Variable Costs of Cogeneration Facilities

Cogeneration facilities throughout Alberta are designed to generate electricity and to meet the unique process demands of the associated industrial process. Because of this, the configuration of the cogeneration facilities varies significantly from site to site. Accordingly, the components of variable cost, as well as the magnitude of each component, are site-specific depending upon the respective configuration.

For example, some sites have cogeneration facilities that provide the option to use steam for either its industrial process or generate additional electricity. This trade-off establishes a legitimate opportunity cost for some sites, but not for others that have no such option. Further, the fuel costs, one of the larger variable cost components, can vary significantly from site to site.

This creates a significant challenge if trying to establish a generic variable cost that would apply across all cogeneration facilities for offer mitigation purposes. If done, the generic cost must ensure that facilities do not risk incurring a loss, which may require: (i) a site-by-site assessment to establish an upper bound; (ii) a significant multiplier applied to the variable cost for the average facility; or (iii) the ability for market participants to establish a site-specific variable cost.

The components of variable cost for cogeneration facilities are as follows:

1. Fuel costs
   a. Site-specific as heat rate may be same as an SCGT, but may be lower depending on whether excess steam/heat is shared with the associated industrial process. Heat rate differences between sites could vary by as much as 100% or more.

2. Variable Rate STS charges including transmission losses

3. Variable O&M costs
   a. Site-specific as variable O&M costs will vary depending on each site:
      i. HRSG – maintenance costs are variable based on how HRSG is operated, number of thermal cycles, water quality.
      ii. Gas turbine – maintenance costs are variable based on how turbine is operated, rapid load changes, and run hours.
      iii. Steam turbine – for sites with the option to use steam to generate additional energy.
      iv. Condensing turbine – cooling-water treatment cost for those sites with a condensing turbine.
      v. Water treatment system – depends on demand for water, which depends on how the plant is operated, also depends on the variability of the supply water quality as this will influence when RO backwashes occur and how often filters need to be replaced.
4. Variable Start-up costs
   a. Cogen units are generally considered to be on, but the generators at some sites are more like peakers with more starts/stops. Start-up costs are similar to a SCGT.
   b. Site-specific
      i. Rate DTS variable charges – depending on the location, the electrical cost to start-up may have an energy component.
      ii. Boiler – cost to fill boiler with water can vary if you supply from your own water treatment or you get it brought in via third party.
      iii. Gas turbine - burns a lot of fuel with no output until at synchronous speed, which can take between 10 minutes and 2 hours depending on site. Also depends on the contract and who controls dispatch since the dispatcher could leave the gas turbine at full speed with no load ready to sync for as long as they require (minutes to an hour if needed).

5. Environmental / emission costs
   a. GHG (carbon tax)

6. Opportunity cost
   a. Site-specific depending on the sites options with respect to steam generation.
      i. Some sites have the option to use steam to generate additional energy, or alternatively to divert the steam to its industrial process. For these sites, the variable cost includes the foregone value of its industrial process. If the site has an auxiliary boiler that can create steam for the industrial process, the opportunity cost may be the additional fuel cost to run the auxiliary boiler.