Ana Dyreson
M.S., P.E.
PhD. student
Mechanical Engineering

Room: 1377 ERB

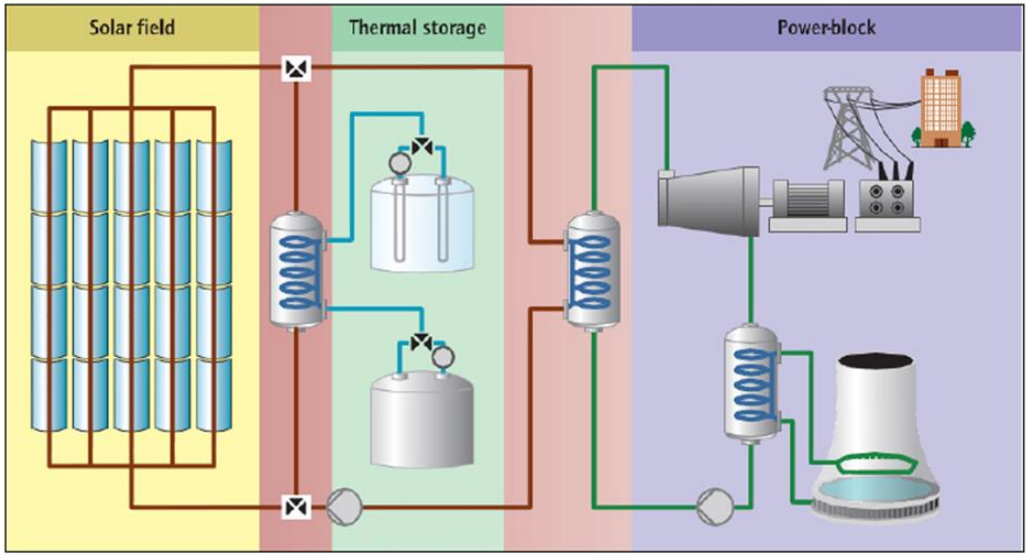
Email:
anadyreson@gmail.com

Hometown: Portage, WI

Thesis: Concentrating Solar Power for the Renewable Electric Grid (*focus TBD*)

Motivation

- Concentrating Solar Power (CSP) using conventional steam Rankine cycles has long been a proven technology
- CSP penetration in the U.S. electric grid remains low
- CSP will play a role in an increasingly renewable electric grid
- I am considering several new and evolving areas in CSP for the focus of my dissertation



From: Zhang, H. L., Baeyens, J., Degrève, J., & Cacères, G. (2013). Concentrated solar power plants: Review and design methodology. *Renewable and Sustainable Energy Reviews*, *22*, 466–481.

New CSP Technologies

- Organic Rankine Cycles (ORC)
  - Using organic fluids (in place of steam) as working fluid offers certain benefits
  - Organic fluids have lower critical temperatures than steam, and so are ideal to accept heat from low temperature sources
  - ORC's are simpler, and so more cost-effective for smaller scale plants
  - But, ORC efficiency is less than that of steam Rankine cycle
- Measurement of heat transfer coefficients for high temperature fluid used in solar fields
  - Currently heat transfer coefficients not well understood
- Dry cooling
  - Decreased water consumption compared to wet cooling
  - But, dry cooling is less efficient

CSP: Renewable, dispatchable

- Renewables like solar photovoltaics and wind introduce increased variability into the electric grid
- CSP with thermal energy storage can be an antidote to the challenges caused by this variability
- I am exploring several topics areas:
  - Advanced modeling of CSP with thermal energy storage for electric grid studies
  - Optimizing the design of CSP with thermal energy storage based on time of day and flexibility energy valuation
  - Hybrid systems which incorporate PV, wind, or geothermal sources with CSP
    - Could provide a more consistent, cost-effective source of power than any one technology on its own