
Updated Assessment of the Tenaska Taylorville Energy Center

Costs to Illinois Families and Businesses Now Exceed
\$400 Million Each Year and \$12 Billion in Total

March 2012

Executive Summary

The 2010 Analysis Concluded that the Proposed Taylorville Energy Center Would Result in Large Cost Increases for Illinois Families and Businesses with Questionable Environmental Benefits

Christian County Generation, L.L.C. (CCG), a joint venture between Tenaska and MDL Holding Co., proposes to build Taylorville Energy Center (TEC), an approximately 600 MW (net) hybrid IGCC plant near Taylorville, IL, that uses experimental technology to inject CO₂ underground in Illinois.

In February 2010, Tenaska provided details about both the rate impact and the operating characteristics of the TEC project as part of its Facility Cost Report (FCR) filed at the Illinois Commerce Commission (ICC). In April 2010, the NorthBridge Group (NorthBridge) reviewed the FCR, as well as other publicly available information, and submitted an assessment report to the ICC detailing TEC's economic and environmental costs. Based upon Tenaska's own data, the NorthBridge report reached two main conclusions:

1. The TEC project would increase electricity rates charged to Illinois families and businesses by hundreds of millions of dollars annually.
2. The TEC project would increase, rather than decrease, CO₂ emissions relative to other less costly alternatives.

In September 2010, the ICC published its independent economic assessment of TEC. Consistent with NorthBridge's analysis, the ICC concluded that TEC costs would be significantly higher than the value of the electricity produced by TEC, and Illinois families and businesses would be forced to pay billions of dollars in subsidies to Tenaska over the 30-year life of the plant. Specifically, the ICC estimated that Illinois families and businesses would see a rate increase of \$286 million per year (\$8.5 billion total), to cover the operating costs and generous profit awarded to the developer under the Clean Coal Act. In addition, the ICC report cautioned that many design issues had not been resolved; construction or commodity market changes could further increase project costs.

The 2012 Updated Analysis of TEC Shows Even Higher Electric Costs to Families and Businesses with Fewer Environmental Benefits

The ICC's report was prescient. Over the last two years, the TEC economics have gone from bad to worse. ***Even assuming construction costs are unchanged from 2010, TEC is now expected to cost Illinois families and businesses \$400 million per year or \$12 billion over the 30 year project life (a 40% increase over the 2010 cost estimates), due to changes in the commodity markets.*** Current natural gas

prices have dipped well below \$3/mmbtu – less than 1/3 of the natural gas price in 2008 – in large part due to technological breakthroughs in the extraction of shale gas. Forward prices for 2015 natural gas are less than half the level Tenaska projected in its “Reference case.” Wholesale electricity prices correlate to natural gas prices and have followed this decline. Simply stated, electric costs to Illinois families and businesses associated with the TEC project have increased because the value of the TEC output has declined, while TEC’s costs and guaranteed profits remain unchanged.

Setting aside its high costs, the TEC plant design promises only mediocre environmental performance. TEC emits 50% more CO₂ per MWH than a conventional Combined Cycle Gas Turbine (CCGT). Since the TEC carbon footprint is far inferior to an unsubsidized new entrant, TEC has little credibility as a demonstration of the viability of clean coal technology.

Legislation to Authorize TEC is Still Pending in the General Assembly

In spite of the deteriorating project economics, legislation authorizing the TEC project (SB 678) remains under consideration in the Illinois General Assembly. SB 678 does nothing to reduce the overall costs of the project or provide meaningful cost caps for Illinois customers. In less than two years, market changes have caused TEC rate impacts to increase by \$3.5 billion and construction hasn’t even begun. Construction cost overruns may add to that number, as evidenced by the billions of dollars of overruns at the Edwardsport IGCC that are currently in dispute in Indiana. SB 678 does little to protect Illinois families and businesses from these large and obvious negative consequences. Utility bills for government and businesses will see the largest direct impact of TEC’s poor economics, but those costs will very likely flow back to Illinois families in the form of higher taxes and higher prices. For example, electricity expenses for Chicago Public Schools will increase by over \$1.6 million per year, specifically due to TEC. Additional customer impacts are shown in Table 1.

The remainder of this document provides an updated assessment of the economic and environmental costs of TEC plus a review of SB 678.

Rate Impact

There is no dispute that the cost to build and operate TEC is significantly higher than the expected market value of the output from the plant. In its 2010 FCR, Tenaska itself estimated that TEC costs would average roughly \$300 million per year more than the market value of the generation.

Figure 1a below illustrates the above-market costs estimated by Tenaska. Similarly, the September 2010 ICC Report concluded that TEC would have above-market costs of \$286 million, and a cost to produce electricity of \$213/MWH on a levelized basis over the 30 year project life. See Figure 1b below.

Figure 1a (Tenaska)

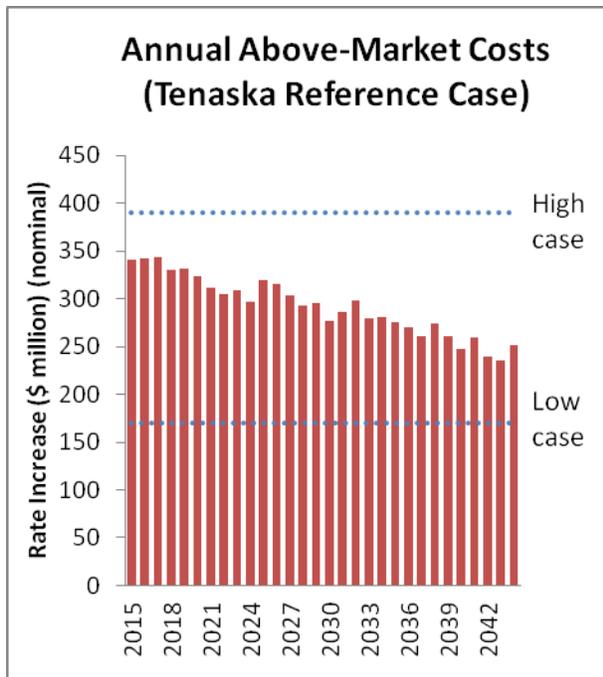
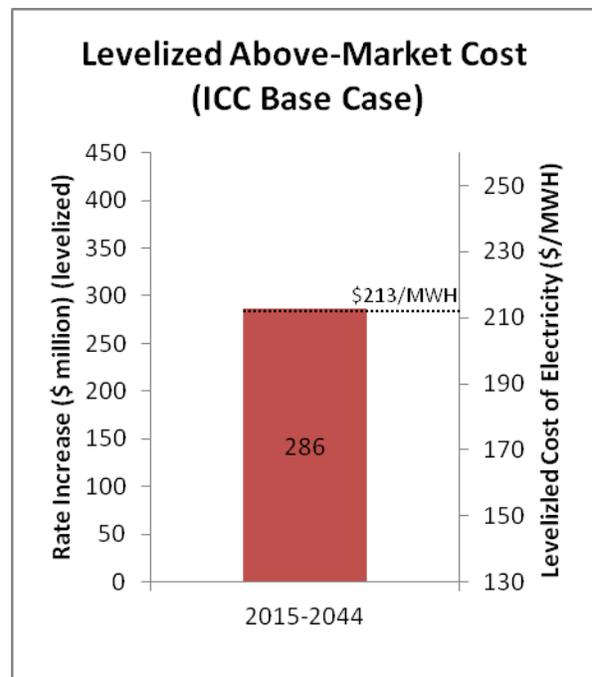


Figure 1b (ICC)



Market conditions have changed since the completion of the Tenaska and ICC Reports in 2010. Both natural gas prices and Illinois power prices have declined significantly. See Figures 2a and 2b below.

Figure 2b

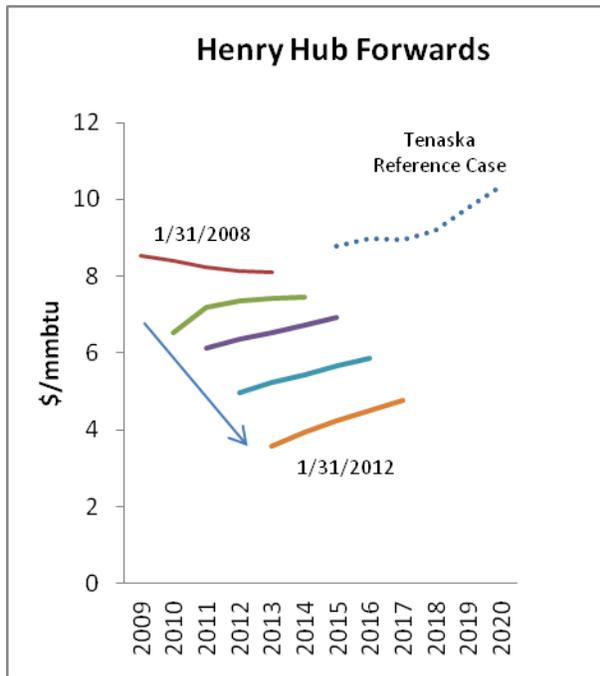
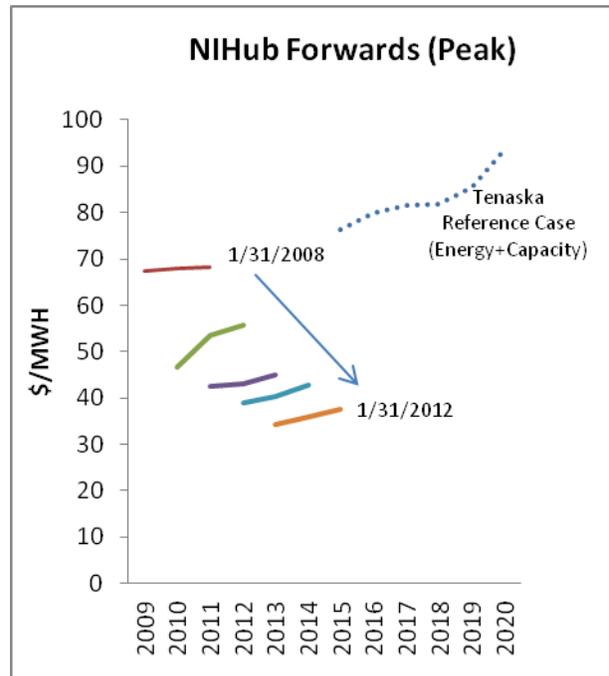


Figure 2b



TEC’s economics have deteriorated along with wholesale market prices because the offsetting value of the energy produced by TEC is now worth much less. The ICC estimated that under a “low gas price” scenario, TEC would have levelized above-market costs of \$396 million per year.

The natural gas forecast scenarios used in the ICC Report are not publicly available. However, we have validated the ICC “low gas price” results by updating the Tenaska Reference case fuel costs and wholesale power prices to reflect current forward prices for natural gas and a zero price for CO₂. Reduced wholesale power prices (partially offset by reduced purchased natural gas expenses) cause the TEC above-market costs to increase significantly. In Figure 3a below, our Updated Reference Case results in an average annual increase of roughly \$400 million per year or \$12 billion over the 30 year

project life.¹ See the Appendix for a detailed discussion of the development of the Updated Reference Case.

Figure 3a (NB Update)

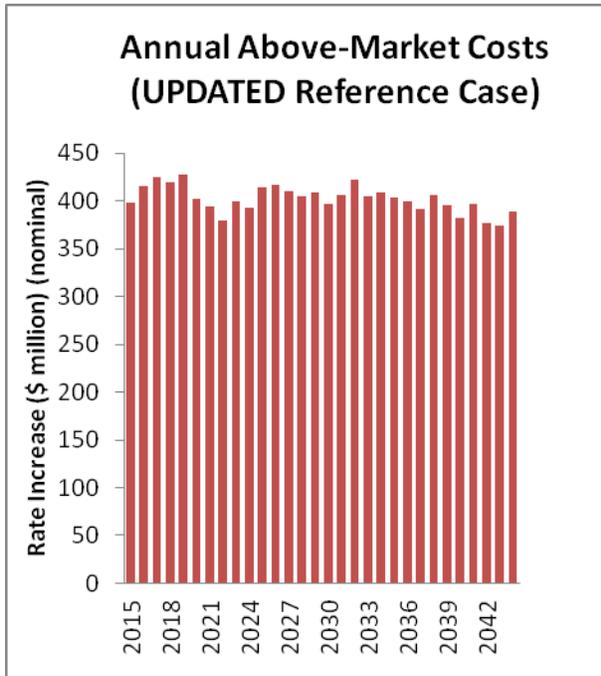
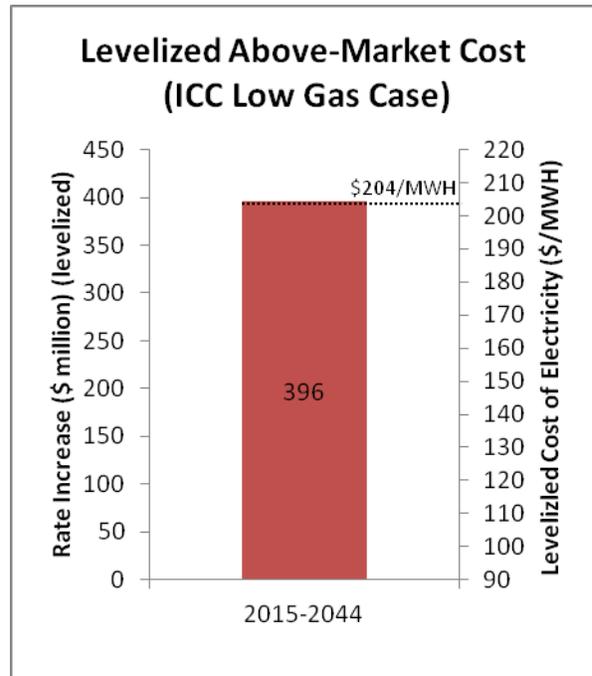


Figure 3b (ICC)



The ICC Report assumes 142.4 million MWH of annual electric sales in Illinois for all future years, and EIA-861 data indicates that Illinois residential sales were approximately 1/3 of total Illinois sales for 2009 and 2010. This implies that \$400 million of annual above-market costs will cause residential rates to increase by roughly \$2.32/MWH (the maximum allowed), and non-residential rates to increase by about \$3.05/MWH.²

These rate impacts translate to significant bill increases. Utility bills for government entities and businesses will see the largest direct impact of TEC’s poor economics, but those costs will likely flow back to Illinois families in the form of higher taxes and higher prices. As illustrated in Table 1 below, TEC

¹ The TEC in-service date was original projected to be in 2015. It is now unlikely that TEC will come online before 2016 or 2017, however, the rate impact is still calculated assuming that the plant comes online in 2015.

² $[\$400\text{MM} - (\$2.32/\text{MWH} * 1/3 * 142.4 \text{ TWH})] / [(1 - 1/3) * 142.4 \text{ TWH}] = \$3.05/\text{MWH}$

will annually add millions of dollars to the expenses of the State of Illinois, the City of Chicago, Chicago Public Schools, and the Chicago Transit Authority (CTA).

Table 1

	Annual Electricity Use	Rate Increase due to TEC	
	(MWH per year)	(\$ per year)	(\$ over 30 years)
City of Chicago	1,070,000 ³	\$3.3 million	\$100 million
Chicago Public Schools	540,000 ⁴	\$1.6 million	\$50 million
State of Illinois	530,000 ⁵	\$1.6 million	\$50 million
Chicago Transit Authority	420,000 ⁶	\$1.3 million	\$40 million

³ http://www.cityofchicago.org/city/en/depts/doe/supp_info/clean_and_renewableenergy.html

⁴ Ibid.

⁵ <http://yosemite.epa.gov/opa/admpress.nsf/0/f026304ce77b3fd08525777c006d28a5>

⁶ http://www.transitchicago.com/assets/1/finance_budget/2011_CTA_Budget_Book_Web_optimized.pdf, pg19

Environmental Impact

A major justification for the TEC project is the reduction in CO₂ emissions that result. In the 2010 NorthBridge report, we estimated that SNG-fueled generation from TEC would reduce CO₂ emissions at an extremely high cost -- approaching \$400/metric ton.⁷ Based on current market conditions, the TEC cost would increase to roughly \$500/metric ton.⁸

Given this extremely high cost, the 2010 NorthBridge report evaluated a CCGT as an alternative to TEC, and demonstrated that a CCGT was far less expensive and had roughly 50% lower CO₂ emissions than TEC, because TEC is responsible for the CO₂ emissions from the auxiliary loads associated with SNG production. Under the Updated Reference Case, the CCGT reduces CO₂ at a cost of just \$55/ton.⁹

The net cost for TEC to convert coal into natural gas is implied by the difference between TEC and a CCGT, since TEC is essentially a gasifier combined with a conventional CCGT. The rate impact difference between TEC and a CCGT represents the incremental cost to produce and burn SNG. Under the Reference Case, Tenaska estimates the 2015 rate increase required to support TEC at roughly \$340 million, compared to \$80 million for a new CCGT which implies that the TEC substitute natural gas has a production cost of over \$20/mmbtu.¹⁰

An additional challenge associated with the TEC project (also noted in the 2010 NorthBridge and ICC reports) is the permanent sequestration of the CO₂. Tenaska proposed to sell the TEC CO₂ into a to-be-built Denbury pipeline connecting Illinois with Louisiana, where the CO₂ can be used for Enhanced Oil Recovery (EOR). Little progress has been made on this pipeline. Tenaska's alternative plan is to build a geological storage facility on a site near Taylorville, but that plan is also undeveloped. If neither the Denbury pipeline nor geological storage is brought to fruition, then the CO₂ emissions from the plant will be substantially higher than the estimate in the FCR report – even higher than a conventional coal-fired generator.

⁷ The annual above-market cost is roughly \$300 MM/year. The CO₂ reduction due to TEC estimated in the 2010 NorthBridge report was 0.8 metric tons per year. $\$300 \text{ MM} / 0.8 \text{ MM metric tons} = \$375/\text{ton}$ (on top of the CO₂ price of \$21-59/ton).

⁸ $\$400 \text{ MM} / 0.8 \text{ MM metric tons} = \$500/\text{ton}$

⁹ Under the Updated Reference Case, CCGT above market costs are reduced to \$65 million primarily due to reduced fuel costs. $\$65 \text{ million} / 1.2 \text{ MM metric tons} = \$55/\text{ton}$

¹⁰ TEC produces 19.3 MM mmbtu of SNG per year and the Reference Case price for gas is roughly \$9/mmbtu (nominal). Therefore, $(\$340 \text{ MM} - \$80 \text{ MM}) / 19.3 \text{ MM mmbtu} + \$9/\text{mmbtu} = \$22.5/\text{mmbtu}$. Using the Updated Reference Case: $(\$400 \text{ MM} - \$65 \text{ MM}) / 19.3 \text{ MM mmbtu} + 4.2/\text{mmbtu} = \$21.5/\text{mmbtu}$.

A primary concern identified in the ICC report is whether TEC is the best way to achieve the environmental benefits of coal gasification as originally proposed under the Clean Coal Act. SB 678 does nothing to address these concerns, but simply re-writes the performance requirements so that the latest TEC plant design can qualify under the Act. The bill replaces the requirement to “use primarily coal as a feedstock”¹¹ with “use coal for at least 50% of total feedstock”.¹² Furthermore, SB 678 reduces the carbon sequestration requirements for clean coal facilities that come into service after 2015 from 70% (or 90%) to 50%.¹³ This weakening of the clean coal performance requirements is not reconciled with the legislative declaration that “the State should encourage clean coal [to] advance environmental protection goals and demonstrate the viability of coal and coal-derived fuels in a carbon-constrained economy”.¹⁴ Tenaska’s own forecast indicates that 30-40% of the generation from TEC will be produced by burning purchased natural gas in a conventional CCGT with no capture of the associated CO₂ emissions. Subsidizing the operations of a conventional CCGT does not advance the development of clean coal technology.

¹¹ 20 ILCS 3855/1-10

¹² Proposed 20 ILCS 3855/1-10

¹³ Ibid.

¹⁴ 20 ILCS 3855/1-5 (1) (8)

SB 678 Ratepayer Cost Protections

SB 678 passed the Illinois Senate in 2011, and is currently under consideration in the Illinois House of Representative. As noted previously, this legislation makes significant amendments to the clean coal portfolio standard, and specifically the requirements for the initial clean coal facility. The number one issue raised in the ICC Report is the high cost of TEC, prompting the recommendation to consider a cost cap for all customers. SB 678 does nothing to reduce the overall project cost or provide any meaningful new cost protections for families and businesses. Instead, the bill replaces several important existing provisions with a complicated combination of illusory rate caps which are ultimately rendered meaningless by the fine print.

Current law provides that rate impacts due to TEC for eligible customers (all retail customers that purchase energy from the utility under fixed-price bundled service tariffs) are limited to 2.015% of the amount paid in the year ending May 31, 2009. If actual rate impacts exceed roughly \$2.32/MWH, then the excess is shifted to the non-eligible customers. SB 678 amends this rate cap so that only residential customers qualify, and small commercial eligible customers would no longer be covered.¹⁵ Figure 4a depicts the expected residential rate impact under the Updated Reference Case forecast and the costs shifted to non-residential customer classes.¹⁶

SB 678 provides some rate mitigation for non-residential customers, however, the rate mitigation is complicated and very unlikely to result in any real benefit. The rate impact for non-residential customers is calculated as if the market prices for power and fuels in Tenaska's "Reference Case" have occurred, regardless of actual market conditions. This result is defined as the "deemed" rate impact. But the "Reference Case" forecast developed by Tenaska in 2010 is much higher than current market expectations, so the deemed rate calculation produces an artificially low deemed rate impact. Nevertheless, in the unlikely event that the deemed rate impact exceeds \$5/MWH, the non-residential customers are granted up to \$50 million of relief. As illustrated in Figure 4b, this non-residential rate mitigation zone is unlikely to be reached due to the very high trigger price and the "deemed" impact

¹⁵ It is unclear if the residential rate cap includes rate impacts due to the 1/3 sharing of capital cost overruns or sequestration cost overruns in excess of \$20 million.

¹⁶ The ICC Report calculates \$2.32/MWH as the 2.015% rate impact cap for Illinois eligible customers. For the purposes of this analysis, we have assumed the same rate impact cap even though the SB 678 cap is applied only to residential customers.

methodology. And even if the rate mitigation is triggered, the \$50 million of relief is small in relation to the \$600+ million per year that customers would be forced to pay in that situation.

Figure 1a

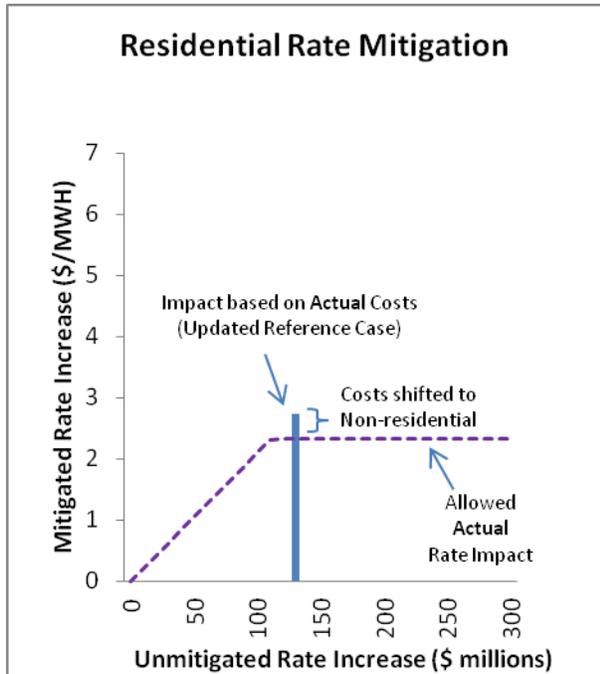
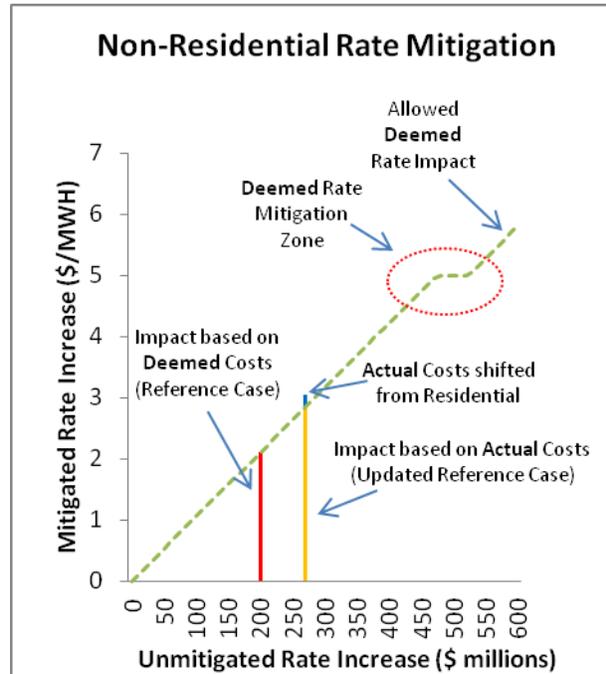


Figure 4b



A key provision in the existing statute is that “the General Assembly must enact authorizing legislation approving the projected price, stated in cents per kilowatthour, to be charged for electricity generated by the initial clean coal facility.”¹⁷ SB 678 eliminates this requirement and substitutes a fast-track no-bid pre-approval process to provide Tenaska with authorization to proceed with TEC before establishing an estimated contract price.¹⁸ This is a complete reversal from the process for transparently evaluating the clean coal project established in the original Clean Coal Act. The ICC estimates that the TEC cost of electricity would be over 20 cents/kwh, but around-the-clock energy for delivery in NIHub in 2015 is currently trading at around 3 cents/kwh.

Perhaps the most problematic feature of SB 678 is the treatment of the sequestration costs. TEC’s sequestration plan is the most undeveloped aspect of the project, even though technology development for carbon capture and sequestration is the principle objective of the Clean Coal Act.

¹⁷ 20 ILCS 3855/1-5 (d)(4)(iii)

¹⁸ Proposed 20 ILCS 3855/1-76(b)(4)

Although Tenaska has not committed to a sequestration plan, SB 678 limits the exposure of the developer to just \$20 million (or roughly \$10/MMtCO₂), even if TEC fails to capture and sequester any of the CO₂.¹⁹ It is difficult to reconcile the fact that, on the one hand, the developer is insulated from most of the risk on the novel aspects of the project, but, on the other hand, the developer is awarded generous profit and cost-recovery provisions for their entire investment (including an 11.5% ROE, and a capital structure deemed to have almost twice as much equity as the project will actually carry).

¹⁹ Proposed 20 ILCS 3855/1-76(e)

Appendix – Updated Reference Case

For our 2010 assessment of the TEC rate impact, we accepted the cost and revenue forecasts included in Exhibit 10.0 of the Tenaska FCR filing, the Pace Rate Impact Analysis. We did not (nor apparently did Pace) evaluate the impact of a construction cost overrun or operating cost uncertainties. The rate impacts in (Figure 1a) above were taken directly from the data submitted by Tenaska to the ICC.

With CO₂ legislation seemingly off the national agenda and natural gas prices severely depressed from 2008 levels, the Pace “Reference Case” is much too optimistic relative to current market conditions. For this updated assessment of TEC, we have adjusted the price forecast for natural gas, power, and CO₂ based on recent market forward prices (1/31/2012). As illustrated in Figure 5a, the Updated Reference Case natural gas forecast was developed using forwards prices for 2015-2024 and the annual escalation implied in the Reference Case for subsequent years.

Figure 2a

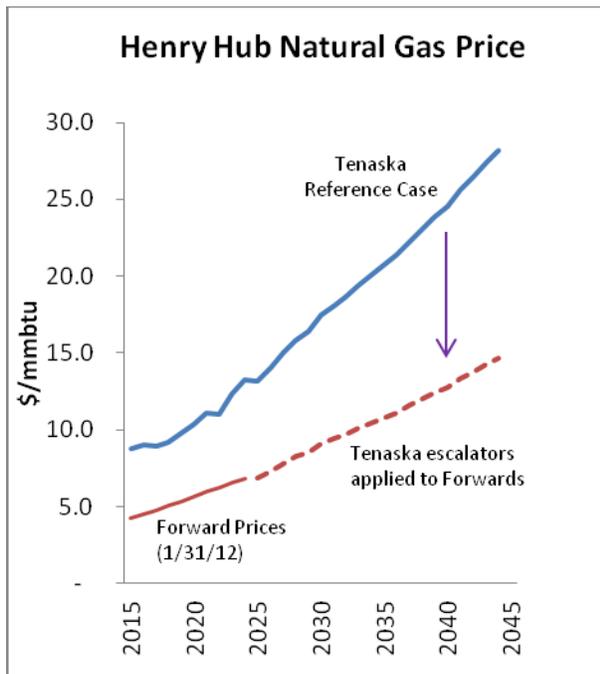
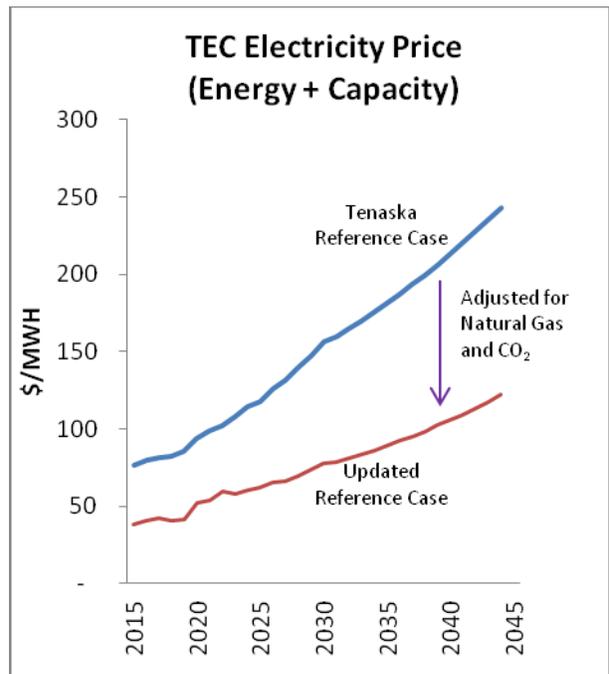


Figure 5b



In Figure 5b, the Updated Reference case electricity prices (energy + capacity) incorporate the updated natural gas price forecast and the assumption that CO₂ prices would be zero for the life of the

project. For the years 2015-2019, the Pace Reference Case electricity price forecast was reduced to account for the decline in the gas price and the CO₂ price using the marginal generation assumption in the “Tenaska Secondary CO₂ Emission Analysis” (Exhibit 12.0) from February 2010.²⁰ Starting in 2020, we assume that new entry is needed and the price forecast reflects the economics of a new CCGT. So, for years 2020 and beyond, the Updated Reference case electricity price forecast is adjusted for the gas price and CO₂ price reduction using the operating parameters of a new CCGT.²¹

²⁰ Page 4 of the Tenaska Secondary CO₂ Emissions Analysis indicates that TEC displaces gas generation in 39% of hours, and displaces (3.49 MM tons/4.1 MM MWH) = 0.85 CO₂ tons/MWH. This implies a market gas HR roughly 10 mmbtu/MWH, i.e. [(85% - 61%*1.05)/39%*(2200/115) = 10.2]. For 2015-2019, the updated reference case power forecast is: [Ref Power – 85%*(Ref CO₂) – 39%*(10 HR)*(Ref Gas – Updated Gas)].

²¹ For 2020 and beyond the updated reference power forecast is [Ref Power – (CCGT HR*115/2200)*(Ref CO₂) – (CCGT HR)*(Ref Gas – Updated Gas)]. The CCGT HR is assumed to be 6.5 mmbtu/MWH in 2020 and decline by 0.75% per year.

Appendix – About Us

The NorthBridge Group is an independent economic and strategic consulting firm serving the electric and natural gas industries, including regulated utilities and companies active in the competitive wholesale and retail markets. NorthBridge has a national practice and long-standing relationships with restructured utilities in Regional Transmission Organization (“RTO”) markets, vertically-integrated utilities in non-RTO markets, and other market participants. Before and throughout the restructuring process of the U.S. electricity industry, we have assisted clients with wholesale market design, competitive market analysis and strategy, regulated power supply procurement, state regulatory initiatives and strategy, and mergers and acquisitions.