SAM for CSP Cooling Analysis

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Summary

- The water footprint of electricity generation
- Dry vs. wet cooling
- Baseline System Advisor Model
- SAM in the analysis of concentrating solar power cooling

Figure 1. Total water withdrawals by category, 2010.

From Maupin et al.

Dry cooling

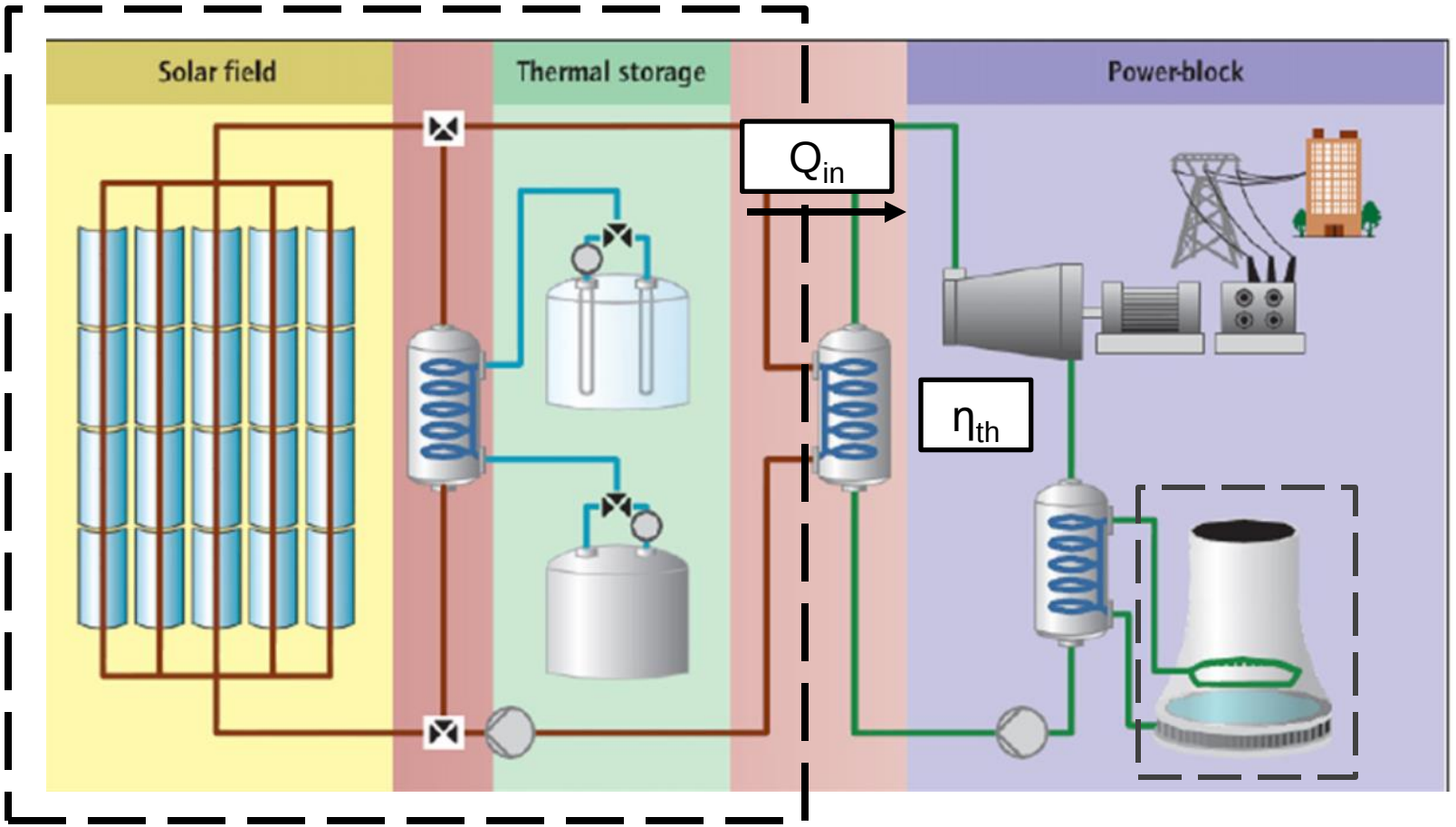
- Water consumption is an important issue in environments where CSP is located.
  - Water consumption for wet cooled plants is approximately 667 gallons / MWh.
- Performance impacts of air cooling:
  - Air-cooling parasitic loads are 3-5% of CSP plant power output.
  - Additional performance penalties exist compared to wet cooling.
- We are analyzing cooling system improvements.

SAM baseline model

- 35 MW air-cooled CSP trough plant

Thermal energy storage capacity	6 hrs
Solar Multiple	2
Thermal capacity solar field	185 MW
Peak power block output	35 MW
Solar collectors	584 Solargenix SG-1, Length = 100m, Width= 5m 73 loops
Collector field area	274,655 m^2
Molten salt storage volume	8,282 m^3

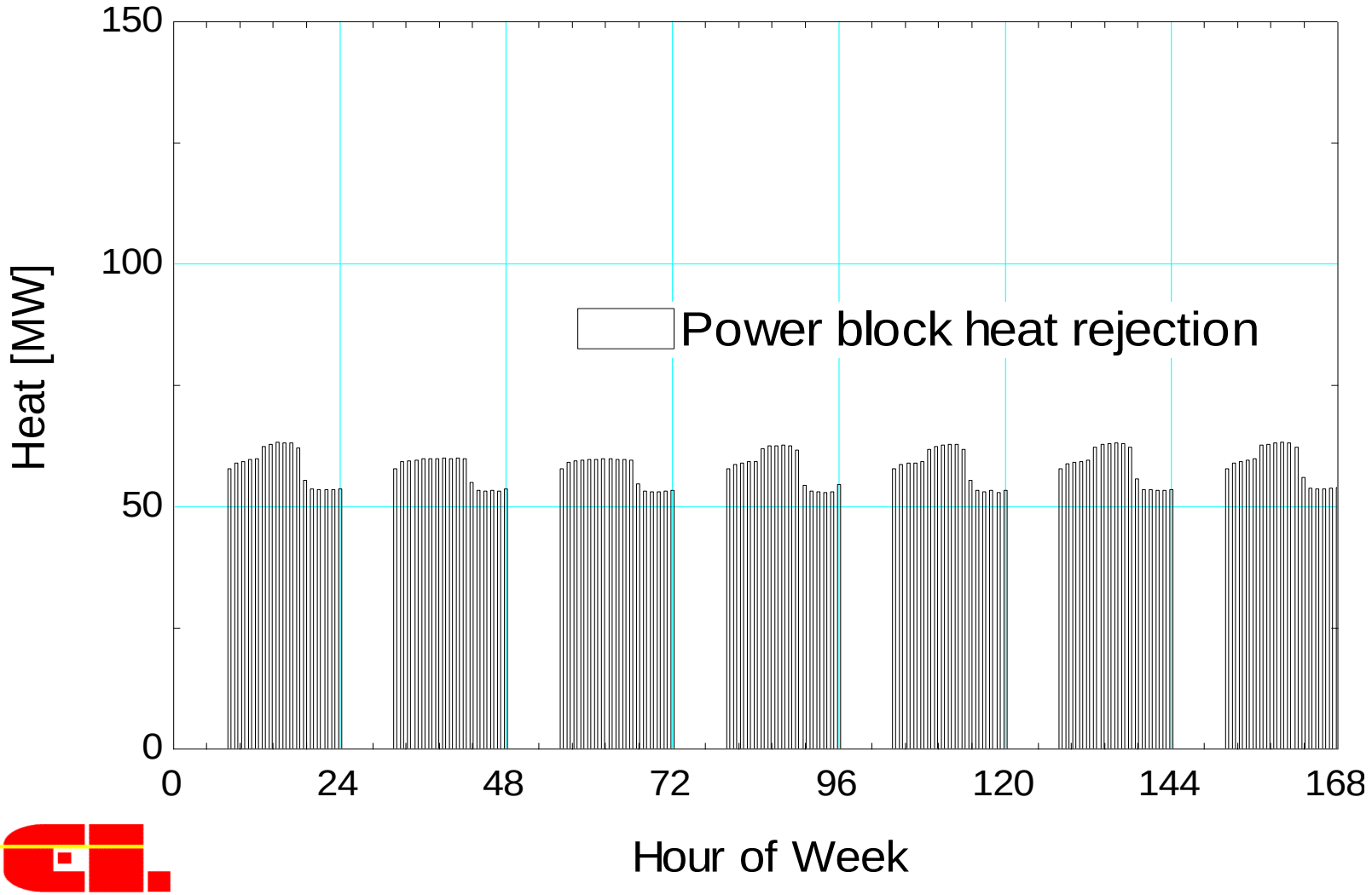
SAM outputs



From Zhang et al.

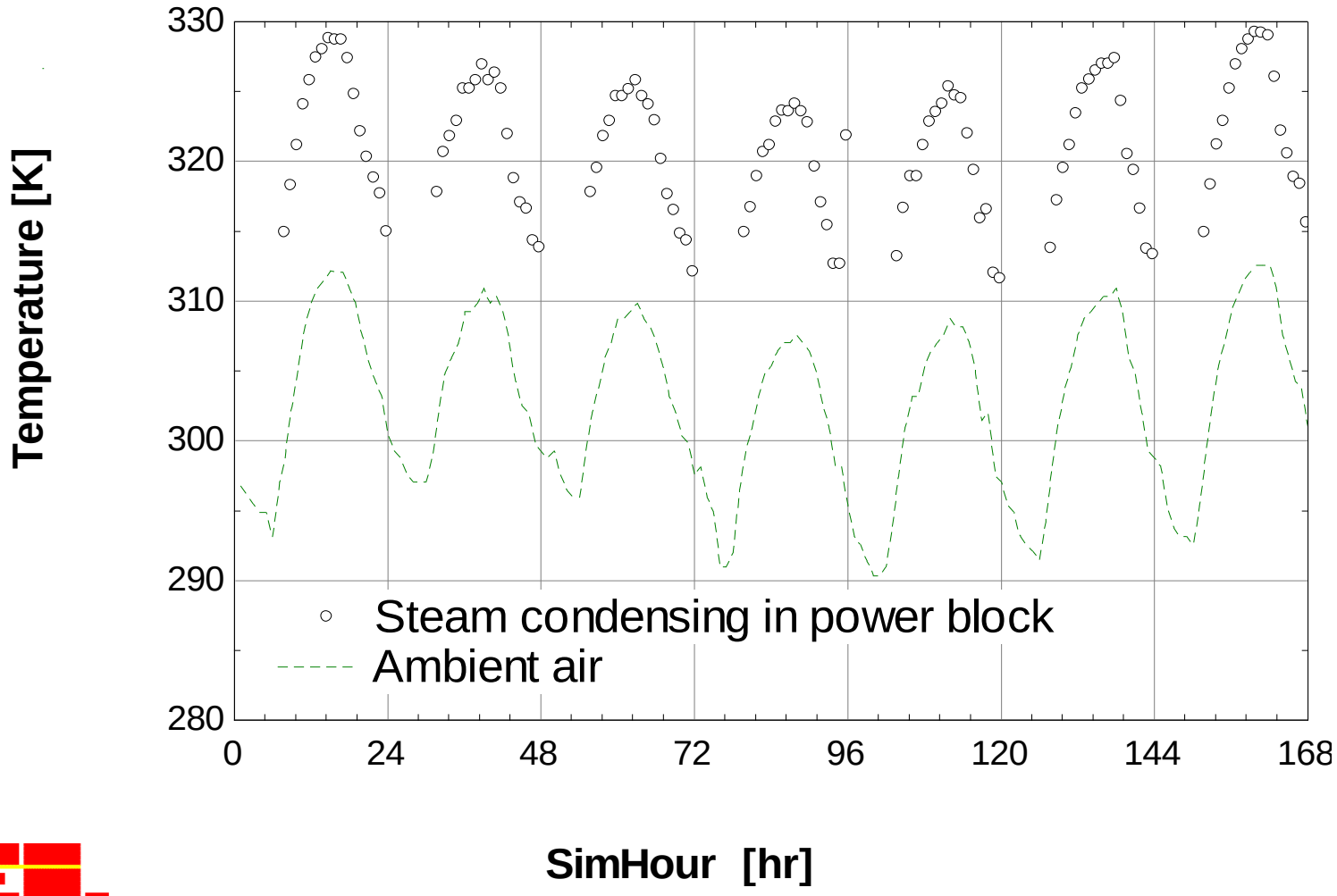
SAM results

- SAM hourly results



SAM results

- From SAM hourly results



Conclusion

- SAM has been useful for to analysis of CSP solar collectors, storage systems, and power block analysis.
  - We can focus on the power block's cooling system.

References

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