System Advisor Model Enhancements for CSP

NREL

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PROJECT OBJECTIVES

Goal:

- Restructure SAM architecture to enable batch simulations with parallel processing, advanced solution methods, modernized code development, and nonproprietary code.
- Develop model for Integrated Solar Combined Cycles (ISCC) in SAM that will interface with existing solar field models.

Innovation:

- This project aims to maintain SAM's unique ability to efficiently model pertinent CSP technologies.
- Efficient research, development, and analysis of CSP is facilitated by the ability to quickly simulate many different CSP cases (e.g. grid integration[1]) and disseminate models with the CSP community.
- ISCCs have been identified as promising power cycle technologies. Models in SAM will enable the CSP community to quickly estimate the performance of systems employing these technologies.

[1]P. Denholm and M. Mehos, "Enabling Greater Penetration of Solar Power via the Use of CSP with Thermal Energy Storage," NREL, Golden, CO, 2011.

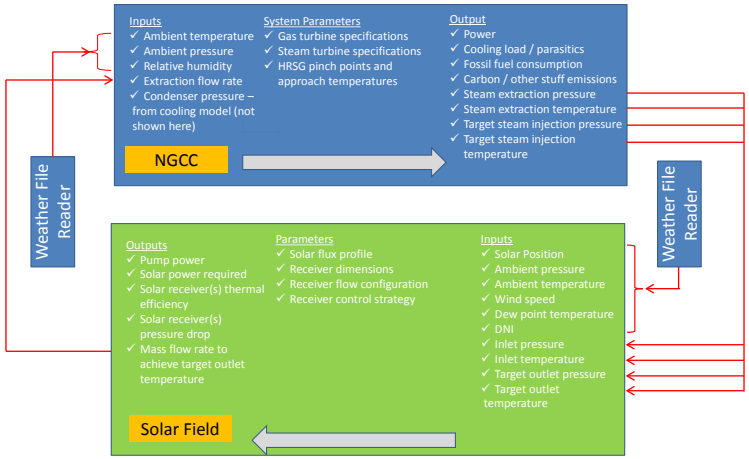
APPROACH

Define Primary ISCC configuration:

NGCC Configuration	2 gas turbines & HRSG x 1 Rankine cycle
Gas Turbine Sizing	215 MWe
Steam Turbine Design Specs	214 MWe, 103.4 bar, 565°C
Steam Turbine Over-design	294 MWe, 165.5 bar, 565°C
Solar Injection Point	Between HP boiler and 1st superheater
Solar Technology	Direct steam power tower

KEY RESULTS AND OUTCOMES

Iterative modeling framework to connect the NGCC and solar field models has been developed. The Primary model will be coded next quarter.



NEXT MILESTONES

- Develop an internal release of SAM that runs the restructured SAM and CSP-specific solver (due 9/30/13). This release will be thoroughly cross-checked against the previous versions of SAM to validate the performance of the new modeling architecture.
- Document and validate ISCC power cycle model (due 9/30/13). We will consult with technology experts to ensure that the Natural Gas Combined Cycle (NGCC) portion of the model is accurate. Modeling results will also be compared to results from the literature.
- Develop an internal release of SAM that includes an ISCC power cycle option.