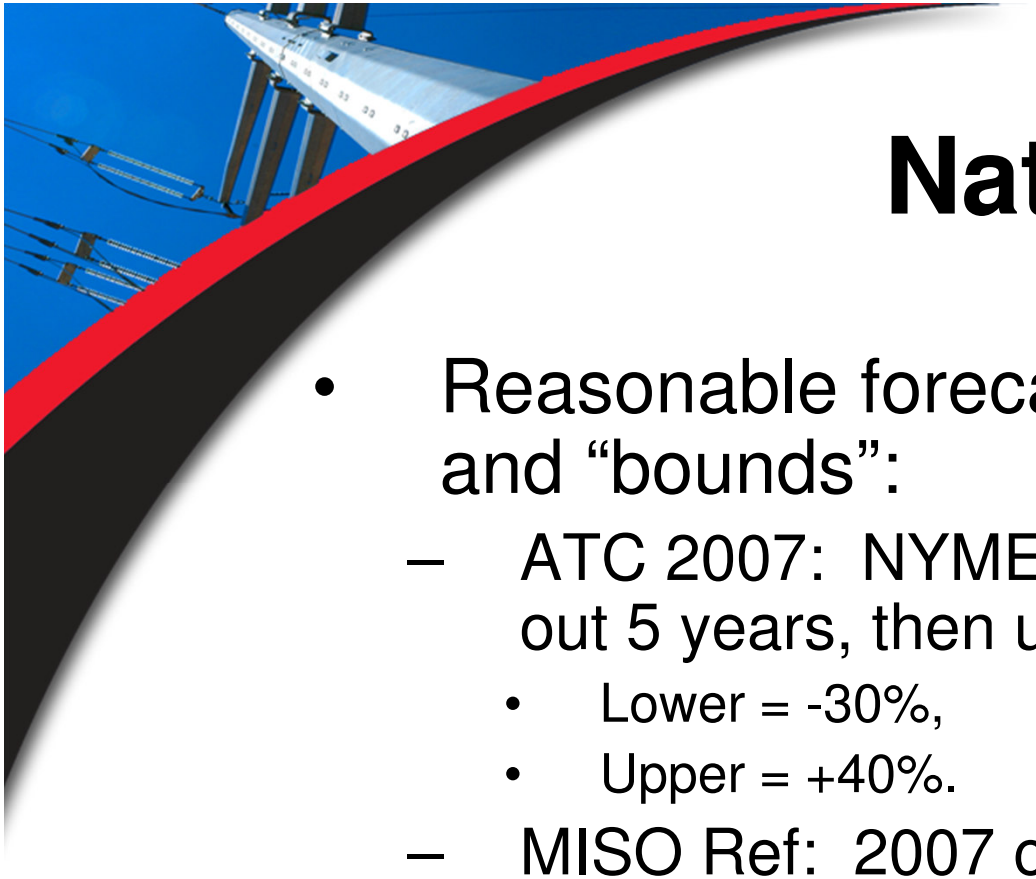

Natural Gas Costs

- Reasonable forecast for natural gas costs and “bounds”:
  - ATC 2007: NYMEX natural gas futures extend out 5 years, then use EIA escalation
    - Lower = -30%,
    - Upper = +40%.
  - MISO Ref: 2007 cost escalated at 4% per year
    - “Mid/High” is Reference +20%
      - Used in MISO’s Environmental & Regulatory futures
  - Variation between winter and summer costs declining? What type of ratio?
  - Natural gas costs often drive LMPs

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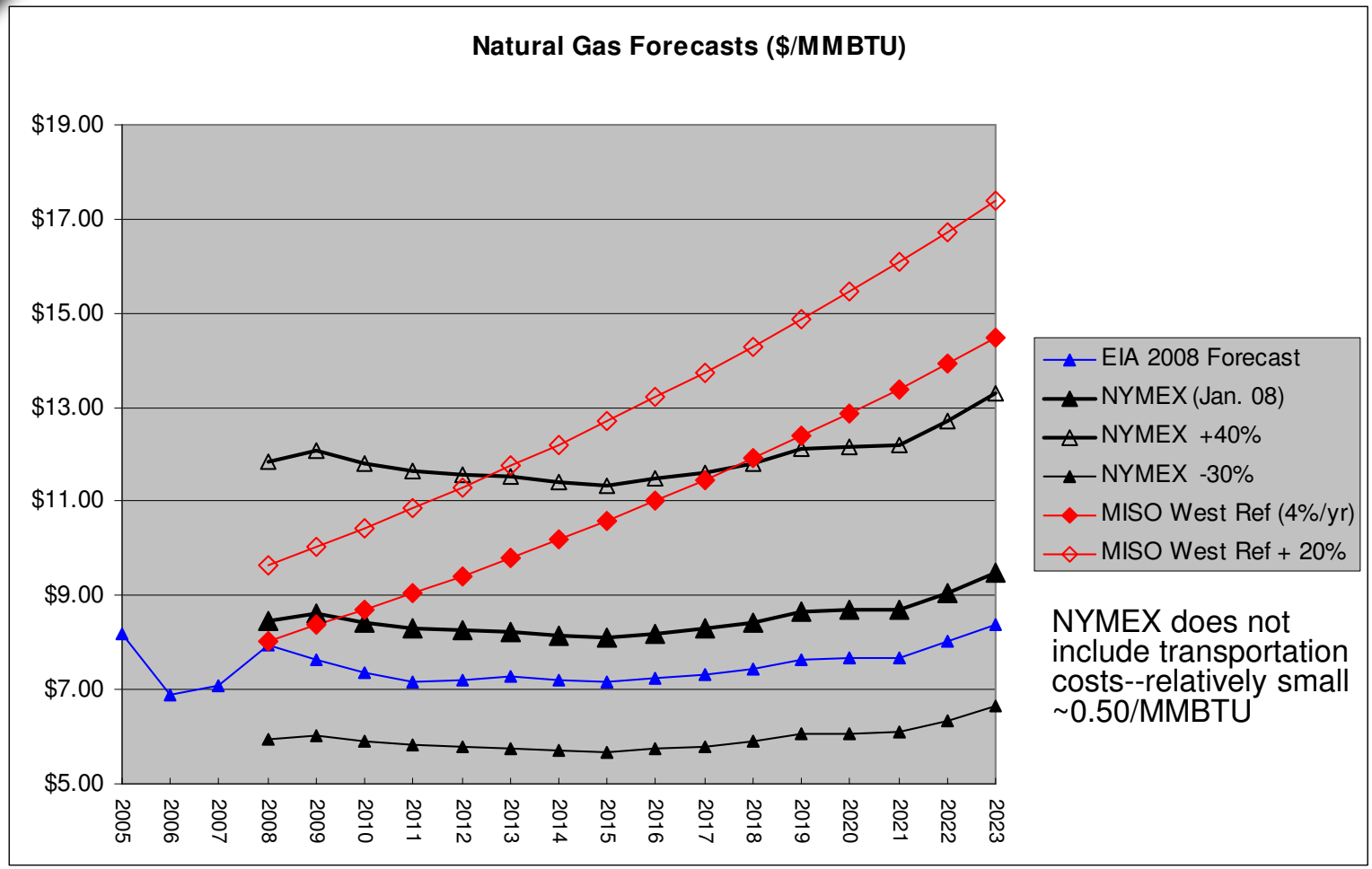
Natural Gas Costs



NYMEX does not include transportation costs--relatively small ~0.50/MMBTU

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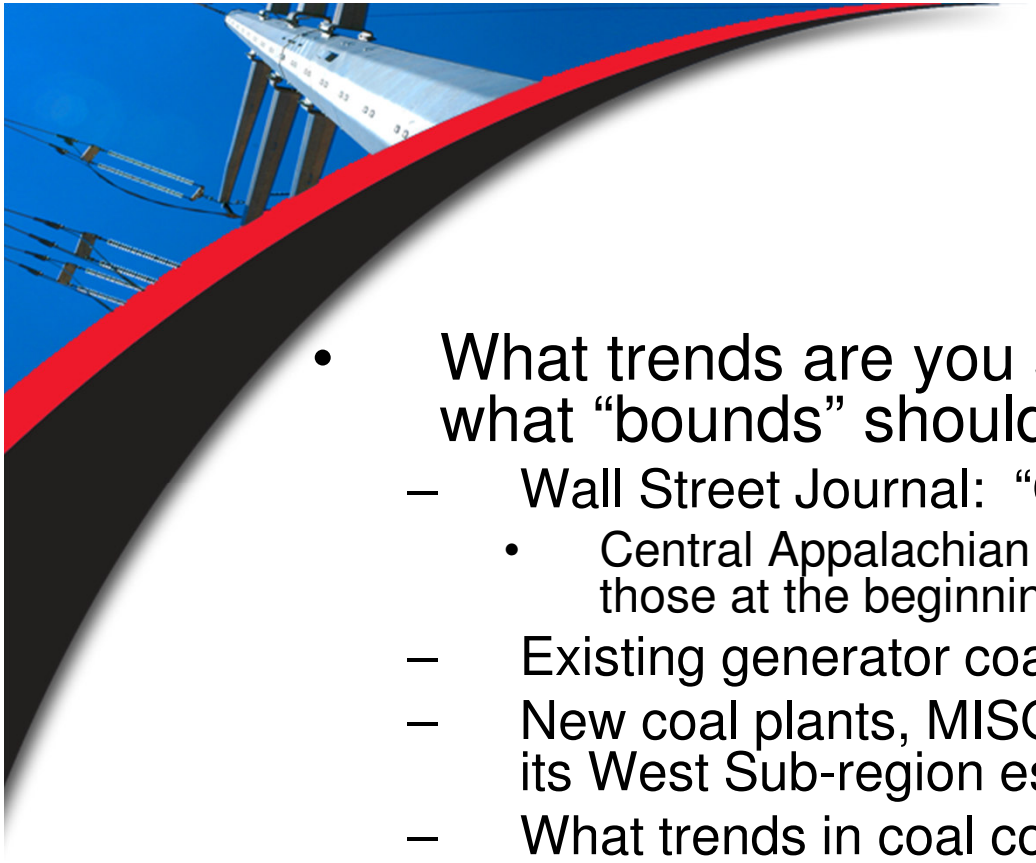

Coal Costs

- What trends are you seeing in coal costs and what "bounds" should ATC use?
  - Wall Street Journal: "China Spurs Coal-Price Surge"
    - Central Appalachian coal futures for March delivery are 2X those at the beginning of 2007. (2/12/08)
  - Existing generator coal costs are unit specific from NEA
  - New coal plants, MISO has $1.37/MMBTU (2008$) for its West Sub-region escalated at 2%/yr ($1.67 in 2018)
  - What trends in coal costs are you seeing and do you anticipate in the future?
  - Does a high CO_2 tax effectively capture/bound the upward pressure on coal costs or not?
  - Should ATC's bounds be expanded, especially on the Upper side? How much?
    - Lower = -10%,
    - Upper = +10%

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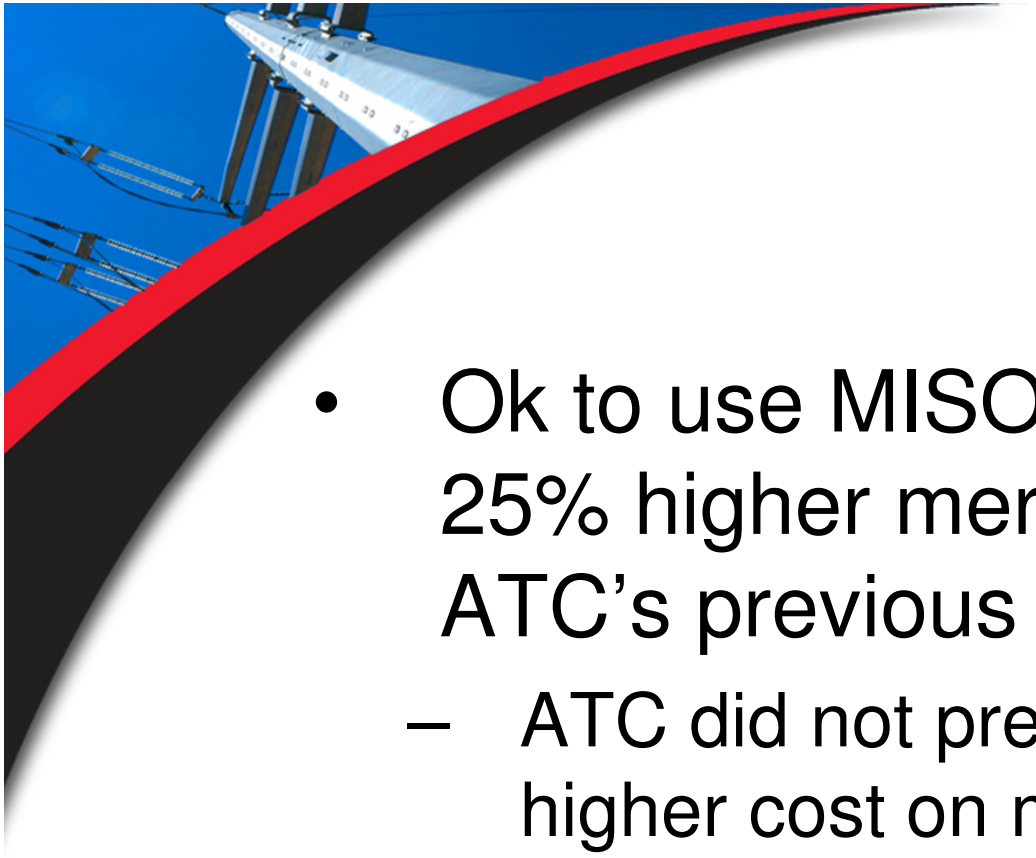

CO_2 Tax

- Ok to use MISO's \$25/ton CO_2 (and 25% higher mercury cost) instead of ATC's previous \$44/ton CO_2 tax?
  - ATC did not previously include a 25% higher cost on mercury in its analysis
  - Adopting MISO's assumption avoids the time consuming process of developing a new expansion plan based on a \$44/ton CO_2 tax

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Amount & Location of Renewables

- For MISO's Reference future:
  - Wind added and sited based on existing state mandates
- For MISO's 20% DOE Wind Mandate future:
  - Wind siting is not limited by regions' boundaries. More wind sited in regions (e.g. MISO) with better wind potential.
    - For example, some of PJM's required wind generation is sited in the West Sub-region of MISO.
  - DOE helped MISO with the wind generation siting.
  - Greenfield wind generation siting follows 80/20 rule: 80% of wind sited in areas with Class 3 wind speed or greater and 20% is sited in Class 2 or greater.
  - Adopt MISO's wind modeling from its Reference and 20% wind futures for ATC's futures?

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Amount of Gen. within ATC- Particularly Low Cost Gen.

- MISO added generation in each of its futures based on its siting rules
- MISO developed gen. expansion plans and will develop PROMOD cases for 2013, 2018 & 2023

MISO Generator Additions within ATC

		MISO Futures				
UNIT Type	Capacity	Ref	20%	Env	Reg	Location Within ATC
Coal	600	2016	2016			Columbia
Coal	600	2023	2023			Weston
Coal	600				2021	Nelson Dewey
Coal	600				2023	Columbia
Ct	600	2013	2013			Between Arpin & Hume
Ct	600				2013	Rockgen Energy Center
Ct	600				2018	Concord
Ct	600				2018	De Pere Energy Center
NUC	1200			2023		Kewaunee

MISO used canceled/active queue generation without signed IAs for siting future gen.

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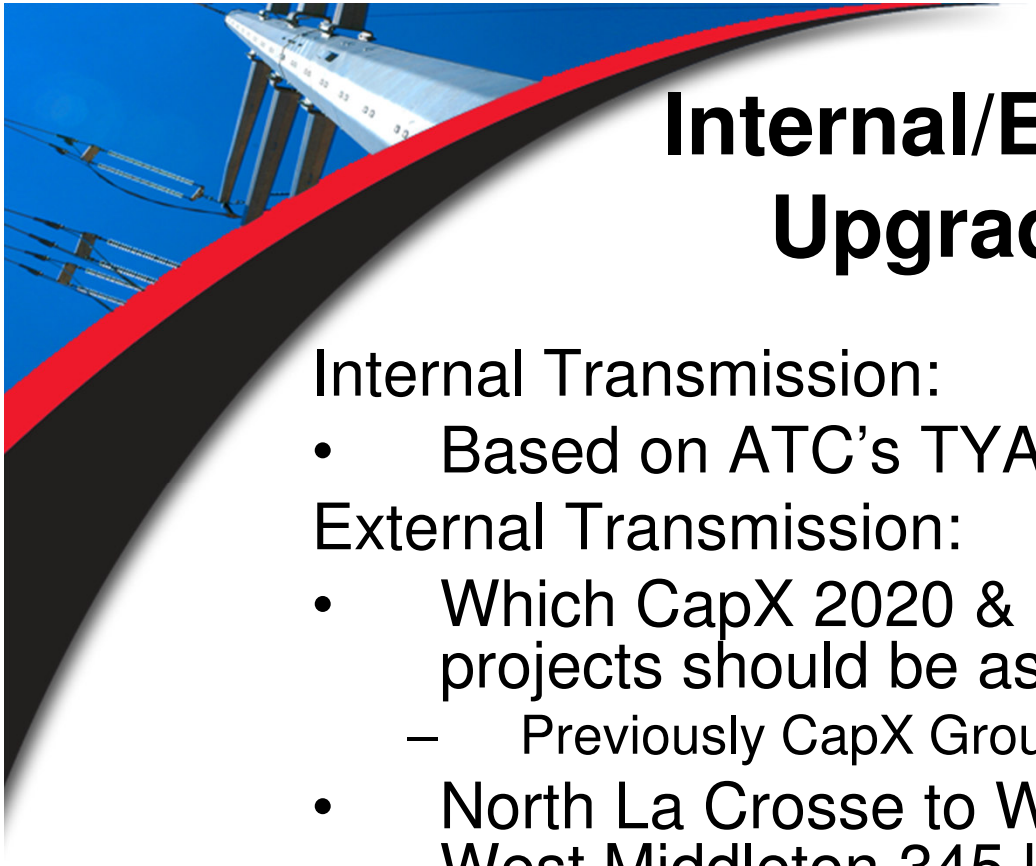

Internal/Exter. Transmission Upgrades & CapX 2020

Internal Transmission:

- Based on ATC's TYA (planned and proposed)

External Transmission:

- Which CapX 2020 & other large external trans. projects should be assumed as "Mid" drivers?
  - Previously CapX Group 1 in all futures.
- North La Crosse to West Middleton or Salem to West Middleton 345 kV line?
  - Relieve Southwest WI low voltages
  - Increase import capability
  - Provide 345 kV outlets for NLAX & Salem, respectively
- Other large projects as "Upper" drivers?
  - ITC's 765 kV project?
  - Southern Indiana projects?

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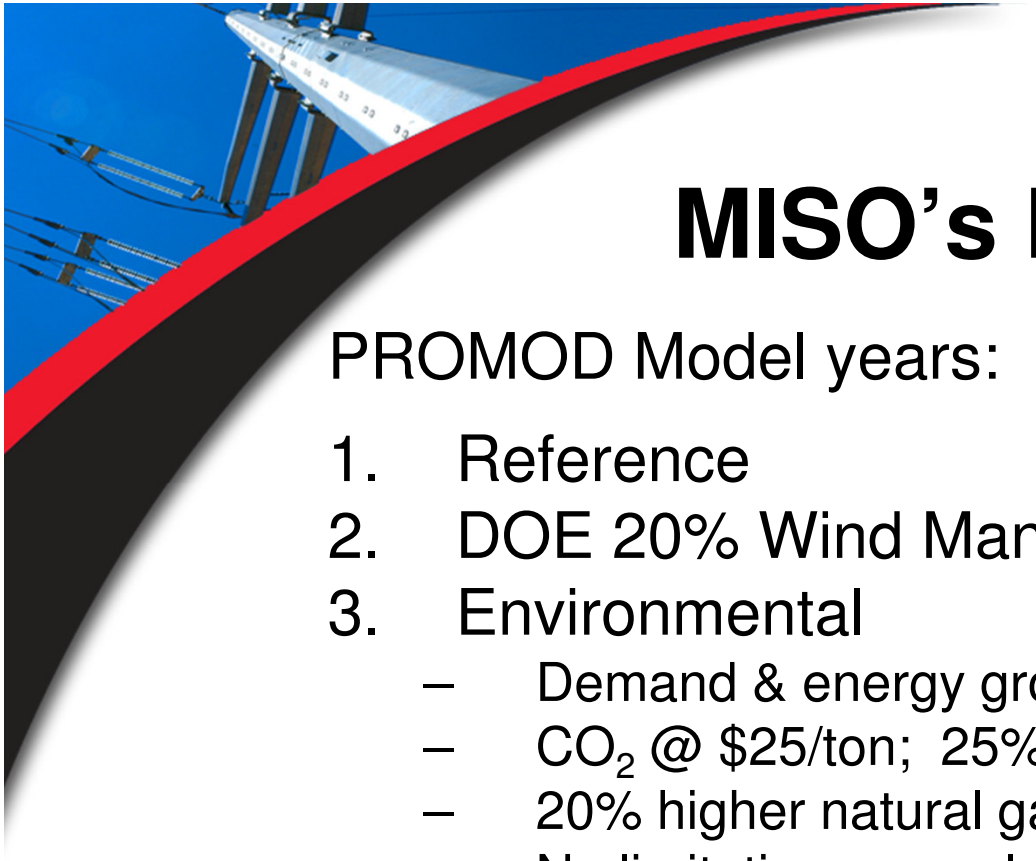

MISO's MTEP09 Futures

PROMOD Model years: 2013, 2018 & 2023

1. Reference
2. DOE 20% Wind Mandate (by 2024)
3. Environmental
   - Demand & energy growth rates 25% lower than Ref.
   - CO_2 @ $25/ton; 25% higher mercury costs
   - 20% higher natural gas costs
   - No limitation on nuclear plants other than long lead time
4. Regulatory Limitation
   - Limited transmission & generation siting
   - 5 year delay on new Coal/IGCC permitting
   - CT and CC plants near loads
   - 20% higher natural gas costs
   - Cost and risk control policies

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ATC's 2007 Futures-Update?

PROMOD model years: 2011 & 2016

- Reference
  - Starting point for other futures
  - For tuning PROMOD to LMP market
  - Not used in Strategic Flexibility

1. Robust Economy (3%/year)
   - With/Without North La Crosse-Columbia 345 kV line
2. High Retirements (older coal)
3. High Environmental ($44/ton CO_2)
4. Slow Growth (0.5%/year)
5. Fuel Supply Disruption (gas & coal)
6. High Growth WI

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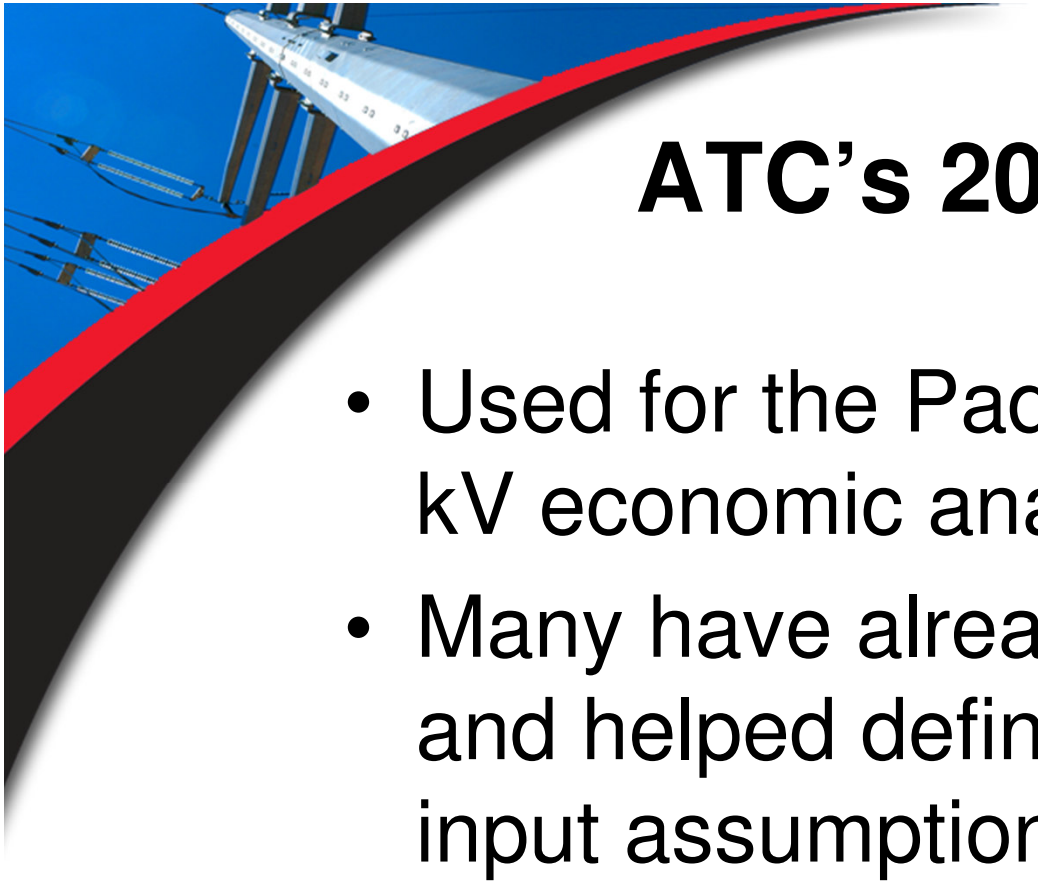

ATC's 2007 Futures Matrix

- Used for the Paddock-Rockdale 345 kV economic analysis
- Many have already seen this matrix and helped define the "bounding" input assumptions
- Align ATC's futures more closely with MISO's latest MTEP09 futures?

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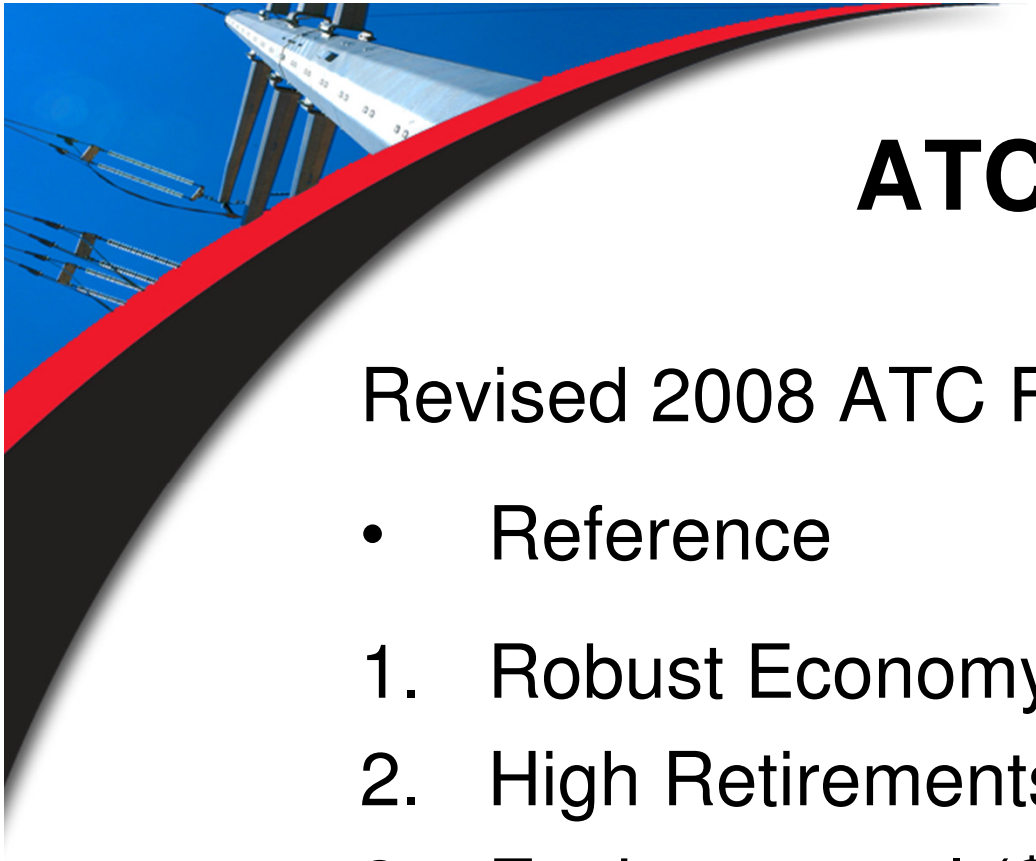

ATC's 2008 Futures?

Revised 2008 ATC Futures?

- Reference

1. Robust Economy
2. High Retirements (older coal)
3. Environmental ($25/ton CO_2)
4. Slow Growth (??%/year)
5. DOE 20% Wind Mandate? - New
6. Regulatory Limitation? - New

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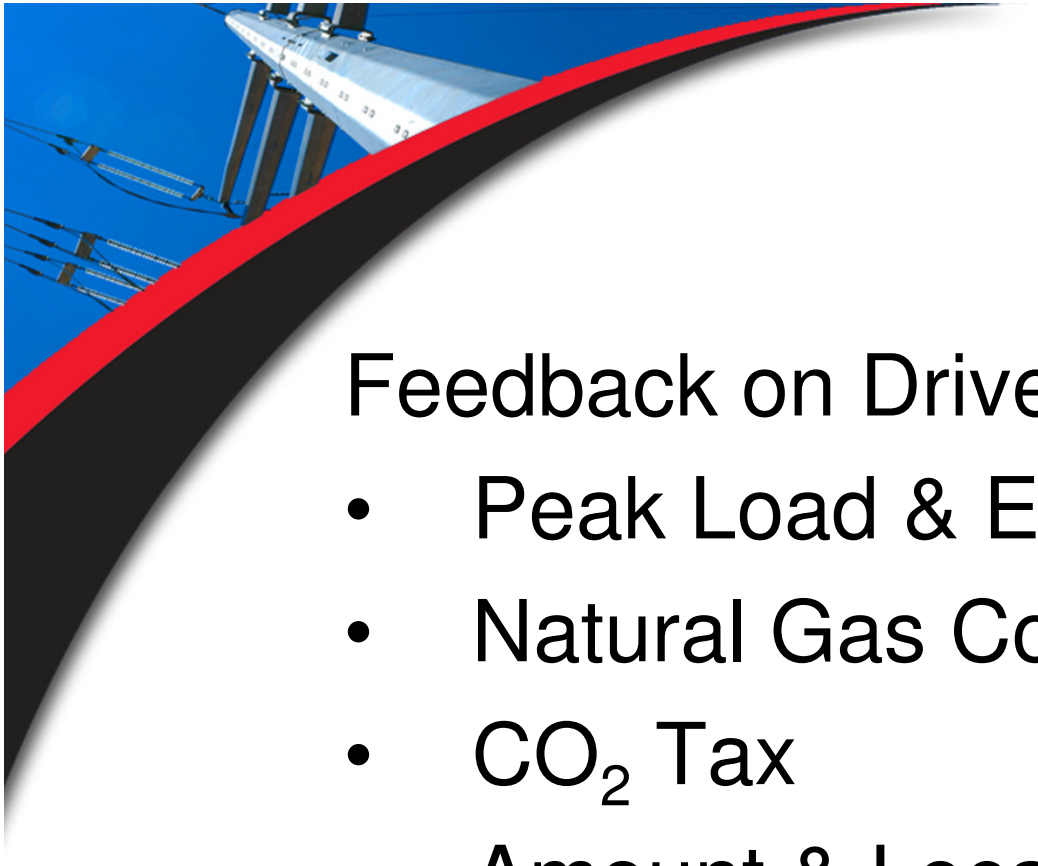

Feedback

Feedback on Drivers:

- Peak Load & Energy Growth Rates
- Natural Gas Costs (coal costs?)
- CO_2 Tax
- Amount & Location of Renewables
- Low-Cost Gen. within ATC
- External Trans. & CapX 2020

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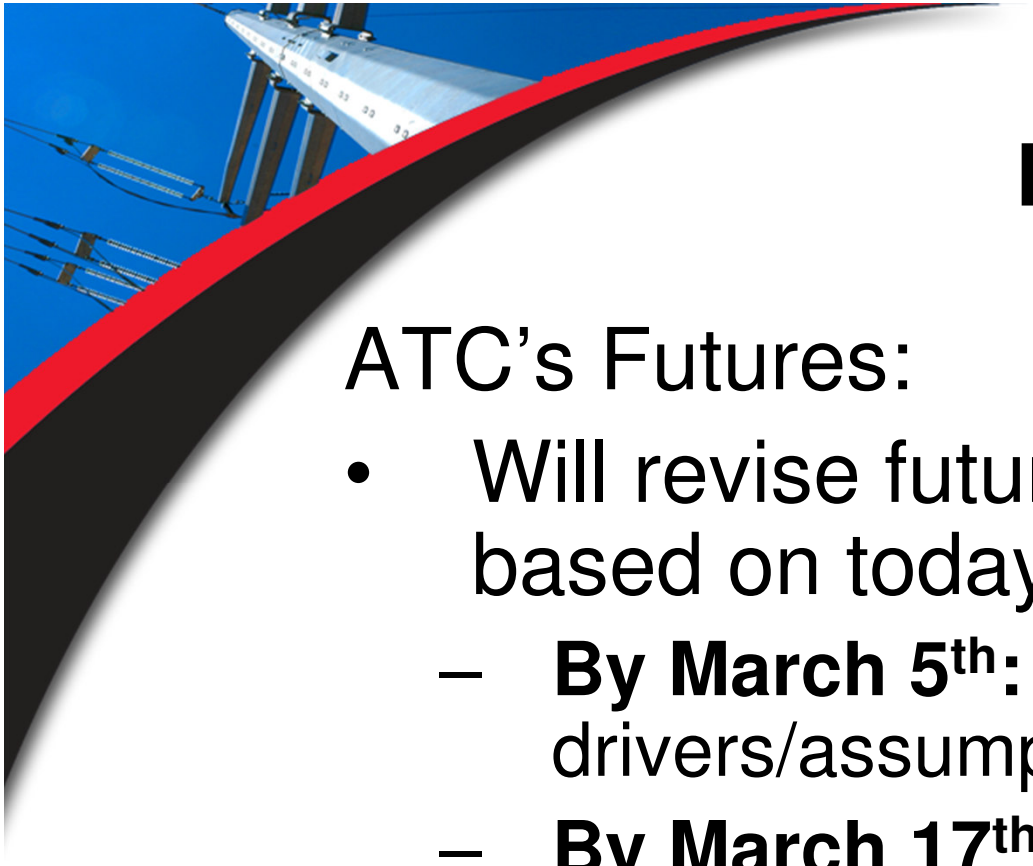

Next Steps

ATC's Futures:

- Will revise futures & provide a matrix based on today's driver feedback
  - **By March 5th:** Feedback on study drivers/assumptions
  - **By March 17th:** Draft matrix posted
  - **By March 31st:** Matrix comments
  - **By April 15th:** Prelim. matrix posted
  - **By April 30th:** Final round of comments
  - **By May 15th:** Final matrix posted

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