

Ranking of Supply-Side Options

In Terms of Utility Costs and Utility Costs Plus Probable Environmental Costs

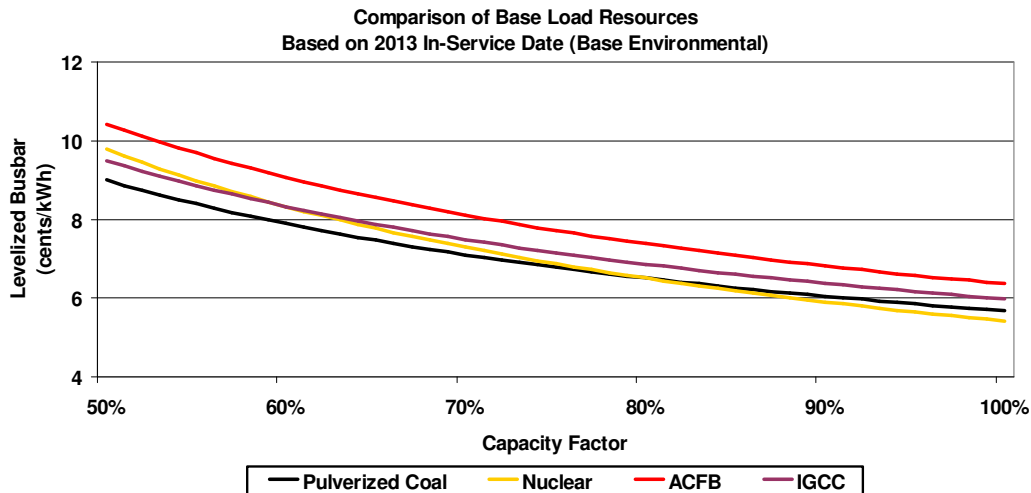
4 CSR 240-22.040(2)(A) Supply-side ranking – utility costs

To meet the requirements of the rule, Ventyx used an excel-based screening model to compare and rank the supply-side alternatives using the ranking technique of levelized busbar cost. The model condensed all the capital and operating cost data for a resource into the single quantitative levelized busbar cost parameter. The levelized busbar cost reflects the per unit cost of a generating resource (cents per kWh) on a “stand alone” or non-system basis.

The levelized busbar costs were calculated across the capacity factor range of the supply-side resource duty cycle to create cost curves. This is important as the capacity factor of a generating unit significantly impacts the levelized busbar cost due to the tradeoff between capital costs and operating costs. Three sets of cost curves were developed comparing base load, intermediate load, and peaking load resources. As per the rule, the costs are expressed in nominal dollars. Ventyx choose to create the cost curves using the operating costs in the year 2013 as that is the first year Empire is considering new supply-side resources.

Base Load Resources: The cost curve for the base load resources considers a capacity factor range of 50% to 100%. The technologies considered were: Nuclear, Pulverized Coal, Atmospheric Circulating Fluidized Bed (ACFB), and Integrated Gasification Combined Cycle (IGCC). The rankings are based on base environmental costs.

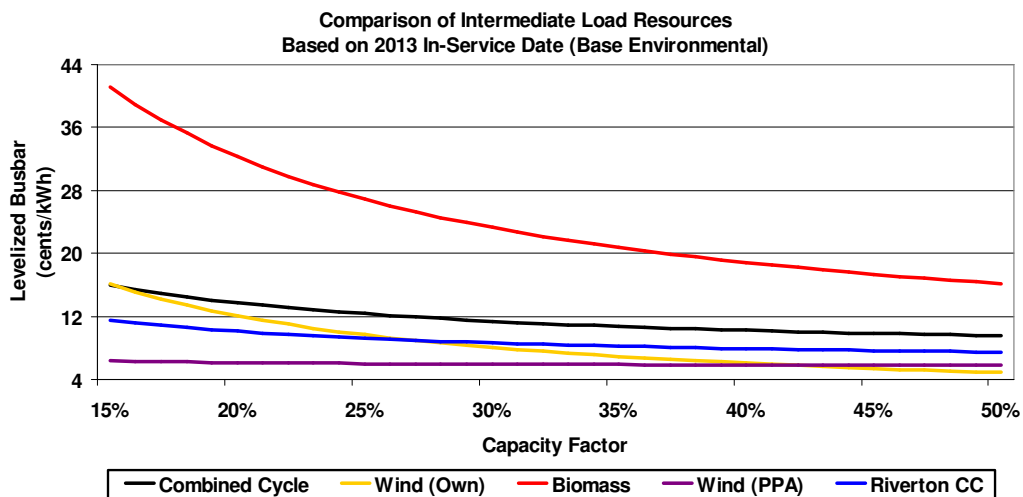
Figure 1



Source: Venytx

Intermediate Load Resources: The cost curve for the intermediate load resources considers a capacity factor range of 15% to 50%. The technologies considered were: Combined Cycle, Wind (ownership), Biomass, Wind (PPA), and Riverton 12 CC retrofit. The rankings are based on base environmental costs.

Figure 2

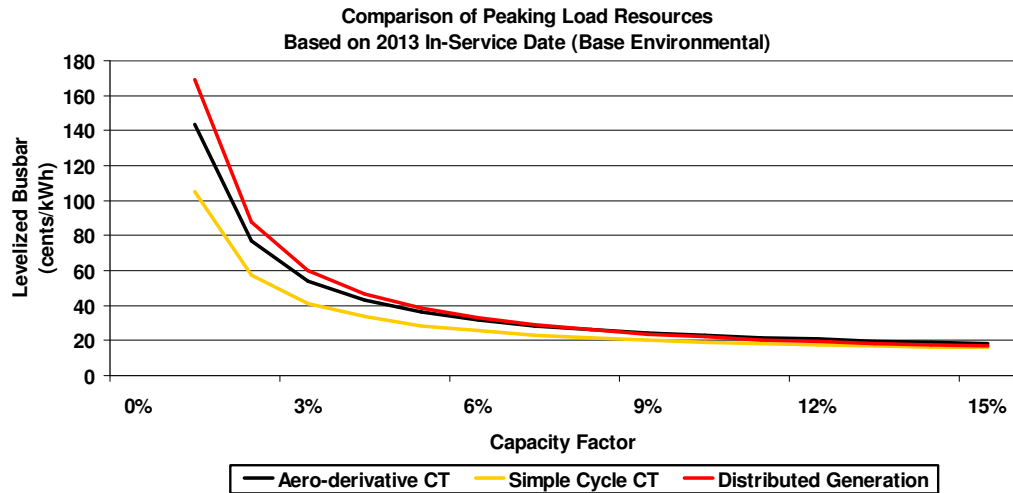


Source: Venytx

Peaking Load Resources: The cost curve for the peaking load resources considers a capacity factor range of 0% to 15%. The technologies considered were: Aero-derivative

CT, Simple Cycle CT, and Distributed Generation. The rankings are based on base environmental costs.

Figure 3

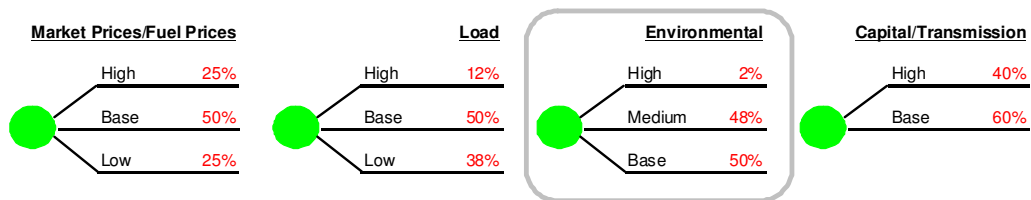


Source: Ventyx

4 CSR 240-22.040(2)(C) Supply-side ranking – utility costs plus probable environmental costs

Ventyx used the following non-zero probabilities to “weight rank” the supply-side alternatives when considering probable environmental costs. The cost of fuel was correlated to the emission costs for each of the scenarios.

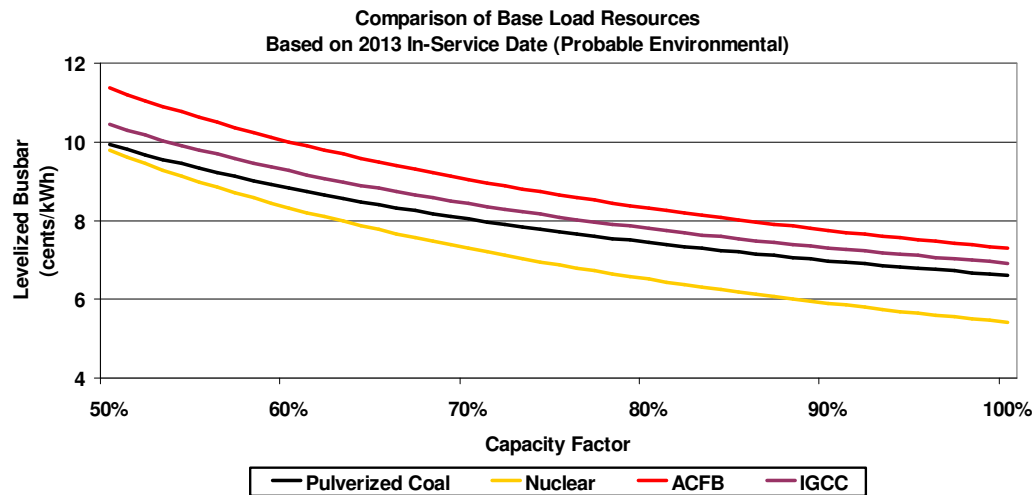
Figure 4



Source: Ventyx

Base Load Resources (with probable environmental costs): The cost curve for the base load resources considers a capacity factor range of 50% to 100%. The technologies considered were: Nuclear, Pulverized Coal, Atmospheric Circulating Fluidized Bed (ACFB), and Integrated Gasification Combined Cycle (IGCC). The rankings are based on probable environmental costs.

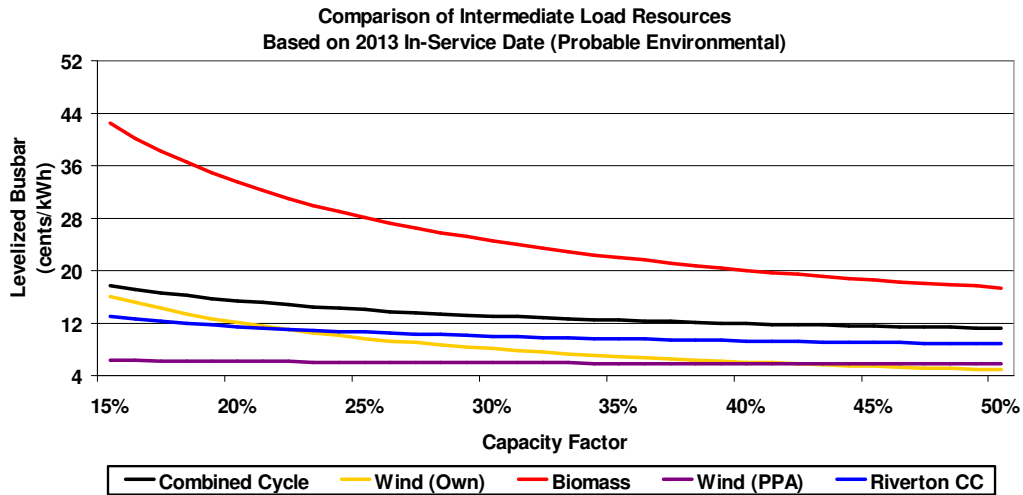
Figure 5



Source: Venytx

Intermediate Load Resources (with probable environmental costs): The cost curve for the intermediate load resources considers a capacity factor range of 15% to 50%. The technologies considered were: Combined Cycle, Wind (ownership), Biomass, Wind (PPA), and Riverton 12 CC retrofit. The rankings are based on probable environmental costs.

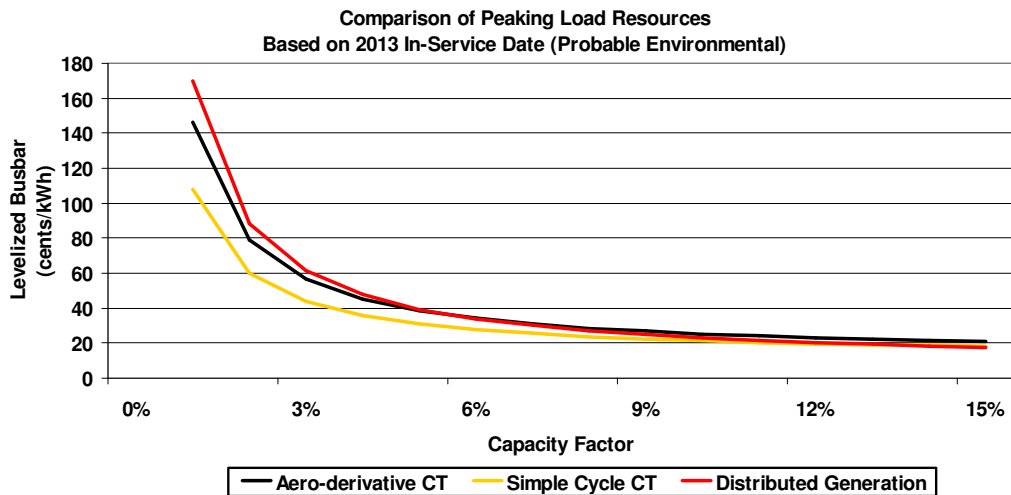
Figure 6



Source: Venytx

Peaking Load Resources (with probable environmental costs): The cost curve for the peaking load resources considers a capacity factor range of 0% to 15%. The technologies considered were: Aero-derivative CT, Simple Cycle CT, and Distributed Generation. The rankings are based on probable environmental costs.

Figure 7

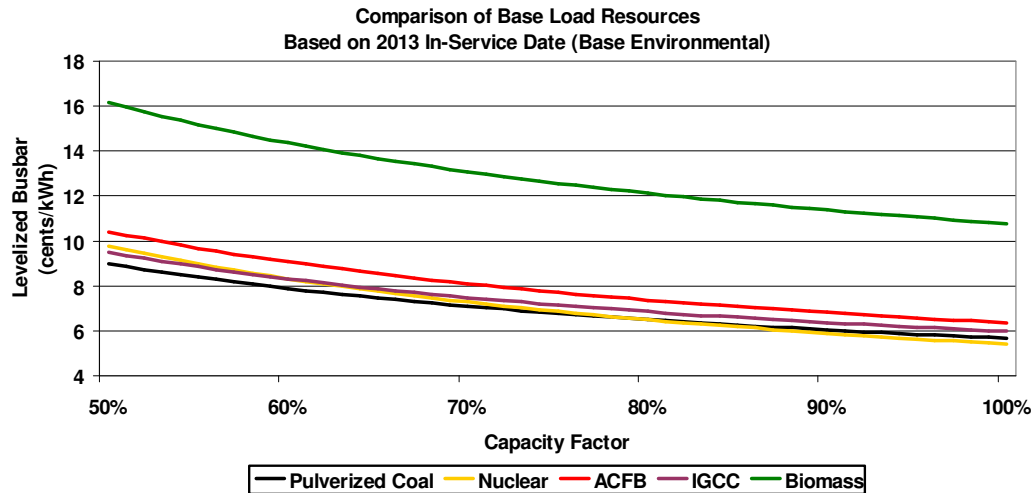


Source: Venytx

Supply-side rankings with biomass graphed with the base load resources

Base Load Resources: The cost curve for the base load resources considers a capacity factor range of 50% to 100%. The technologies considered were: Nuclear, Pulverized Coal, Atmospheric Circulating Fluidized Bed (ACFB), Integrated Gasification Combined Cycle (IGCC) and Biomass. The rankings are based on base environmental costs.

Figure 1

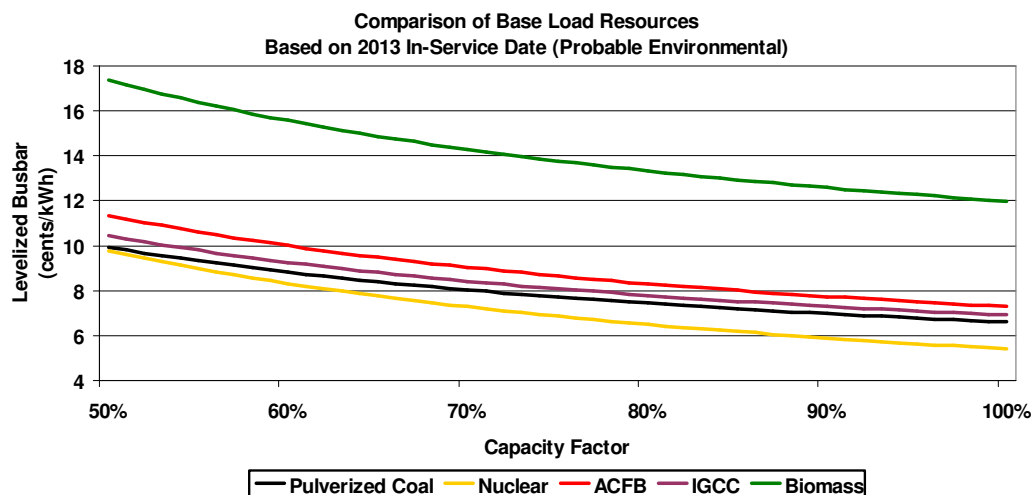


Source: Venytx

Supply-side ranking with biomass graphed with the base load resources – utility costs plus probable environmental costs

Base Load Resources (with probable environmental costs): The cost curve for the base load resources considers a capacity factor range of 50% to 100%. The technologies considered were: Nuclear, Pulverized Coal, Atmospheric Circulating Fluidized Bed (ACFB), Integrated Gasification Combined Cycle (IGCC) and Biomass. The rankings are based on probable environmental costs.

Figure 2



Source: Venytx