Hedging Power Costs with Green Power

Can it be done?

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Utility and Market Realities

Behind the Wheel: Management Focus

- "Regulated" utility market realities are not "market" realities
- "Deregulated" markets aren't really deregulated "markets"
- Strategies (and "deals") have to be tuned to these realities and to prices in each regional market

Regulated Utility Pricing

Behind the Wheel: Management Focus

- Utilities dispatch power plants based on marginal operating costs, (Marginal costs = fuel and O&M)
- Plant capital costs recovered through "demand" charges and "meter/customer" charges as well. (Capital costs = "mortgage" to repay construction costs)
- Typically, utility rate/kWh includes total costs ("marginal" and "capital")
- Thus, utilities are able to recover all costs, even when plants were "too expensive."

Market Pricing Fundamentals

Behind the Wheel: Management Focus

- Energy (kWh) priced "on the margin" – The last (highest) bid accepted by the market sets the price for ALL bids.
- Price based on highest fuel cost or lowest heat rate (least efficient plant).
- All producer costs have to be covered by "winning" bids: Incentive to price high in case you don't win, rather than low to capture market share.
- But, pricing high increases risk of "losing" so incentive to "rig" bidding and manipulate market rules.

"Utility" vs "Market"

Behind the Wheel: Management Focus

- Utilities dispatch power plants based on marginal operating costs, but charge on basis of total costs (construction, O&M, fuel, etc.)
- Utilities able to recover all costs, even when plants were "too expensive."
- Costs are known and stable (but might be "high").
- Marketers charge "what the market will bear," but need to charge for fuel and O&M (marginal operating costs) at least.
- Highest marginal cost plants typically set the price for ALL plants, regardless of operating costs.
- Prices are unknown and volatile (but "correct" if market well-designed, run, and monitored – probably none are).
- Utilities "average" costs. Markets multiply costs in multiple markets/ancillary service fees. Right now, utility costs are lower than "market based" prices.

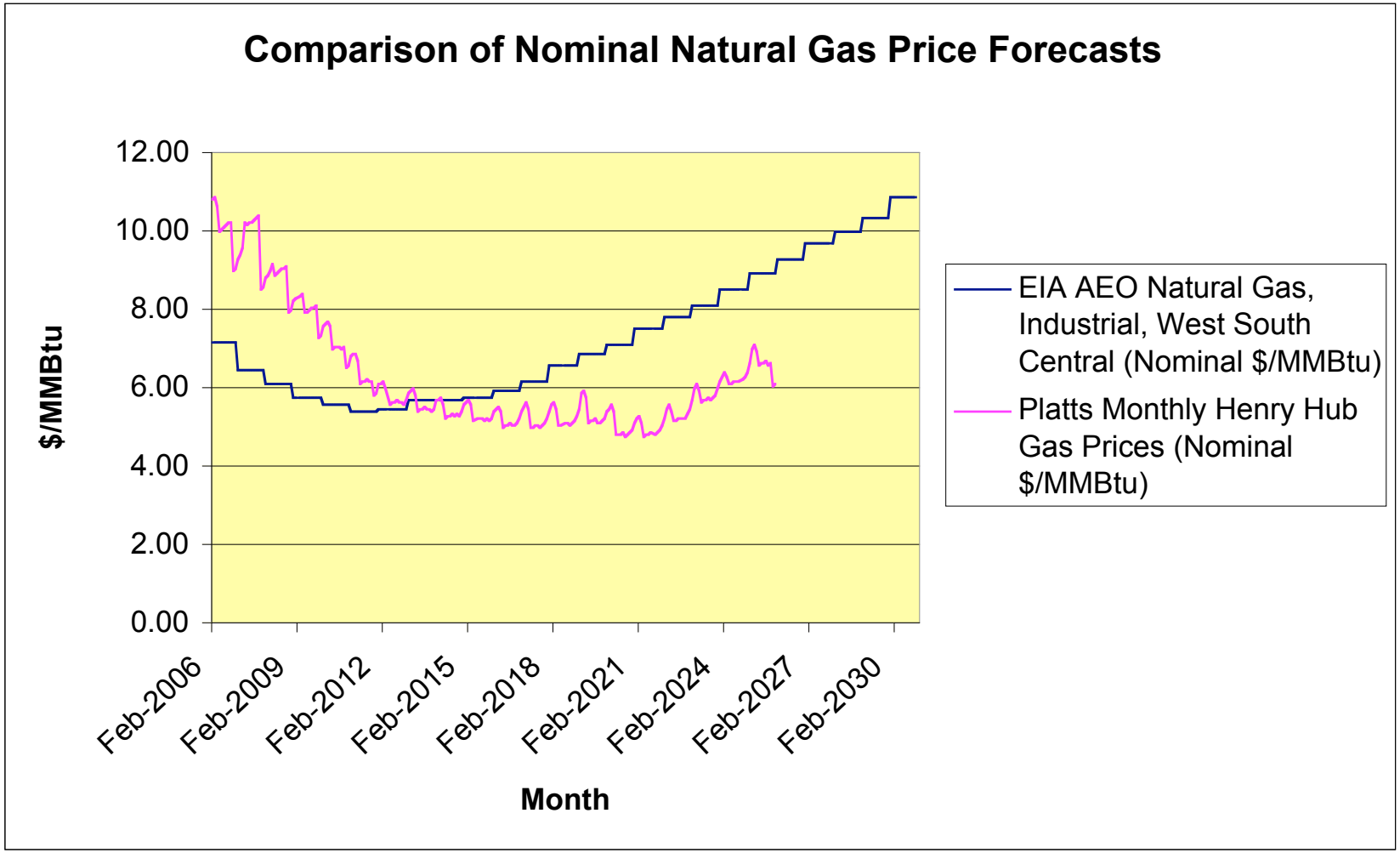
How Do You Know What Market Prices Will Be?

Behind the Wheel: Management Focus

- Market prices are based on either:
  - Fuel costs for new plants, typically gas turbines
  - Efficiency of "embedded cost" plants that are idle, typically coal plants
- Marginal gas plant costs ~ gas price "futures"
- Cost of "embedded" plants more difficult to determine
- Why do you need to know? Future price estimates needed to evaluate "green power" options

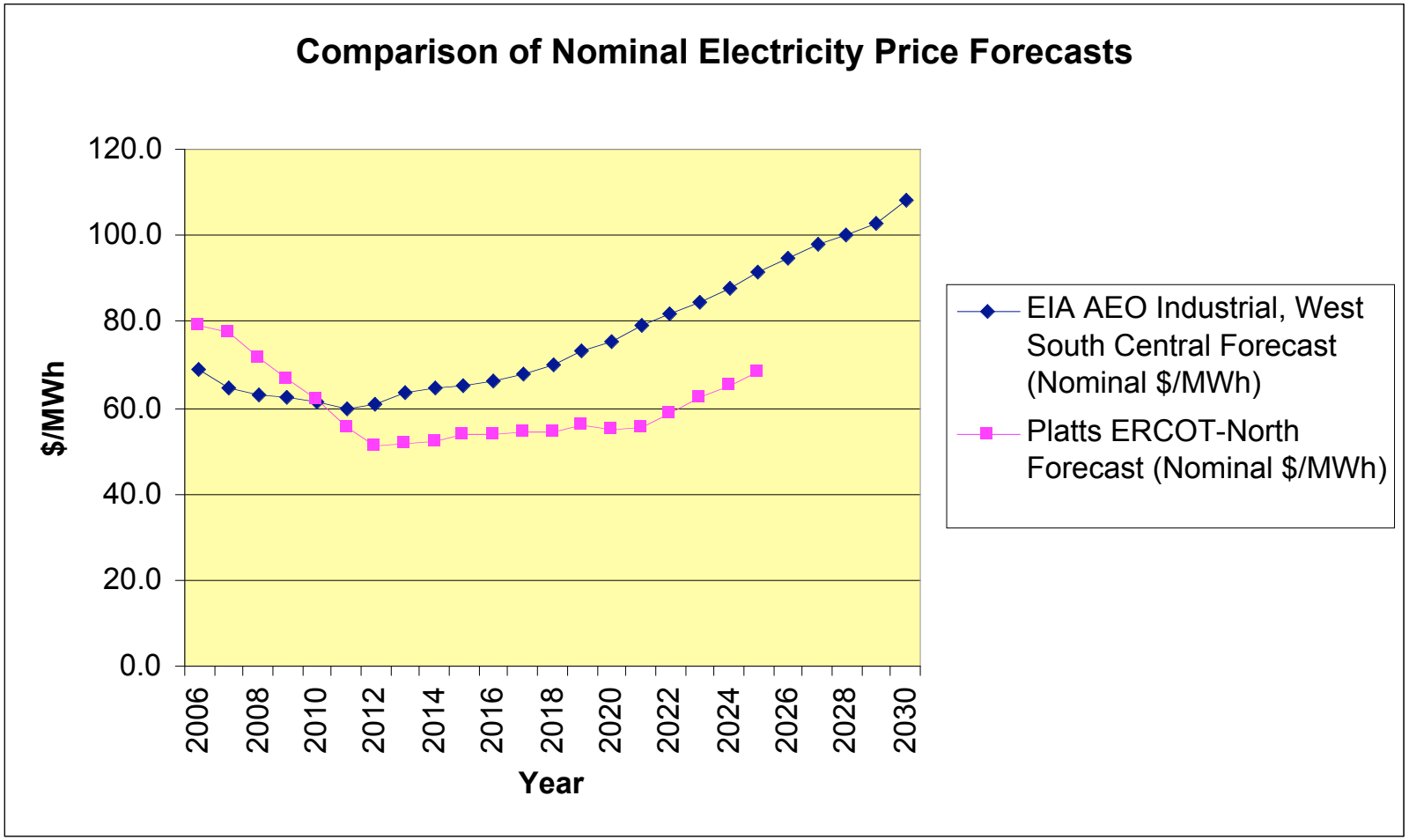
Two 20 yr. Gas Price Forecasts

Behind the Wheel: Management Focus



Two 20 yr. Power Price Forecasts

Behind the Wheel: Management Focus



Green vs Conventional Power

Behind the Wheel: Management Focus

- System power (operating plants)
  - Known reliability
  - Known O&M costs
  - Unknown(?) but "hedgeable" fuel costs
  - Dispatchable! (Can turn on/off as needed)
  - Great "load following" capability
  - Don't need to run all the time to recover costs.
- Green power
  - Reliability and capacity factor (output timing and amount) certain within limits +/-10%?
  - Fuel costs are known (and $0)
  - O&M uncertain, but known within limits
  - Typically not very dispatchable and poor for load following, because even "non-intermittent" plants need to run as "must run" plants to recover development costs.
- New conventional power plants are different but usually NOT basis of price comparison (should be though). O&M and fuel cost are unknown, and reliability is a guess.

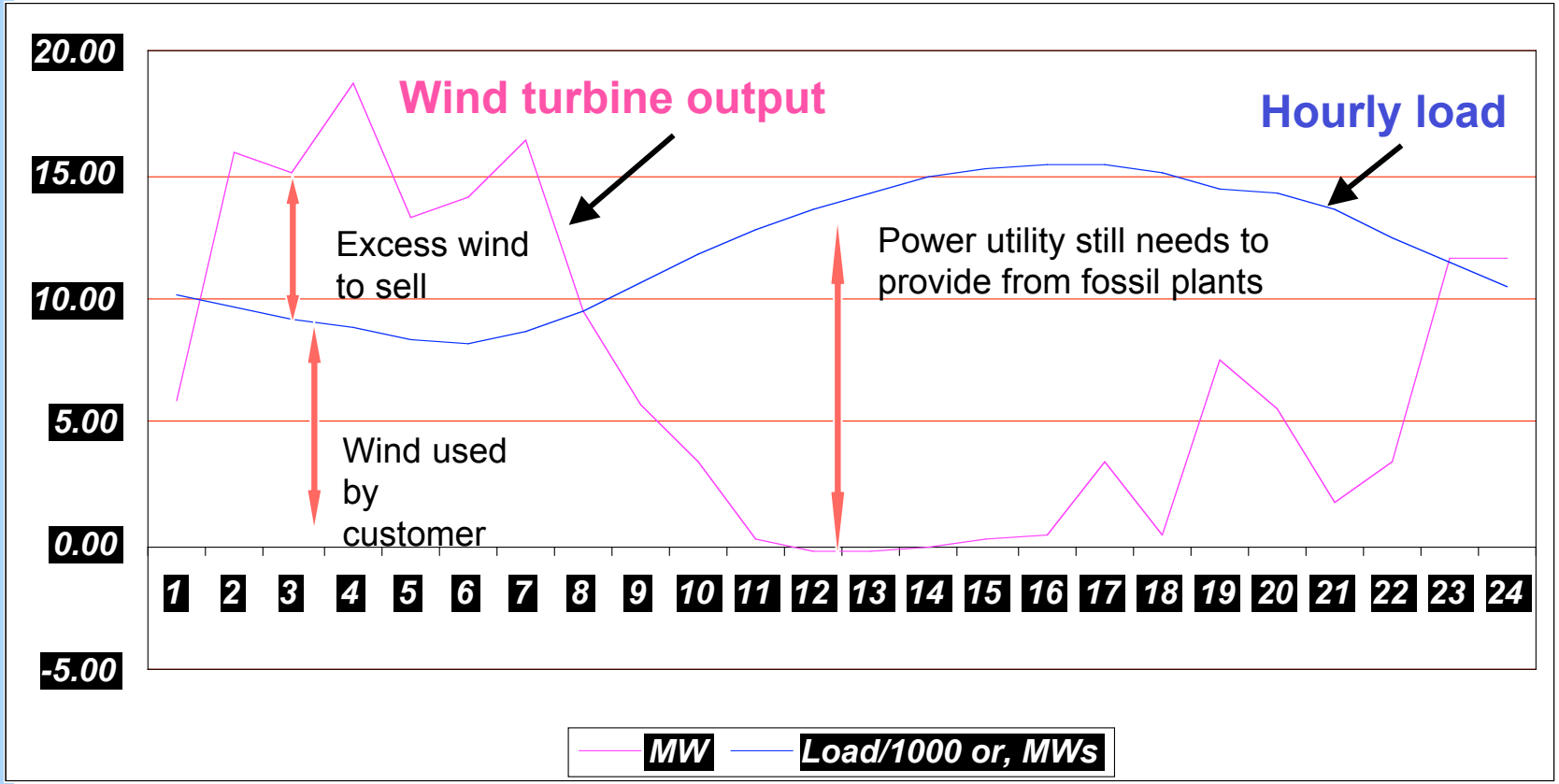
Wind (intermittent) Example

Behind the Wheel: Management Focus

- In any hour, it may produce *more* than your load,
- Or, it may produce *less* than your load,
- And some hours it *consumes* grid power.
- You "pay" either way (to sell the excess at a loss, generally, or to purchase to make up deficit)
- Assuming each kWh is "worth" prevailing incremental production costs, the "excess" will sell at that price (regardless of *your* price), and the deficit will be purchased at that price.

Load/Wind Balance

Behind the Wheel: Management Focus



Conclusions

Behind the Wheel: Management Focus

- Loads with greatest coincidence to renewable output will have greatest savings/lowest premium (depends on price of renewables and utility power).
- For intermittent renewables, that means loads with high load factor are "better." Ironically, demand management works against this.
- If current and/or future market prices are higher than renewable cost, money is/will be saved.
- In the long run, future market prices are more likely to be higher than today (EIA) or only somewhat lower (Platts).

Sample Deal

Behind the Wheel: Management Focus

- Wind farm "output" contract + conventional market power purchases to firm and shape to meet load.
- Wind price is fixed for 100% of load:
  - **First 10 years price fixed at 4.8 cents/kWh (doesn't increase with inflation, so price actually decreases over term ~3%/yr)**
  - **Yrs 11-15 price at ~4.6 cents (then)**
  - **Yrs 16-30 price at cost of O&M: 1.3-1.5 cents/kWh**
- Customer "owns" all output regardless of sale/purchase from market.
- Although "surplus" generation will be sold into the spot market, 100% of green credits for wind generation accrue to customer.
- Firming and shaping energy (and "surplus" sales) at "market."
- Minimum contract term, 10 years

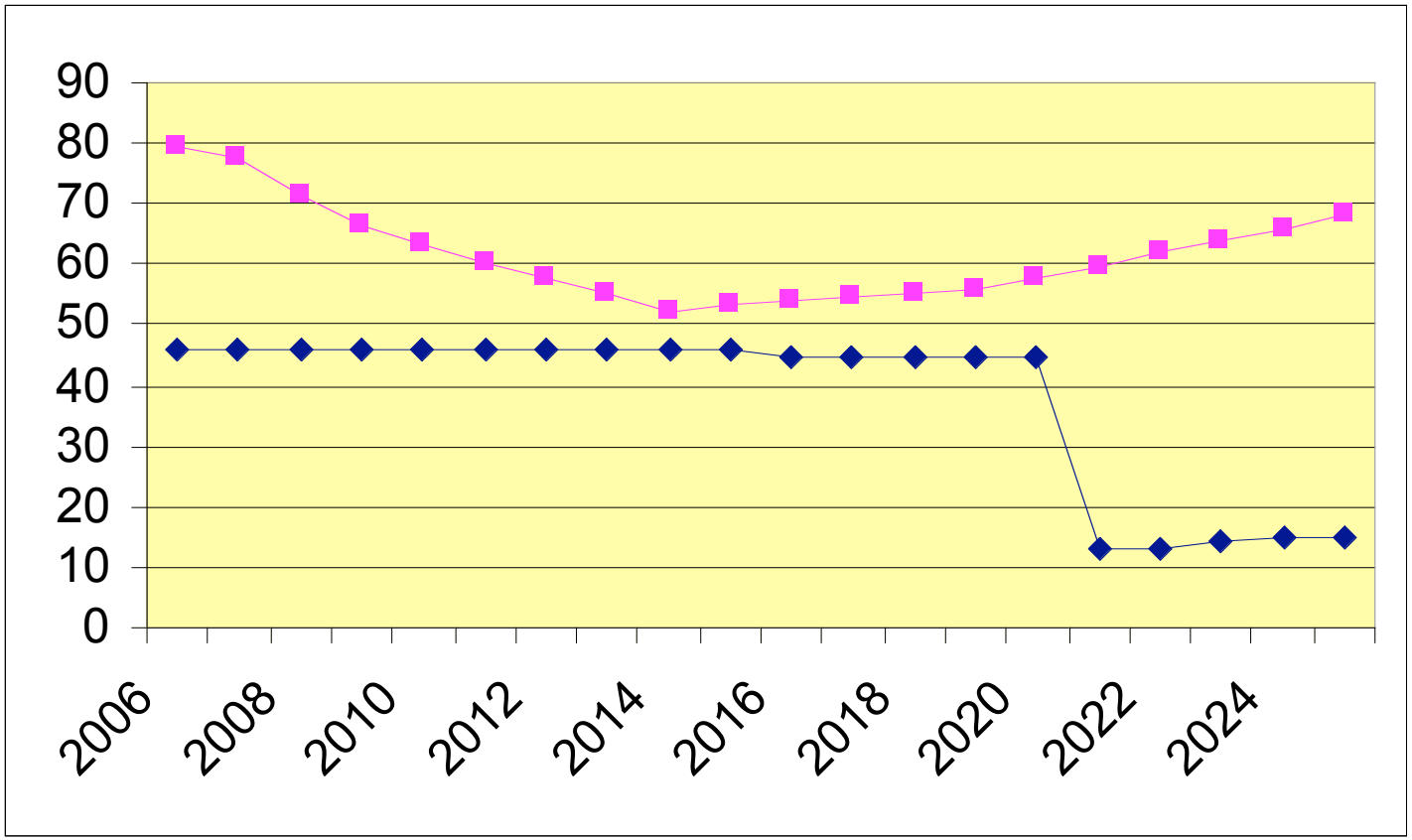
Benefits to Customer

Behind the Wheel: Management Focus

- Customer load 42% coincident with wind output. Customer "owns" 42% of its electricity at fixed price for life of contract.
  - Limits exposure to market price volatility
  - Price decreases in "real" terms ~ 3% yr
  - Budget more certain
  - Annual savings estimated at up to $4 million as long as gas prices remain in $8-12 MMBtu range.
  - Savings past year 16 will be huge because price falls to O&M cost.

Deal Price vs Market Price Projection

Behind the Wheel: Management Focus



Notes: Electricity cost based on current price and NIST escalation rate.

Deal Risks

Behind the Wheel: Management Focus

- Project risks
  - Non-performance (wind doesn't blow or turbines don't work)
  - Owner/operator goes bankrupt
  - Out-year O&M costs significantly higher than projected
- Market risks
  - Market prices collapse
- Regulatory risks
  - Texas may re-regulate utilities and void contract

Impact of Low Coincidence Comparison of DOD to GSA Load

Behind the Wheel: Management Focus

Texas DOD Site

- 08 forward curve price avg. = $69.58 MWh (~7 ¢/kWh)
- Typical 06 price ~6 ¢/kWh
- Wind price $48/MWh
- Melded price ~$59/MWh
- Wind/load coincidence = 42%
- Wind % of supply = 100%

Texas Fed. Building

- 08 forward curve price avg. = $69.58 MWh (~7 ¢/kWh)
- Typical 06 price ~7 ¢/kWh
- Wind price $48/MWh
- Melded price ~$62/MWh
- Wind/load coincidence = 33%
- Wind % of supply = 33%

Summary

Behind the Wheel: Management Focus

- Renewables cost more than conventional power for same reliability.
- But, renewables can be purchased cost-effectively when:
  - Prevailing market prices are high/tied to high fuel costs
  - Power supply alternatives are priced at market
  - Utility avoided costs are correctly valued at true avoided costs (not just current incremental costs)
- Long-term contracts are required to get best price, typically tied to projects under development.
- Coincidence of load and resource key to economics
- There is a mid-term risk that market prices could be lower if gas prices drop significantly
- Deal is significantly "life-cycle cost-effective", even if conventional power prices drop significantly
- There is a risk of non-performance
- The deal is complex to procure and to explain
- Benefits are greatest in the future (15 years out).