

## Condition-Based Malfunction Forecasts for Commercial Operations

### Deployment of a Prognostic Asset Management Solution for CCI's Power Generation Assets

**Background:** Castleton Commodities International (CCI) is a leading global merchant energy company, trading energy commodities and operating a variety of energy assets. These include dual-fired (oil & gas) generating units and cogeneration units in the USA, ranging from 77 MW to 600 MW and covering peak demand in metropolitan areas such as Dallas and New York City. All generating assets are fully equipped with condition monitoring and diagnostic systems, recording and archiving condition and process data for all crucial asset components.

As a power generator primarily focused on commercial operations CCI seeks full transparency of both market and generation risk, which is largely driven by the risk of unscheduled generating unit downtime. To better understand and manage generation risk on the basis of their assets' actual conditions, CCI has introduced Cassantec's prognostic solution across its entire fleet of generating assets, including Roseton in Figure 1. With the acquisition of additional generating assets, the solution is gradually expanding.

**Objective:** CCI's objective is to actively manage the future availability of its power generating assets, in line with its ongoing commercial commitments, and to secure power supply in upcoming peak demand periods. The prognostic solution, in particular, is to provide a daily update of unscheduled future downtime risk for its generating assets. The risk of unscheduled downtime is computed at the component level, then aggregated to the unit and fleet level, and explicitly compared to power-zone-specific market prices. For units that are "in the money" at any future point in time, risk-mitigating action is taken if necessary. Such action includes preemptive yet informed component maintenance or replacement, ideally during idle periods or scheduled revision cycles.

**Approach:** The prognostic solution provided by Cassantec is computing future risk profiles at component, unit, and fleet level, based on condition and process data of the generating assets. This data includes current and historical parameter values for all crucial asset components, such as gas and steam turbines, power generators and transformers, boilers and HRSGs, boiler feed pumps, induced and forced draft fans. In a first step, the prognostic solution uses current and historical condition and process data to project

*"While we use proprietary power demand forecasts on the market side, Cassantec is filling an important gap with availability forecasts on the generation side. We are intrigued by their prognostic technology and excited about their overall value proposition. We expect their solution to become a standard tool in the power industry, especially for technologically progressive and commercially ambitious unregulated utilities."*

**Dr. Brad Romine**, SVP of Power Trading, CCI

the component's condition into the future. In a second step, the future condition is correlated with component-specific malfunction modes, to determine the future malfunction risk for all components considered. In a third step, the malfunction risks are illustrated and aggregated in a prognostic report that offers component, unit, and fleet level views, as displayed in Figures 2-4. The generation risk reports are complete-



Figure 1: Roseton Site (Source: CCI)

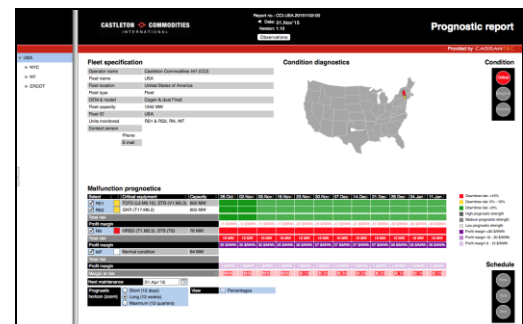


Figure 2: Example Report, Fleet Level

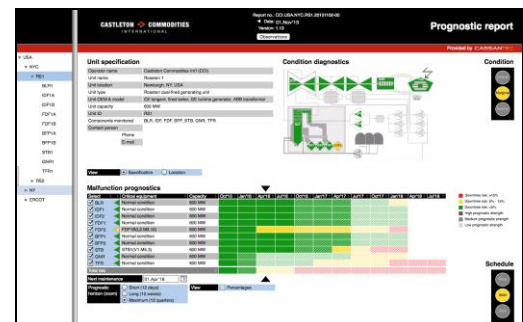


Figure 3: Example Report, Unit Level

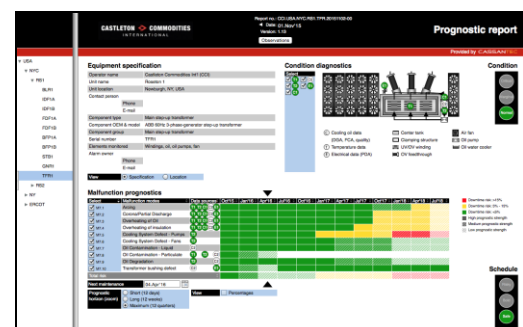


Figure 4: Example Report, Component Level

mented with market power price forecasts to determine both megawatt@risk and margin@risk indices. Monitoring these indices allows adjustment of trading and hedging strategies, mitigating both market and generation risk of the power business

**Benefits:** CCI is expecting benefits of the prognostic solution on three levels:

- *Competitive commercial advantages at the fleet level*, through the use of the prognostic reports for informed commitments in power trading and hedging
- *Higher uptime records at the unit level*, through the use of the prognostic reports and related downtime risk profiles for improved maintenance planning, scheduling, and scoping
- *Lower asset management costs at the component level*, through informed mitigation of performance flaws, inefficiencies, and latent defects and through targeted work order preparation

For reliability managers and mechanical engineers onsite, availability forecasts are a strong complement to the condition monitoring and diagnostic systems in place, consolidating data from different sources, extending insights by an explicit future time dimension, and rendering standardized and conclusive reports. The forecasts may also serve as a shared planning tool in collaboration with equipment vendors, service providers, or insurers.

**Next Steps:** Continuous refinement of the operational solution, and extension to newly acquired generating assets.

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