**Questions regarding ERCOT’s marginal loss study**

*1. Please provide the marginal loss surplus for each case in the study. (NRG)*

A. The marginal loss surpluses reported by the model for the base case and two sensitivities are provided in the following table:

**Annual Marginal Loss Surplus**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Low Gas Price Case** | **Base Case** | **High Gas Price Case** |
| Surplus Payments ($M) | 222.2 | 280.5 | 297.3 |

*2. Please confirm that the distribution of marginal loss surplus to consumers is not included in the Annual Changes in Total Consumer Costs. (NRG)*

A. Correct. The reported changes in Total Consumer Costs are calculated by summing the hourly Load multiplied by LMP for each bus.

*3. Please provide the annual reduction in system congestion costs from the marginal loss study. (NRG)*

A. The total system congestion costs for the six model runs are provided in the following table. The amount of system congestion between the average loss and marginal loss cases are not directly comparable, in the average loss cases the locational marginal prices (LMPs) consist of two components (energy price and congestion price) whereas in the marginal loss cases, the LMPs consist of three components (energy price, congestion price and losses).

**Annual System Congestion Costs**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Low Gas Price Case** | **Base Case** | **High Gas Price Case** |
| Average Losses ($M) | 634.7 | 796.7 | 871.5 |
| Marginal Losses ($M) | 504.7 | 594.8 | 629.6 |

*4. Is the Annual Generator Revenue Change from the marginal loss study comparable to the Energy Cost reduction in the RTC study?  If not, please provide a comparable Energy Cost reduction for the marginal loss study for the system and by zone. (NRG)*

A. The Annual Generator Revenue Change from the marginal loss study is not comparable to the Energy Cost reduction in the RTC study. The Annual Generator Revenue data from the marginal loss study was calculated by multiplying the hourly output of each generator by the LMP at each generator bus by hour and then summing all 8,760 hours in the annual simulation. The Energy Cost reduction in the IMM RTC study was calculated by multiplying the system lambda by the hourly generation and then summing across the intervals included in the back-cast analysis.

As the Uplan model provides LMPs for all generation and load buses for each hour, the aggregated data from the model output is based on hourly summation by location, rather than calculating a system average and then multiplying that by hourly generation.

*5. Please provide the total amount of installed wind and solar used for each case in the study. (NRG)*

A. The amounts of wind and solar capacity were consistent across all model runs. The cases included a total of 2.3 GW of installed solar capacity and 25.6 GW of installed wind capacity.

*6. Please provide the total energy by zone used for each case in the study. (NRG)*

A. The total annual amounts energy used by consumers by zone were consistent across all model runs. The totals are provided in the following table.

**Annual Customer Energy Demand by Zone**

|  |  |
| --- | --- |
|  | **Demand (GWh)** |
| Houston Zone | 141,892.5 |
| North Zone | 131,344.3 |
| South Zone | 111,264.6 |
| West Zone | 33,517.9 |

*7. Please provide the annual load-weighted average energy price from the marginal loss study.* (NRG)

A. The annual load-weighted average LMPs for each model run are provided in the following table.

**Annual Load-Weighted LMPs**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Low Gas Price Case** | **Base Case** | **High Gas Price Case** |
| Average Losses ($/MWh) | 23.93 | 30.02 | 32.38 |
| Marginal Losses ($/MWh) | 24.38 | 30.52 | 32.85 |

*8. Please quantify the reduction in RUC commitments in the marginal loss study as a result of increased starts of resources closer to loads. (NRG)*

A. The Uplan model is not designed to simulate the ERCOT day-ahead process, including Reliability Unit Commitment (RUC). ERCOT cannot quantify any changes in RUC commitments resulting from the implementation of marginal losses.

*9. UPLAN has the option of modeling the loss on each line as equally split to the two terminals of the line. Was this the option used in the ERCOT analysis of marginal losses? If not, how were losses modeled? Was it just modeled as load at the load-distributed reference bus like most US ISOs? Have you looked at the differences between the results using these options? (Shams Siddiqi)*

A. Uplan has four options to model losses: “No Losses,” “Integrate Losses to Generation,” “Mimic A/C Losses,” and “Integrate Losses to Load.” We used the “Integrate Losses to Load” option for both the average loss modeling and the marginal loss modeling.

ERCOT did not evaluate the impacts of the other two options to model losses. Since it has not yet been determined how ERCOT would actually implement marginal losses in Security Constrained Economic Dispatch (SCED), it was decided that it would not be informative to provide three different sets of results for each sensitivity case. In addition, ERCOT spent a significant amount of effort understanding and vetting the software using the loss implementation option selected. The other two loss options could have required a similar level of effort, which would have delayed completion of the study.