Virtual Combined Cycle Operating/Technical Challenges Resulting from Unequal Regulation Assignments

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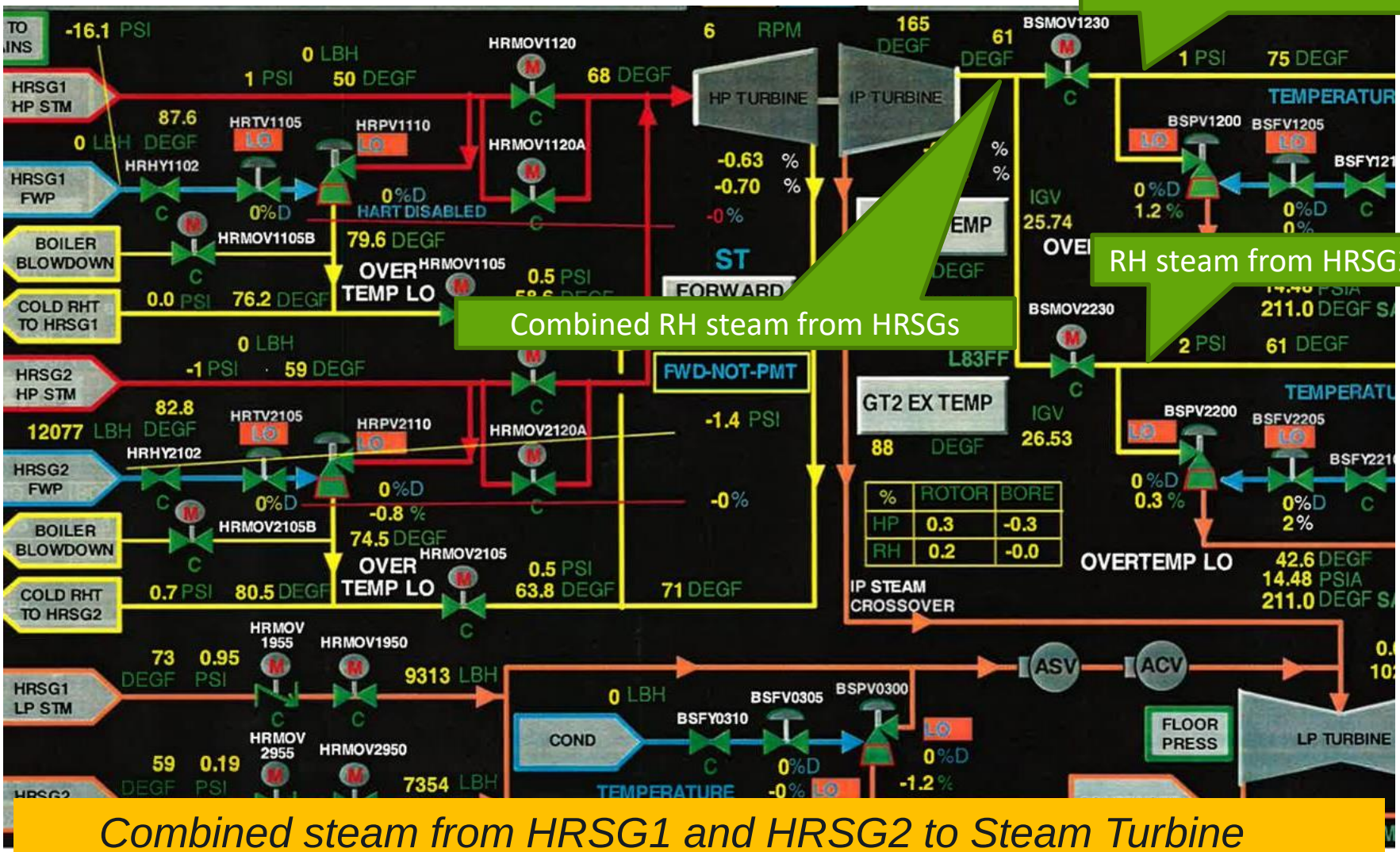
Overview of Problem

- Due to the inherent design of some 2(+)x1 combined cycle power plants, there are number of operational and technical challenges associated with fulfilling Regulation commitments that are unequally assigned to units within the same combined cycle power block.
  - Power block defined as 2x1 or 3x1 combined cycle configuration.
- Successfully fulfilling such assignments can result in substantial short-term and long-term impacts to the power plant equipment and its reliability.

Simplified Description of the Technical Issue

- Unequal Regulation assignments on generating units in the same power block can frequently result in the need to operate each respective unit at very different generating/firing rates.
- For example, in a 2x1 operating configuration, both gas turbines deliver steam to the steam turbine through a common header.
- In the instance of unequal Regulation assignments, it is not uncommon for one unit to operate at low-to-mid load and the other unit to operate at full output.
- If the two gas turbines are fired at different rates, the resulting pressure of the steam generated by each respective heat recover steam generator (HRSG) varies accordingly…i.e., increased firing rate results in increased steam pressure.
- Because steam from the two units intermingles into a common supply header to the steam turbine, each unit's flow competes with that of the other, and the higher pressure always wins.
  - Example: Max load (with supplemental firing) -1900 psi; Base load -1100 psi; Min load - 850 psi
- The HRSG producing the lower pressure steam can undergo a stall condition, effectively limiting flow through that HRSG.
- This limits flow through the individual steam generating tube circuits within the HRSG, resulting in reduced cooling in those tubes and increased tube metal temperatures.
- Ultimately this can lead to tube failure and unplanned shutdown of the unit for repairs.
- This can result in forced outages, increased EFOR, unmet market commitments, significant repair costs, and the unit being unavailable for dispatch for the duration of those repairs.

Steam Supply to Steam Turbine



Conclusion

- Due to the inherent design of some 2(+)x1 combined cycle power plants, ensuring equal allocation of Regulation assignments across virtual units is essential, in order to effectively meet obligations.