

IRP Update



City Commission
Workshop

March 28, 2007

Purpose of this IRP Update

- Total plan cost projections for the TEC Plan and the Gas Plan have changed
- In total these changes alter difference in the plan costs by less than 2% (\$83 million out of \$4.5 billion NPV)
- Variations of this magnitude are not unusual as long-range planning studies are further refined
- However, due to the nature of these changes and their impact on decisions regarding participation in the Taylor Energy Center, staff has prepared an update

What Changed?

- Modeling assumptions used in the estimation of production costs
 - Treatment of Purdom Unit 8
 - Treatment of Taylor Energy Center (TEC)
 - Unit commitment rule that reflects operating reliability requirements
- Updated capital cost assumptions
 - For TEC (disclosed in Nov/Dec 2006)
 - For other new generating resources

Modeling Assumptions

- During analysis of the potential addition of another green power purchase (GPS), staff discovered two errors in modeling assumptions used in the production cost simulation:
 - The minimum loading for Purdom 8 had been represented as 27 MW instead of 130 MW
 - The City's share of the Taylor Energy Center (TEC) had not been represented as a "must run" unit

Modeling Assumptions

- The assumptions used for Purdom 8 and TEC produce an incorrect production cost result
 - Dispatch in the model does not recognize unit operating characteristics/constraints
- The impact is magnified because the model did not include the City's local unit commitment rule
 - To meet reliability standards, the City requires two local units be online (excluding peaking units)

Unit Minimum Loading

- Intended to properly represent the operating characteristics of the generating units
- Impacts unit commitment and dispatch decisions, and therefore production costs
- Primarily affects costs during off-peak seasons and/or low load periods when capacity online exceeds demand
- Excess generating capacity must be “dumped” in the off-peak periods at cost or sometimes at a loss

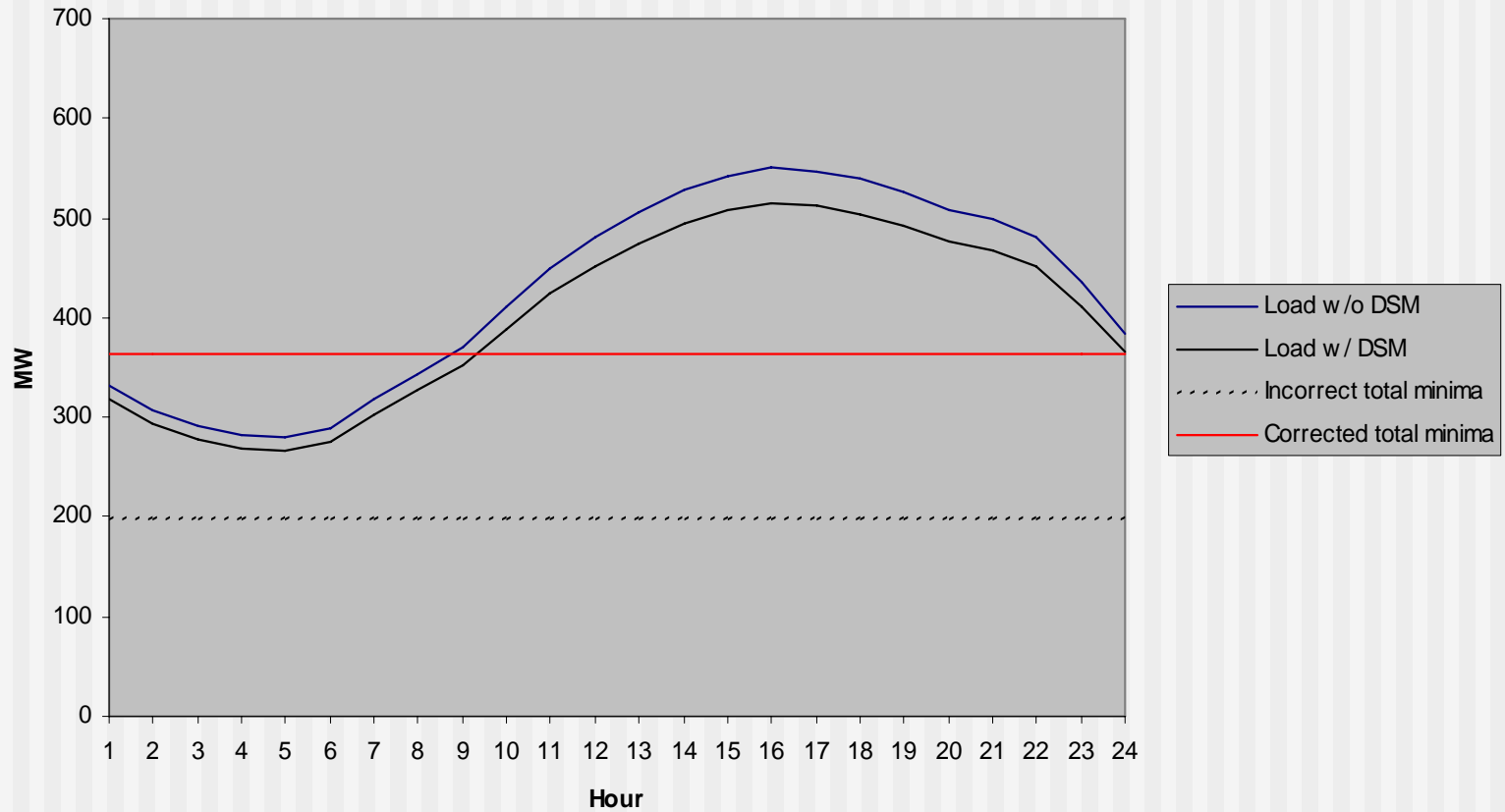
“Must Run” Units

- Must Run status used in production cost models to ensure that unit characteristics and system operating constraints are properly considered
 - System dispatch & cost will reflect unit cycle time and dump power resulting from excess capacity in low load periods
- If no units are designated as Must Run, the model can choose to commit or decommit units solely based on economics and unit cycle time
- This can lead to an unrealistic result if large generating units are cycled on and off frequently

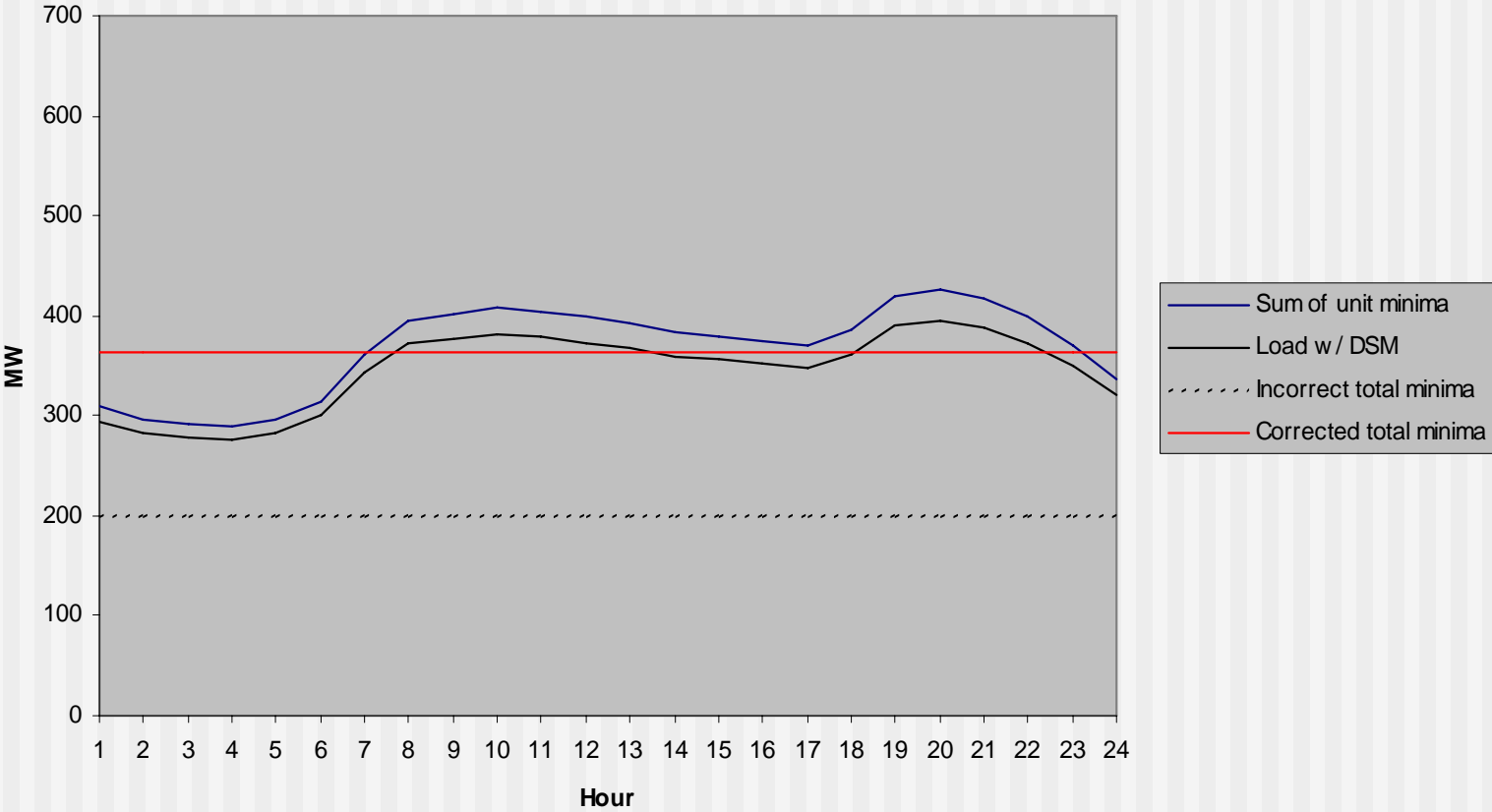
Modeling for TEC

- TEC was not modeled in the cases as Must Run
 - Consultant presumed it was least cost resource and would dispatch anyway
 - Implied that the City could decommit its portion of the unit for economics in low load periods (ie, assign to another partner or sell)
- This assumption does not reflect the current agreement among the participants in TEC
 - No operating agreement in place yet to specify what happens to unit minimums
 - Conservative assumption for planning studies would be to presume each owner takes their share of unit output including minimums

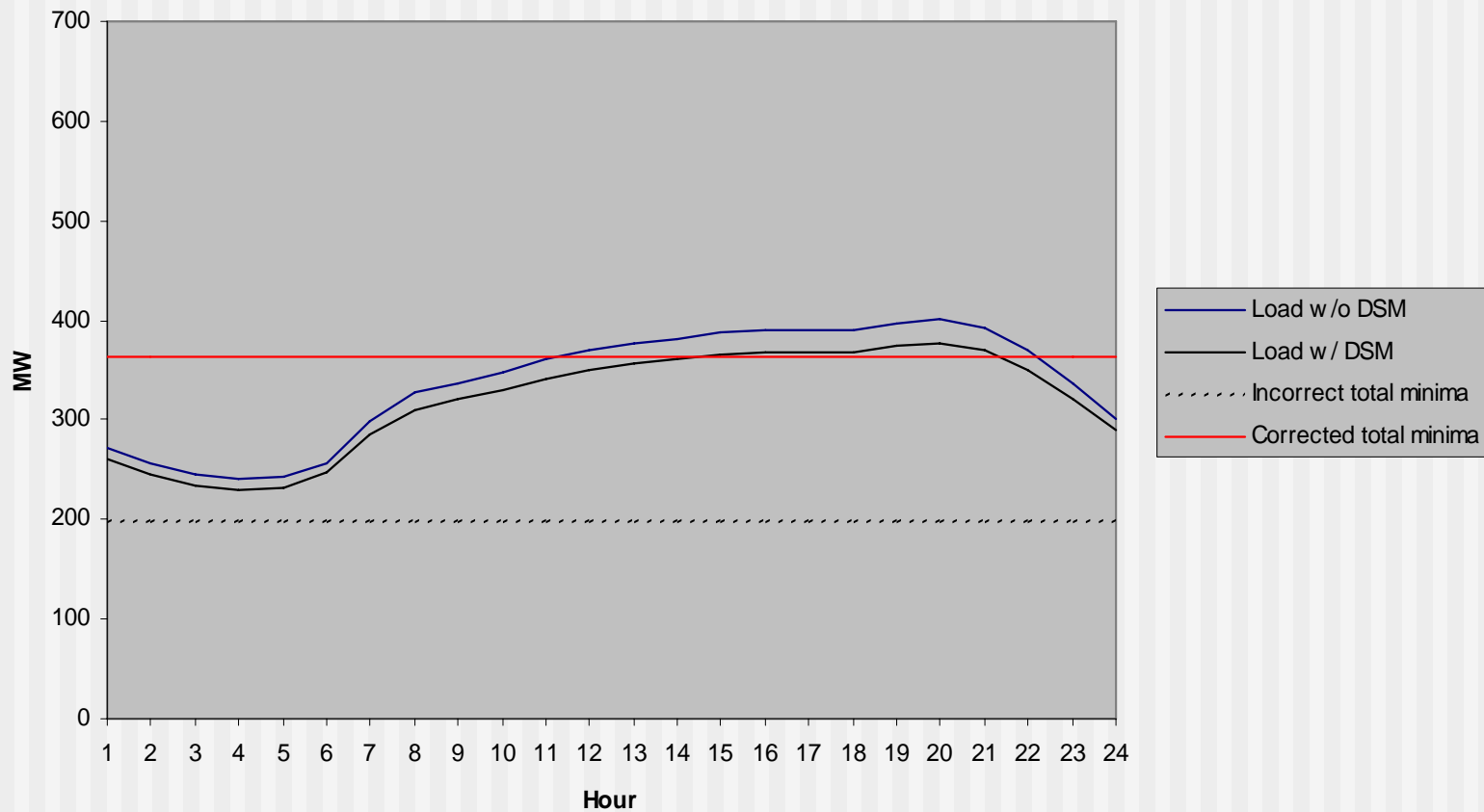
2013 Average Summer Day (2006 Forecast) (Incorrect and Corrected Total Unit Minima)



2013 Average Winter Day (2006 Forecast) (Incorrect and Corrected Total Unit Minima)



2013 Average Shoulder Month Day (2006 Forecast) (Incorrect and Corrected Total Unit Minima)



Unit Commitment Rule

- The City's system requires two local units (steam/CC) to be online to meet reliability requirements for regulation, voltage support and first contingency response
 - If no units are designated as Must Run, the system production cost could be too low (model would decommit/recommit units solely based on economics)
 - System might not be able to meet load if a single element were forced out (first contingency)
- Original model was not programmed with this commitment rule
 - B&V advised model could not handle this constraint
 - Testing of alternative modeling indicated no significant impact to total production cost

The Result

- With Purdom 8 incorrectly modeled, TEC not a Must Run unit, and only a single local unit required online, system dispatch was unrealistic
 - Units were turned on/off too frequently
 - Little or no dump power
 - Production cost was optimized (lowered) without recognizing operating constraints
 - The 2-unit commitment rule did not appear to impact the results

The Impact

- These modeling assumptions affect the results of the IRP Study cases
 - Production costs are lower than they should be in all cases, especially for plans that include TEC
 - As a result, the TEC Plan appeared more cost-effective than it should have vs. the Gas Plan
- These assumptions also affect the case results submitted to the PSC as part of the Need Determination Hearing for TEC

Revised Modeling

- Set Purdom 8 minimum to 130 MW
- Make TEC a Must Run unit
- Represent the replacement power contract from Progress Energy (for City's share of CR-3) as must take
- Develop a unit commitment algorithm that ensures 2 local units are online
 - Does not treat TEC as a local unit
 - Does not require both Purdom 8 and Hopkins 2 online year-round
 - Presumes that the City's import capability is maintained at 250 MW & decremented when TEC comes online

Results:

Modeling Adjustments

Cumulative Present Worth Plan Costs (M\$)
Cases Assume Full DSM & 30 MW BG&E

	Gas Plan (Case 4)	TEC Plan (Case 8)	TEC Plan – Gas Plan
Original Results	\$4,528	\$4,523	(\$5)
Modified Results	\$4,514	\$4,549	\$35
Net Change	(\$14)	\$26	\$40

Modeling Corrections Include: Purdom 8 minimum of 130 MW, TEC as Must Run unit, and local unit commitment rule applied.

Results:

Revised Capital Costs

Cumulative Present Worth Plan Costs (M\$)
Cases Assume Full DSM & 30 MW BG&E

	Gas Plan (Case 4)	TEC Plan (Case 8)	TEC Plan – Gas Plan
Original Results	\$4,528	\$4,523	(\$5)
Modified Results	\$4,536	\$4,574	\$38
Net Change	\$8	\$51	\$43

Revised Costs Include: TEC increase of 19% as disclosed in Dec 2006 & new gas-fired generation increased by 12%. Gas Plan results also reflect change in expansion plan.

Revised Unit Additions

- As a result of changes in the modeling assumptions, the Gas Plan was re-optimized
 - A new expansion plan was selected that is slightly different than the plan as originally presented
 - Original Plan: 160 MW CT in 2016
 - Revised Plan: 78 MW CT in 2016 and a 47 MW CT in 2017
 - The revised plan allows more flexible operation of units and minimizes system production cost
- The unit addition schedule for the TEC Plan was not re-optimized
 - TEC is the only unit addition in that plan

Results:

Combined Changes to Plan Costs

Cumulative Present Worth Plan Costs (M\$)
Cases Assume Full DSM & 30 MW BG&E

	Gas Plan (Case 4)	TEC Plan (Case 8)	TEC Plan – Gas Plan
Original Results	\$4,528	\$4,523	(\$5)
Adjustment for Updated Capital Cost Estimates	\$8	\$51	
Adjustment for Modeling Assumptions	(\$14)	\$26	
Net Adjustment	(\$6)	\$77	
Revised Results	\$4,522	\$4,600	\$78
Combined Change in Plan Savings			\$83

Results reflect the combined effects of corrected modeling assumptions & adjustments for revised capital cost estimates

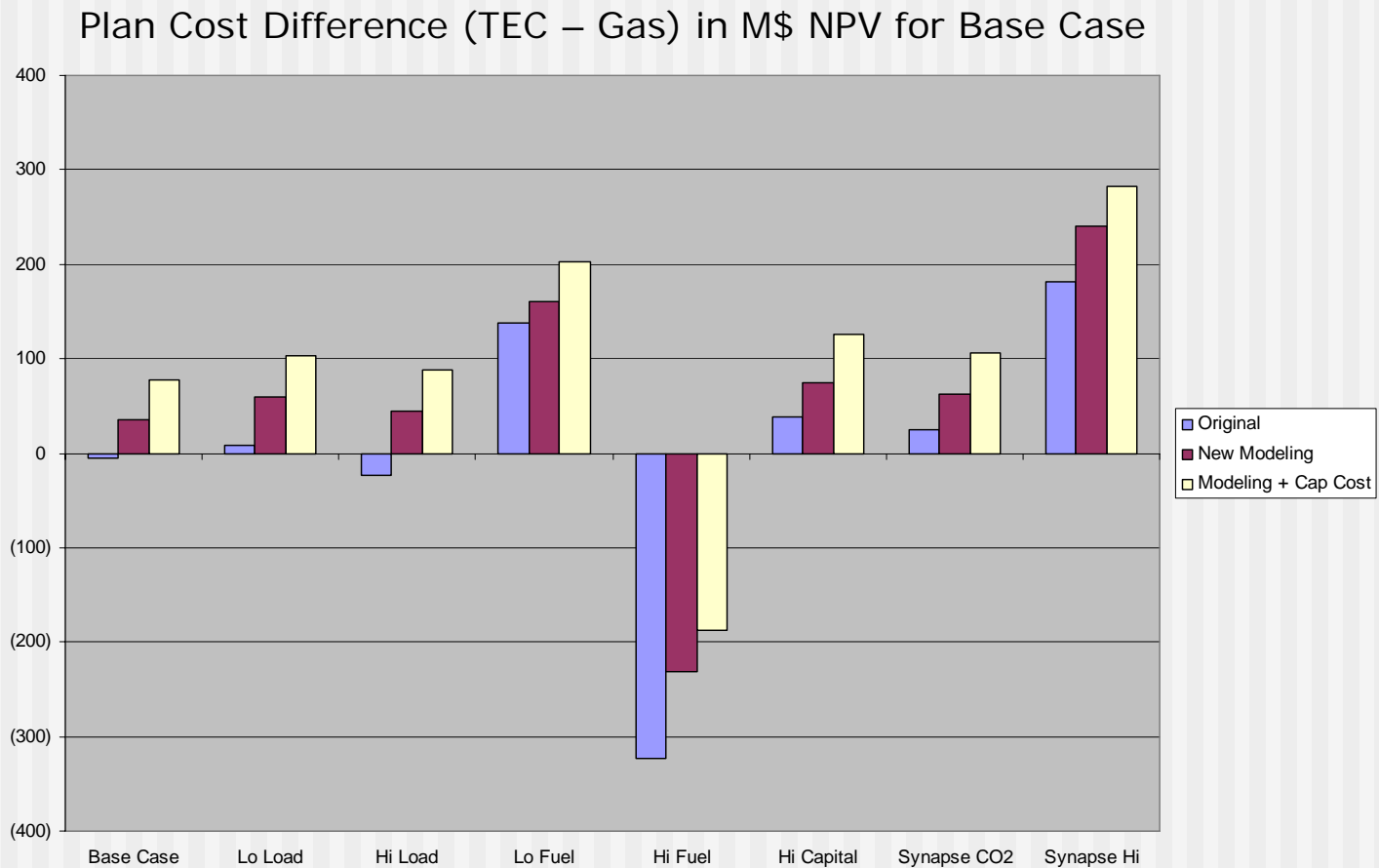
Net Change in Plan Costs

- The change due to modeling assumptions (\$40 million) is a 0.9% increase. This is equivalent to a 15 cents/MMBtu increase in the 30-yr average price of gas used in the IRP study (from \$9.58/MMBtu to \$9.73/MMBtu)
- The total change in plan cost of \$83 million is a 1.8% change. The equivalent change in avg. gas price in the IRP would be about 30 cents/MMBtu (or 3%)
- Fuel price variations of this magnitude (15 to 30 cents) can happen over any given 48-hour period
- A change in any one of several key assumptions could result in a 1-2% impact to the 30-year cumulative present worth plan costs

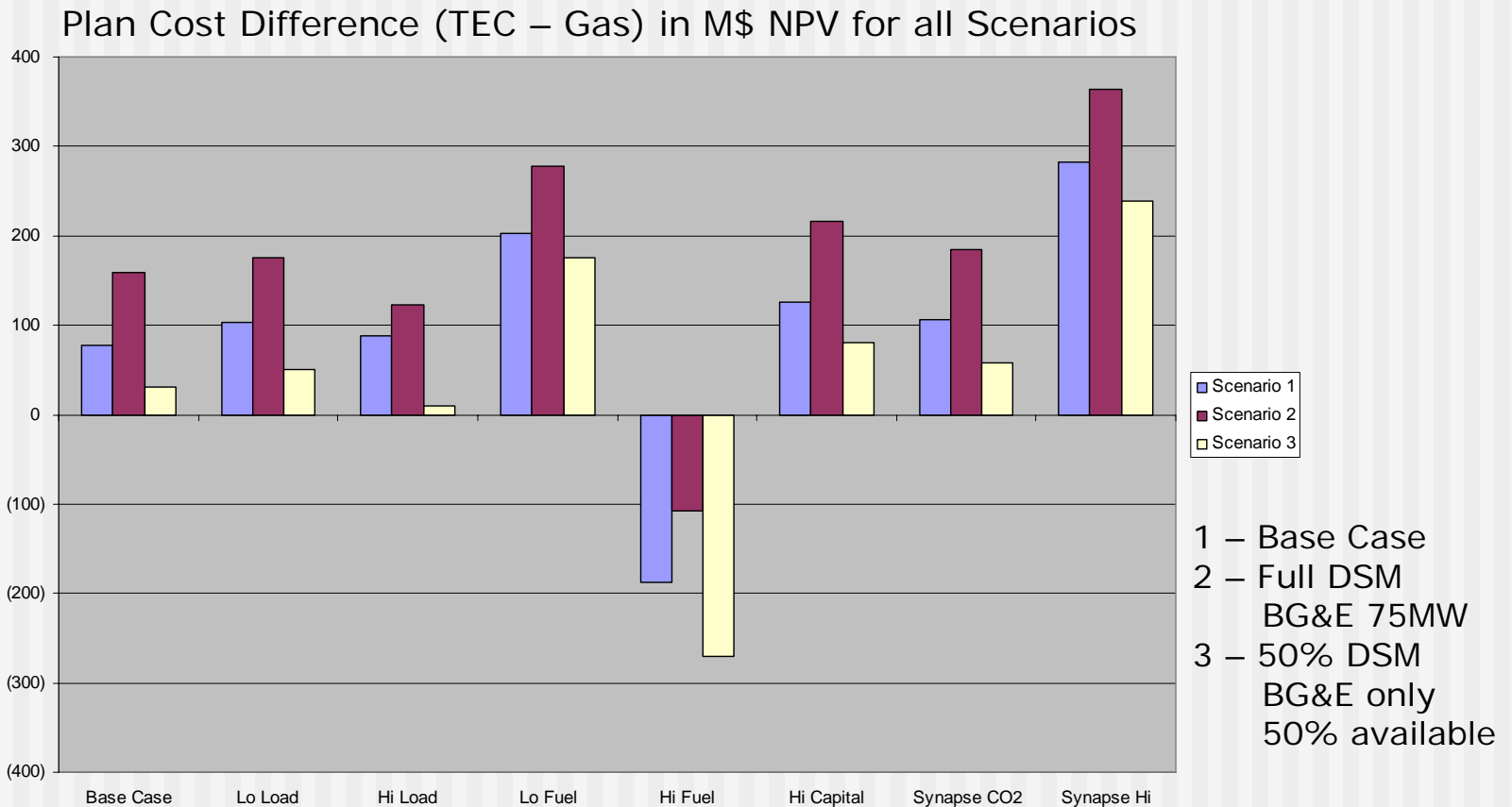
Revised Sensitivity Cases

- Sensitivities for the Gas Plan and the TEC Plan were re-run with the corrected assumptions/cost data
- Results show that the TEC Plan is not as cost-effective as previously reported
- Staff is still reviewing these results for consistency

Sensitivity Cases



Sensitivity Cases



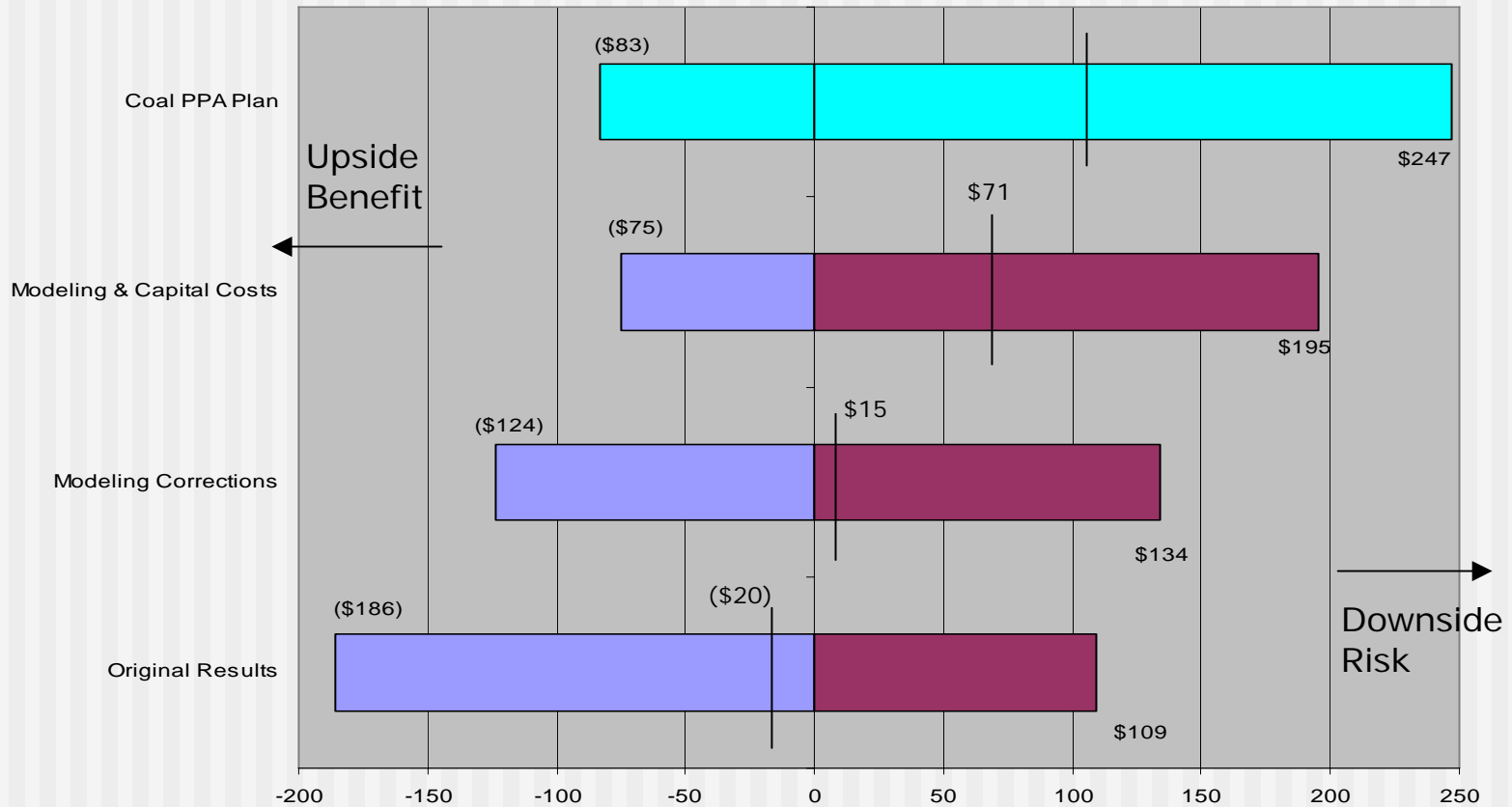
Note: Results reflect impact of new modeling assumptions and revised capital costs

Updated Risk Analysis

- To further evaluate the impact of these changes on plan costs, B&V prepared new risk analysis cases for the Gas Plan and TEC Plan
- Analysis used the same key variables tested in the original risk assessment: capital cost, fuel price, load forecast, and CO2 compliance cost
- Results show a shift in the relative position of the TEC Plan compared to the Gas Plan; the TEC Plan still shows potential savings but the expected value now higher than the Gas Plan
- Risk analysis was not conducted for the IGCC Plan or the Coal PPA Plan. However, original Coal PPA Plan is shown for context.

Risk Adjusted Plan Costs

(M\$ Diff from Gas Plan – Full DSM/BG&E)



Risk Analysis Results

- Increase in capital cost has substantial impact on results
 - Recall that risk analysis computes plan cost variations of +20% on the new capital cost estimates
- Updated Coal PPA Plan results would likely also increase
 - TEC Plan should maintain relative relationship to that alternative
- TEC Plan still shows benefit but outcome is more uncertain with higher probability of costs exceeding the Gas Plan
 - However, analysis is based on IRP Study fuel forecast that is 18+ months old
- Further evaluation is needed to determine if risks have actually shifted to favor a Gas Plan strategy

FPSC Need Hearing

- Adjusted modeling assumptions impact the results reported to the FPSC in January re the City's benefits from TEC
 - Savings for participation in TEC were reduced by about \$54 million NPV
- TEC partners requested that the FPSC defer action on the need case pending submission of updated cost numbers
- No decision yet about the schedule for re-opening the need case

FPSC Plan Costs

Results for resource plans prepared as part of the TEC Need Hearing:

	Plan with TEC ³	Plan without TEC ⁴	Differential Savings with TEC
Base Case Results from January 2007 Hearing	\$4,379.1	\$4,567.7	\$188.6
Base Case Results after applying modeling adjustments	\$4,441.4	\$4,576.1	\$134.7
Change in Plan Costs	\$62.3	\$8.4	
Change in Plan Cost Savings with TEC			(\$53.9)

Note 3 – Plan consists of TEC unit and 2-LMS100 simple cycle turbines

Note 4 – Plan consists of 1-LMS100 simple cycle turbine & a circulating fluid bed (CFB) coal unit

Next Steps

- IRP analysis will continue to be reviewed and revised
 - New fuel forecast
 - New load & energy forecast
 - Potential additional green energy purchase (GPS plasma torch)
 - Investigate smaller ownership share of TEC or PPA
 - Continue review of IGCC
 - Participation in PEF nuclear unit
 - Continued investigation of climate change impacts
- Regular updates are planned over the next year