Nuclear Hyper

Nuclear Hybrid Power Generation

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Summer Intern

Mentor
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CHRES CONSORTIUM OF HYBRID RESILIENT ENERGY SYSTEMS
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About Me – David Valadez

- 21 years old
- Born in El Paso, TX
  - ~25% Nuclear power
- Raised in both sides of the border
- Attend the University of Texas at El Paso
- Senior in the physics program

Personal Motivation

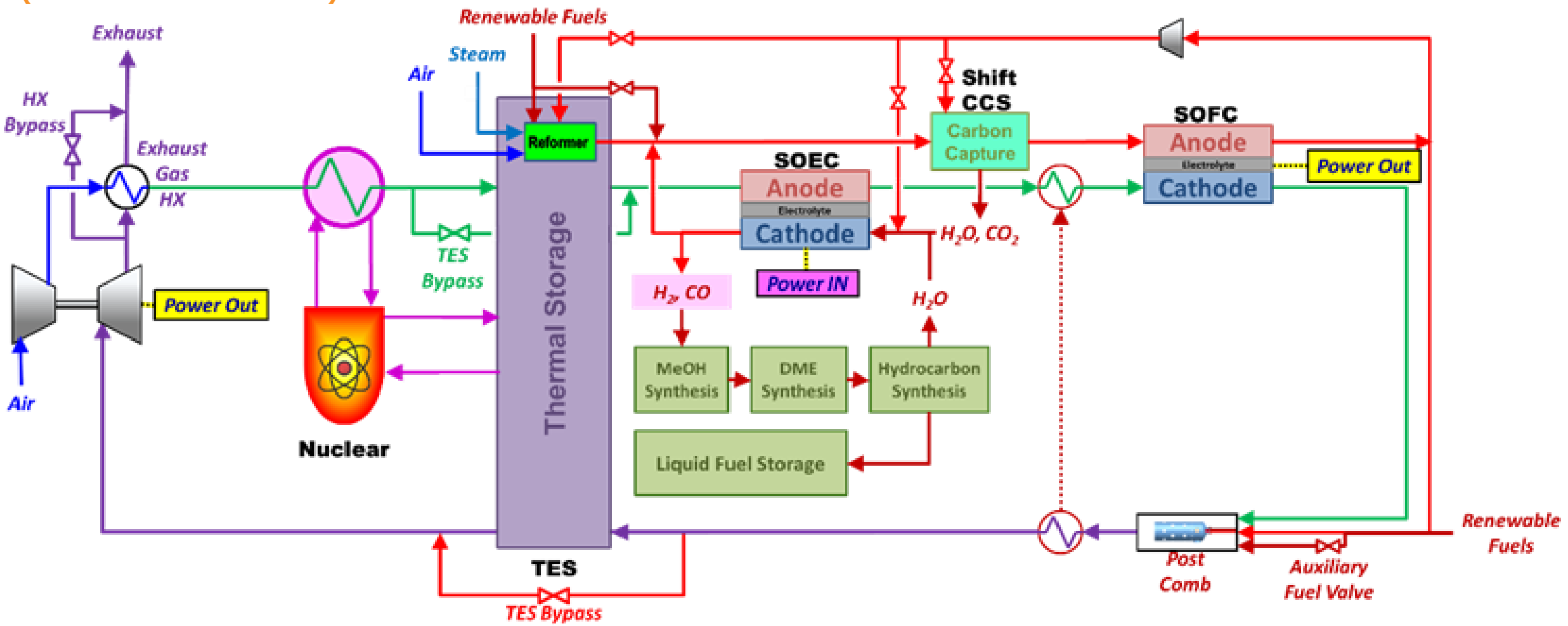
Why am I interested?

- Interested in nuclear power generation systems.
  - Interesting physics
  - Cleaner
  - Safer
- Interested in the potential of hybrid systems
  - Efficient

Project Overview

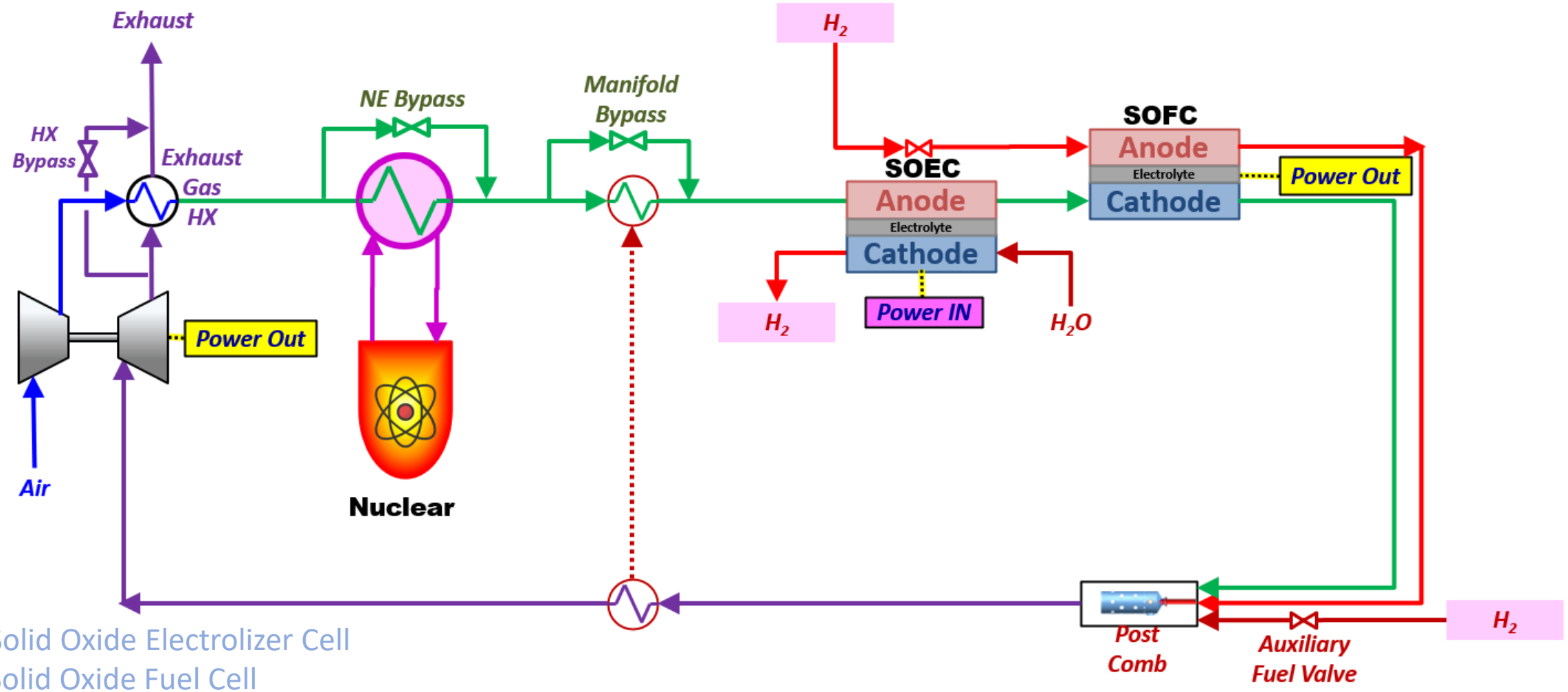
SMR Hybrid

(Small Modular Reactor)



Simplified System

Summer time frame

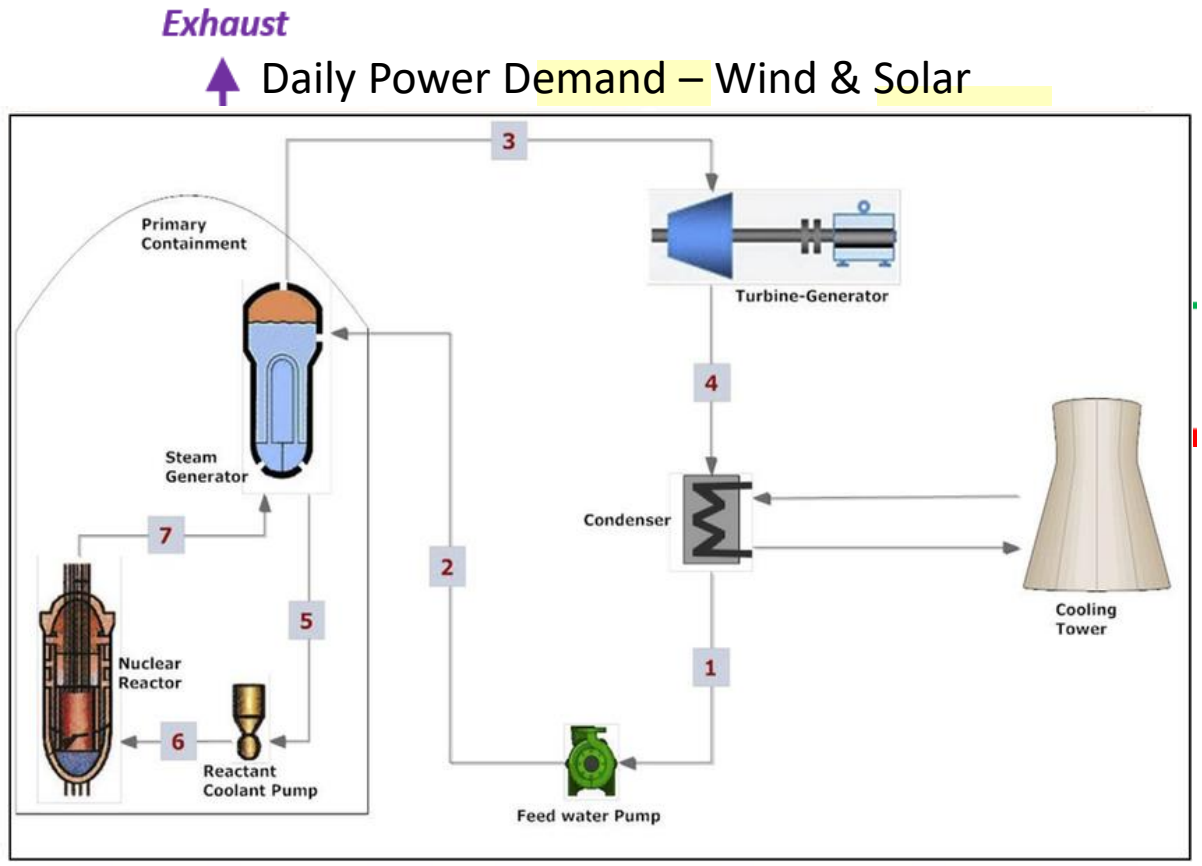


SOEC- Solid Oxide Electrolizer Cell

SOFC- Solid Oxide Fuel Cell

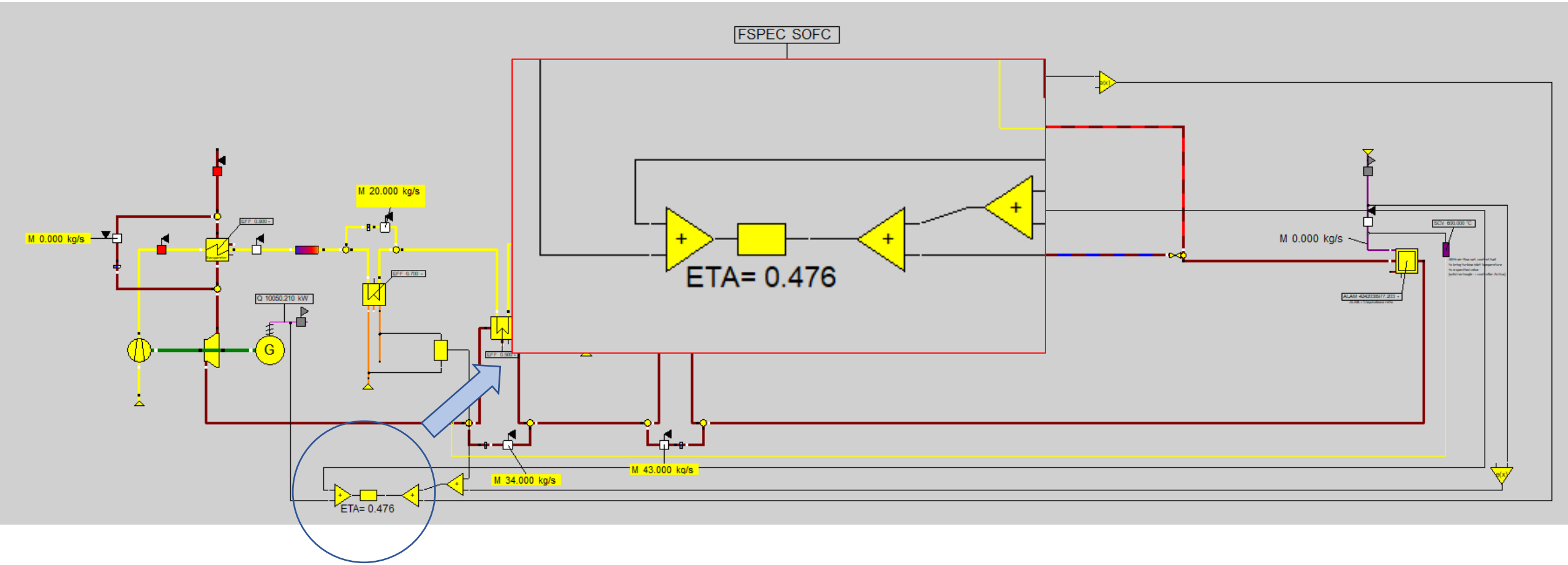
Benefits

- Safety rating kept high by controlling temperature with bypasses
  - Don't have to touch SMR
- Gives a more flexible system
  - Energy generation mode
  - Hydrogen generation mode
- Surpasses standard Rankine efficiency (~30%)
- Decentralized power generation



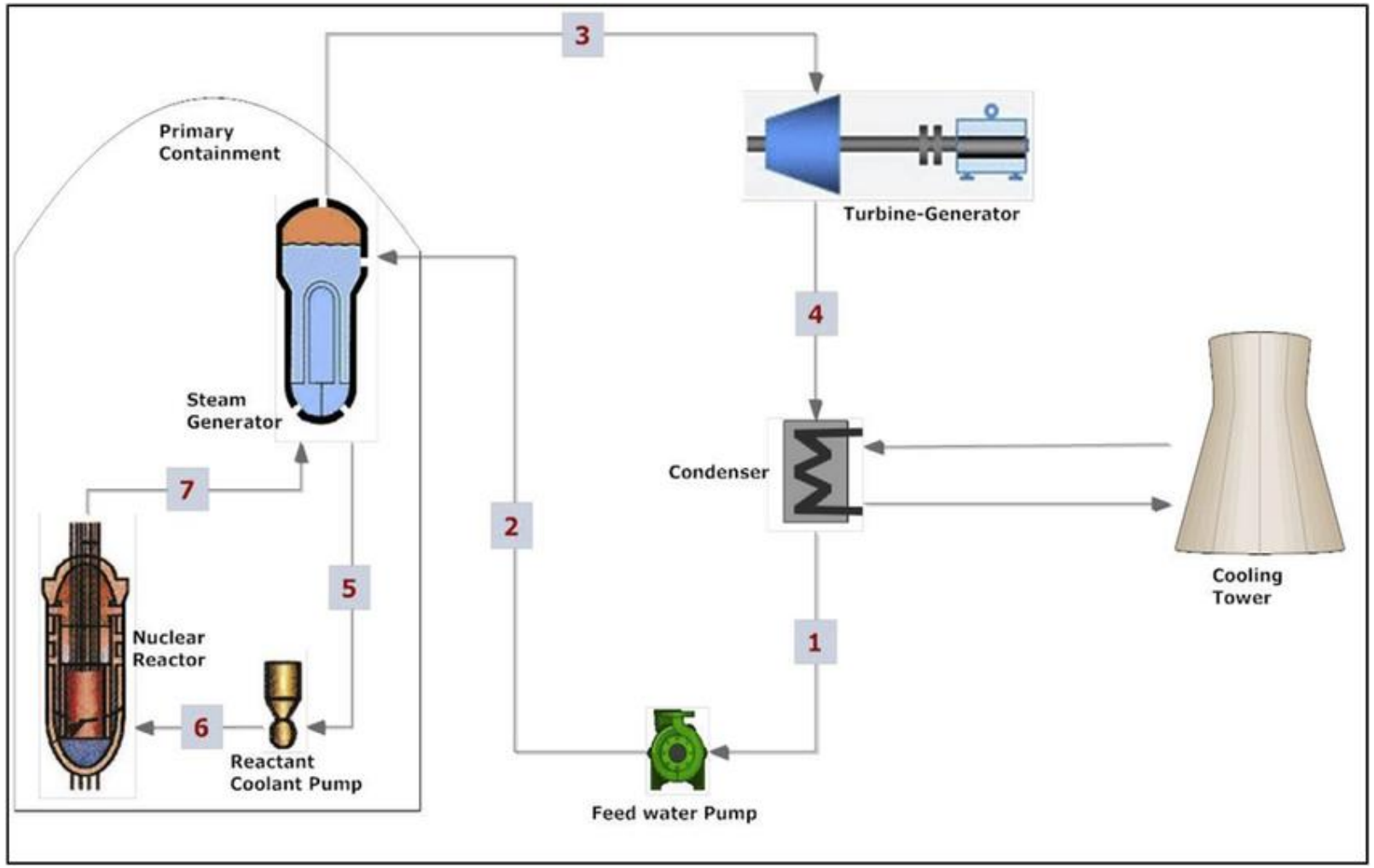
Nuclear simulation

In ebsilon



Nuclear Rankine Cycle

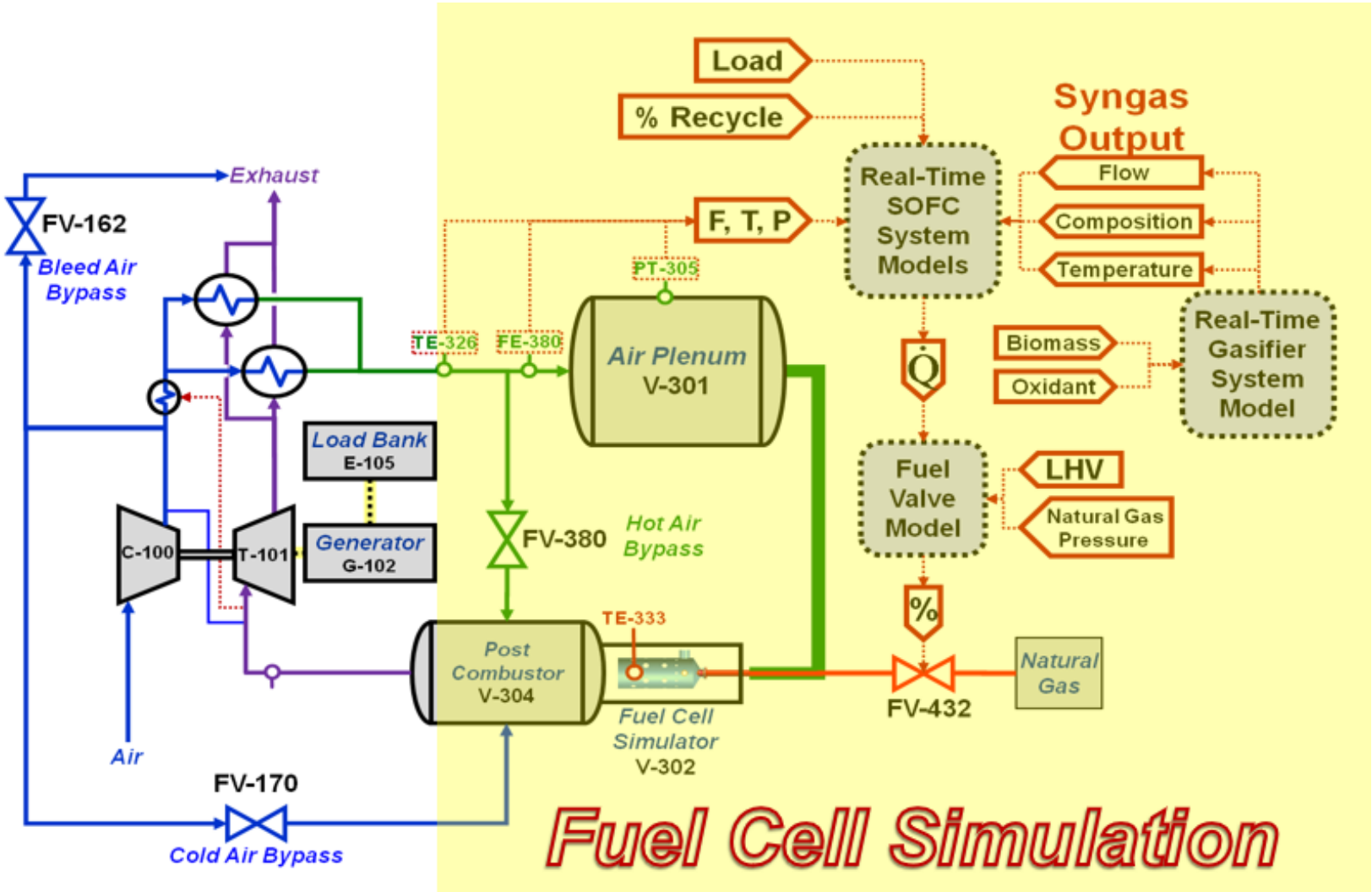
In Ebsilon



Orhan MF, et al., Approaches for integrated hydrogen production based on nuclear and renewable energy sources: Energy and exergy assessments of nuclear and solar energy sources in the United Arab Emirates, International Journal of Hydrogen Energy (2016), http://dx.doi.org/10.1016/j.ijhydene.2016.05.044

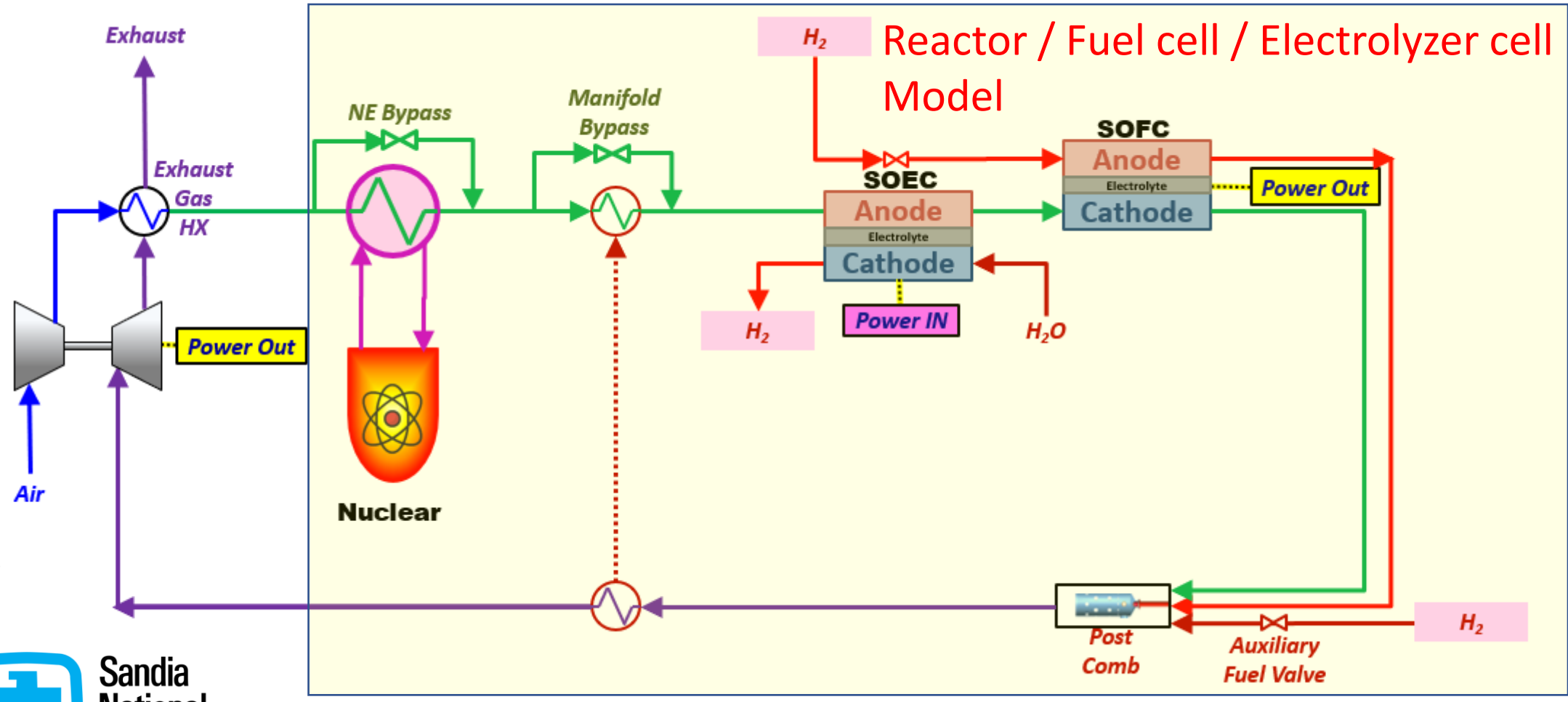
The Hyper Facility

Cyber-physical power generation tests



Nuclear Hyper

Cyber-physical system



How this experience impacted my life

What this Internship has taught me

- Research experience
- Work environment
- Conference experience
- Living far from home

Questions?

VISIT US AT: **www.NETL.DOE.gov**

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Synopsis

- David Valadez – Physics Intern form UTEP
- Summer project – Nuclear hybrid
- Why we are pursuing this
  - Safe, Flexile & Efficient
- Development of Ebsilon models
- Cyber-physical future