**Craig S. Turchi** craig.turchi@nrel.gov
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National Renewable Energy Laboratory
Principal Engineer and Manager, Thermal Energy Science & Technologies Group

**Education and Training**

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| North Carolina State University | Chemical Engineering | PhD 1990 |
| Texas A&M University | Chemical Engineering | BS 1985 |

## Research & Professional Experience

**Manager, Thermal Energy Science & Technologies Group** 2019-
Oversee ~25 researchers engaged in solar thermal, geothermal, and related thermal-energy collection, conversion, transfer and storage technologies.

**Concentrating Solar-Thermal Power (CSP) Team Leader** 2022-2024
Led NREL's cross-disciplinary CSP research team engaged in ~$10M per year research in CSP optics, heliostat design and performance, molten salt and particle thermal energy storage, hybrid system design and dispatch optimization, techno-economics, and related

**Principal Engineer, NREL** 2008-2020
Principal Investigator on $8M, multi-national project designing a thermal transport system for Gen3 CSP that uses $MgCl_2$-based molten salt for thermal energy storage interfaced with either a molten-salt or liquid-sodium heat transfer fluid.

CSP System Analysis task leader, responsible for assessing the current and future cost of CSP technologies as well as identifying nascent technologies that could significantly improve CSP performance or cost.

CSP Market Transformation task leader with oversight of a diverse set of CSP-related activities in resource assessment, system analysis, grid integration, and environmental assessment, including water consumption at CSP plants.

Principal Investigator on projects exploring the integration of hybrid solar and geothermal energy technologies and the use of solar and geothermal energy for direct heating applications such as process heat and thermal desalination.

**Principal Investigator and Senior Engineer, ADA Technologies, Inc.** 1998-2008
Led R&D to remove toxic metals from water, air, and solid systems. Managed lab- and pilot-scale demonstration projects for clients including EPA, DOE, DOD, NIH, the Electric Power Research Institute, and private companies.

Founded Aqualitech, LLC, a provider of metal recovery systems for dental clinic wastewater, and served as technology manager for Amended Silicates, LLC, a joint venture between ADA and CH2M HILL.

**Senior Engineer, Zentox Corporation** 1996-1998
Developed advanced oxidation systems for treatment of industrial wastewater, cooling towers, remediation applications, and indoor air pollutants.

**Research Engineer, NREL/Solar Energy Research Institute (SERI)** 1990-1996

## Professional Activities & Awards

- Member, American Institute of Chemical Engineers (1985- )
- Organizing Committee, *Thermal Mechanical Chemical Energy Storage Workshop* (2019-2025)
- Organizing Committee, *Supercritical $CO_2$ Power Cycles Symposium* (2014, 2016, 2018, 2020)
- NREL "Outstanding Performance" Staff Award 2015

## Selected Publications


- Phase 2 Final Report: Turchi et al., "CSP Gen3: Liquid-Phase Pathway to SunShot," NREL/TP-5700-79323, June 2021. https://doi.org/10.2172/1807668
- C. Augustine, C. Turchi, M. Mehos, "The Role of Concentrating Solar-Thermal Technologies in a Decarbonized U.S. Grid," NREL/TP-5700-80574 (2021).
- S. Gage, P. Sharan, C. Turchi, and J. Netter, "Evaluation of formate salt PCM's for latent heat thermal energy storage," *Energies*, Volume 14, Issue 31 (2021).
- P. Sharan, T. Neises, C. Turchi, "Thermal Desalination via Supercritical $CO_2$ Brayton Cycle: Optimal System Design and Techno-Economic Analysis without Reduction in Cycle Efficiency, Applied Thermal Engineering Vol. 152 (2019).
- C. Murphy, Y. Sun, W. Cole, G. Maclaurin, C. Turchi, and M. Mehos, "The Potential Role of Concentrating Solar Power within the Context of DOE's 2030 Solar Cost Targets," National Renewable Energy Laboratory Technical Report, NREL/TP-6A20-71912 (2019).
- Turchi, C.S., Vidal, J., Bauer, M., "Molten salt power towers operating at 600–650 °C: Salt selection and cost benefits," *Solar Energy,* **164**, 38-46 (2018).
- M. Mehos, C. Turchi, J. Vidal, M. Wagner, Z. Ma, C. Ho, W. Kolb, C. Andraka, and A. Kruizenga, "Concentrating Solar Power Gen3 Demonstration Roadmap," National Renewable Energy Laboratory, Technical Report NREL/TP-5500-67464 (2017).
- "Concentrating Solar Power," Turchi, Stekli, and Bueno, in *Fundamentals and Applications of Supercritical Carbon Dioxide ($sCO_2$) Based Power Cycles,* Brun, Freidman, and Dennis, eds., Elsevier, 2017.
- J. Vanneste, J.A. Bush, K.L. Hickenbottom, C.A. Marks, D. Jassby, C.S. Turchi, T.Y. Cath, "Novel thermal efficiency-based model for determination of thermal conductivity of membrane distillation membranes," *Journal of Membrane Science*, **548** (2018).
- M. Mehos, J. Jorgenson, P. Denholm, C. Turchi, "An Assessment of the Net Value of CSP Systems Integrated with Thermal Energy Storage," SolarPACES 2014, *Energy Procedia*, **69** (2015).
- Turchi, Ma, Neises, and Wagner, "Thermodynamic Study of Advanced Supercritical Carbon Dioxide Power Cycles for Concentrating Solar Power Systems," *J. Sol. Energy Eng.*, **135** (2013).
- Turchi and Heath, "Molten Salt Power Tower Cost Model for the System Advisor Model (SAM)," NREL/TP-5500-57625, February 2013.
- SunShot Vision Study, co-authored Chapter 5, CSP Technologies, U.S. DOE, February 2012.
- Turchi, C., M. Mehos, C.K. Ho, and G. J. Kolb, "Current and Future Costs for Parabolic Trough and Power Tower Systems in the US Market," SolarPACES 2010, September 21-24, 2010.
- Dr. Turchi has over 50 journal publications and is an inventor on ten patents.