

# Combined Cooling, Heat, Power from Biomass and Solid Waste

September 29<sup>th</sup>, 2010

FESC Summit

University of Central Florida, Orlando

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# Outline

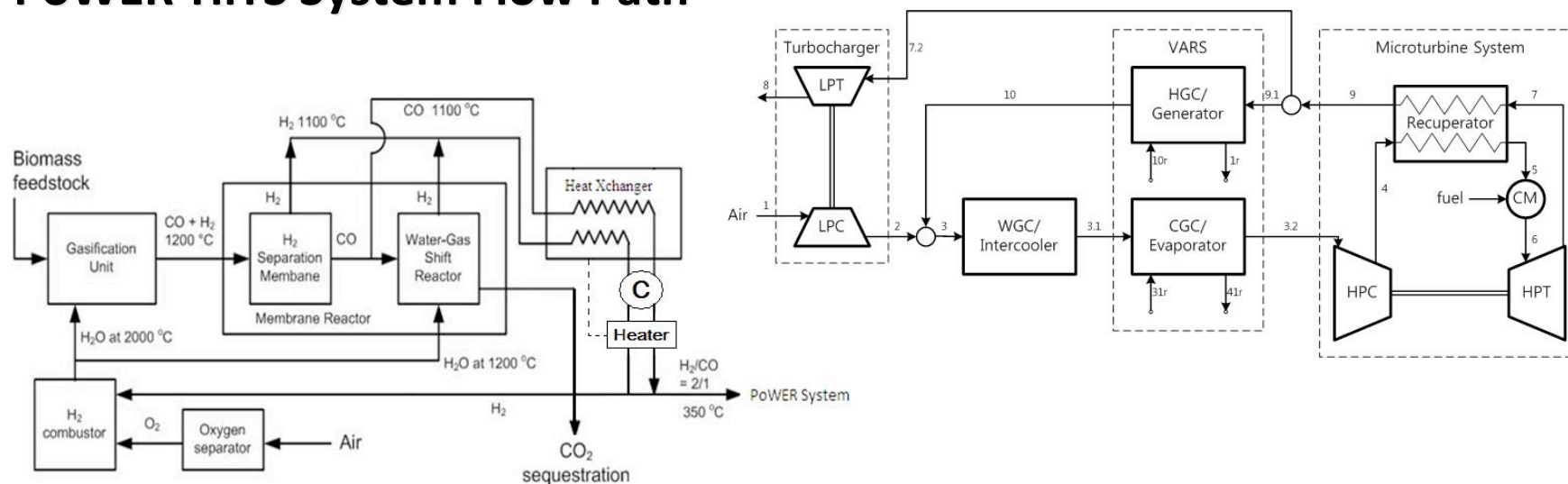


1. Objective
2. Project Impact
3. Project Overview
4. Experimental Program
5. Integrated System Modeling
6. Conclusions
7. Future Work Plans

# 1. Objective

- Research and demonstration of a novel HiTS-PoWER technology that enables economic utilization of dispersed biomass and solid waste resources to produce electric power, cooling, heat and water
- Maximizing integrated system efficiency and control system design
- Producing economically viable power with minimal emissions

## PoWER-HiTS System Flow Path



## 2. Project Impact (Benefits to Florida)



### ● Energy sustainability

- Renewable resources otherwise wasted (MSW)
- Provides transition pathway, little disruption
  - Closely integrates UF breakthroughs in three areas to achieve unparalleled efficiency
    - Advanced gasification system
    - Novel high temperature membrane H<sub>2</sub> separator
    - Novel power, fresh water, refrigeration, and heat plant
- Flexible distributed power generation; Zero impact on water, space requirements, very low emissions



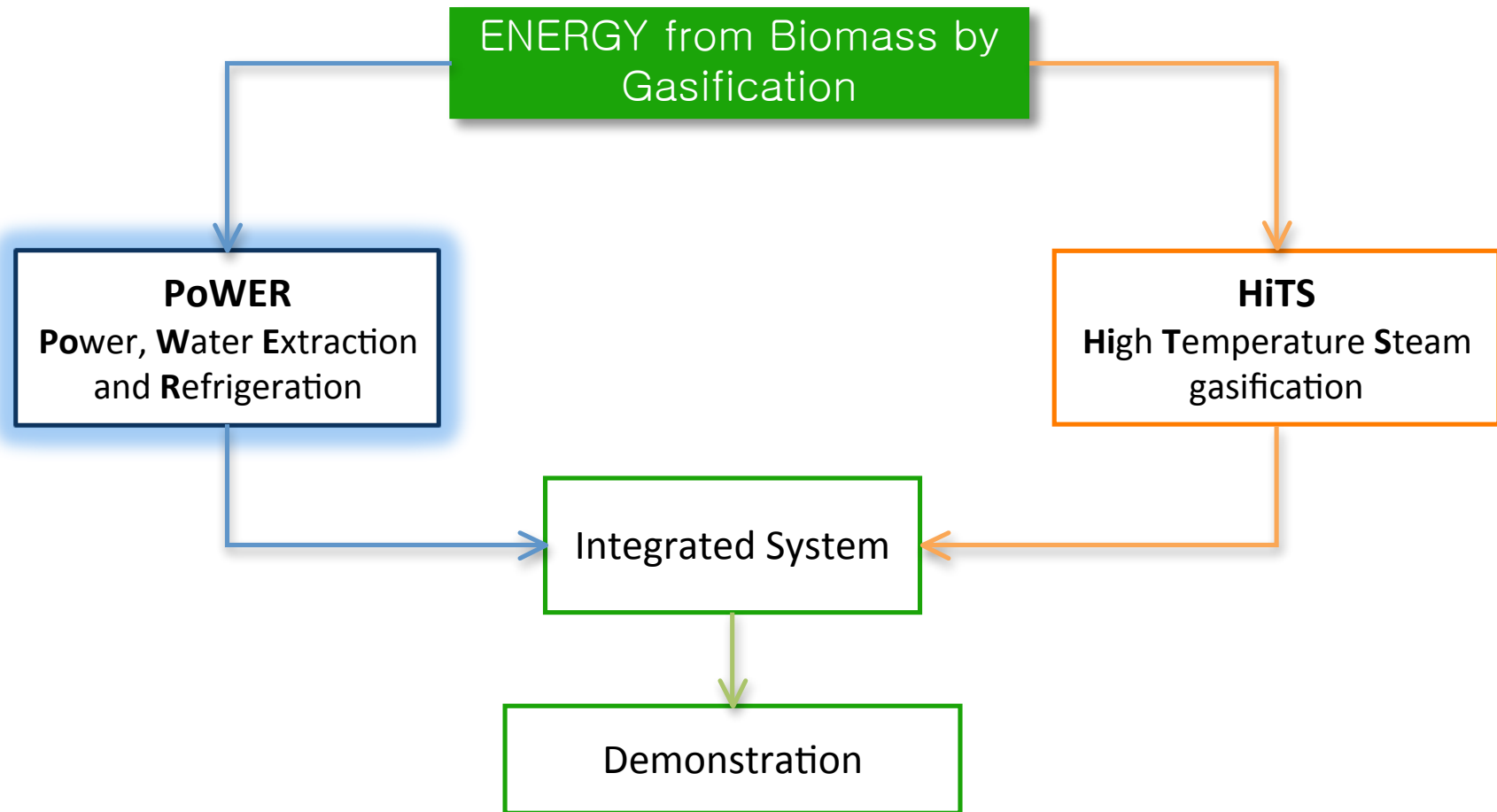
## 2. Project Impact (Benefits to Florida)



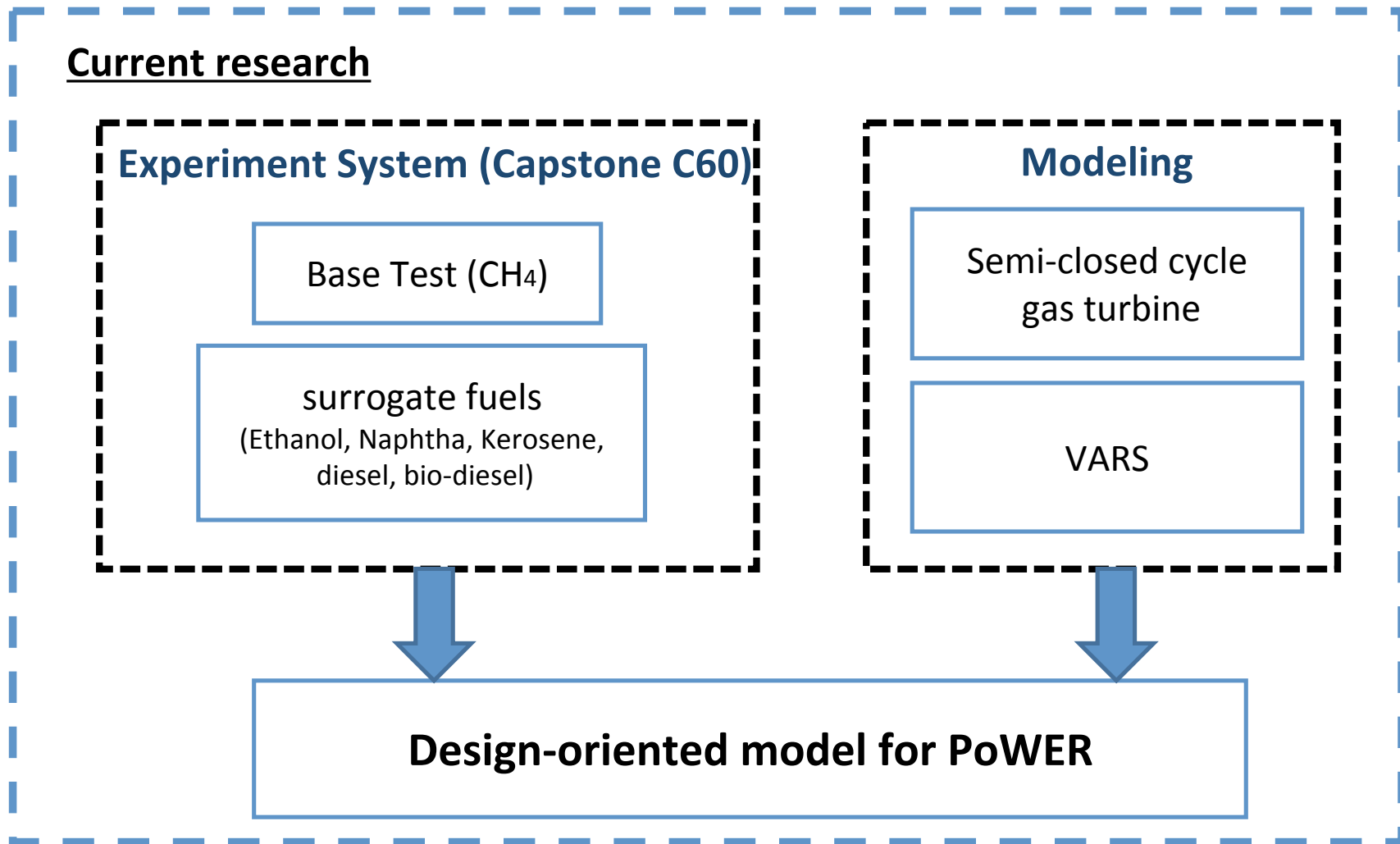
### ● Economic benefits

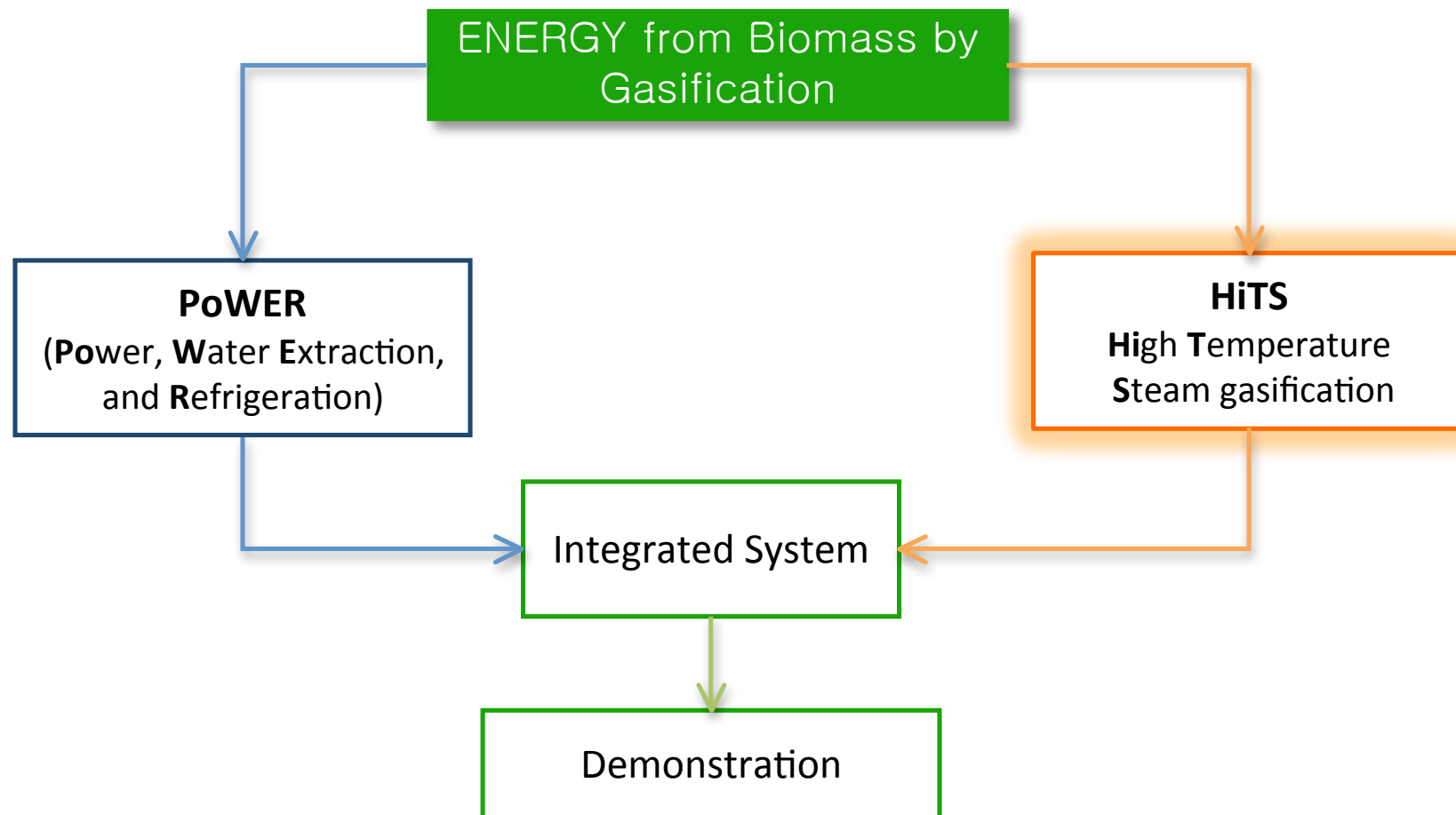
- High volume production of integrated systems envisioned within State; academic/industrial team all located within Florida
- Innovations provide strong competitive advantage to Florida manufacturers of system and components
- Near term potential for thousands of new, high-tech jobs in Florida; far term potential much higher
- Stability in energy supply/enhanced grid stability decreases economic disruptions  
(hurricanes provide more biomass feedstock, when it's most needed)

# 3. Project Overview



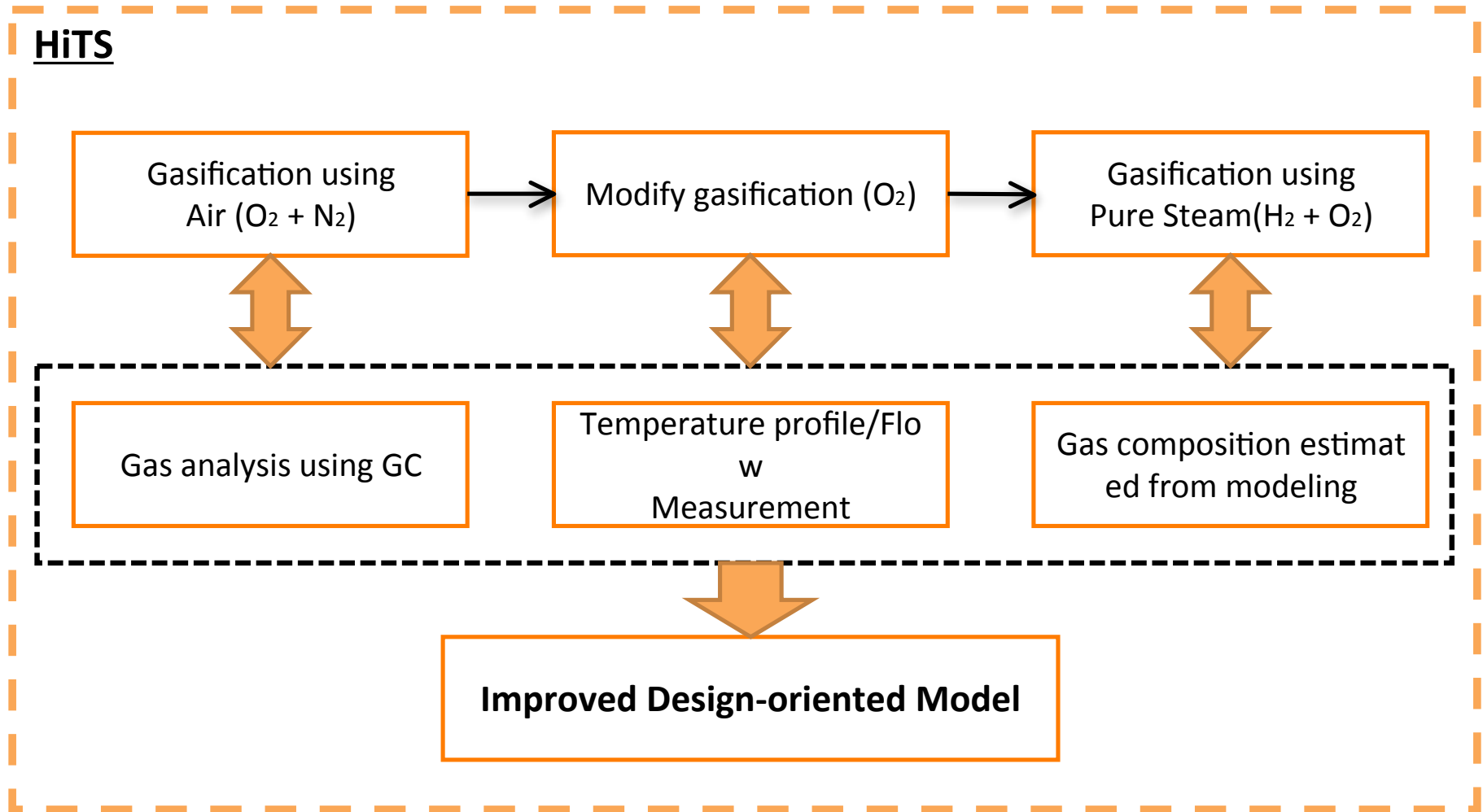
# 3.1 PoWER

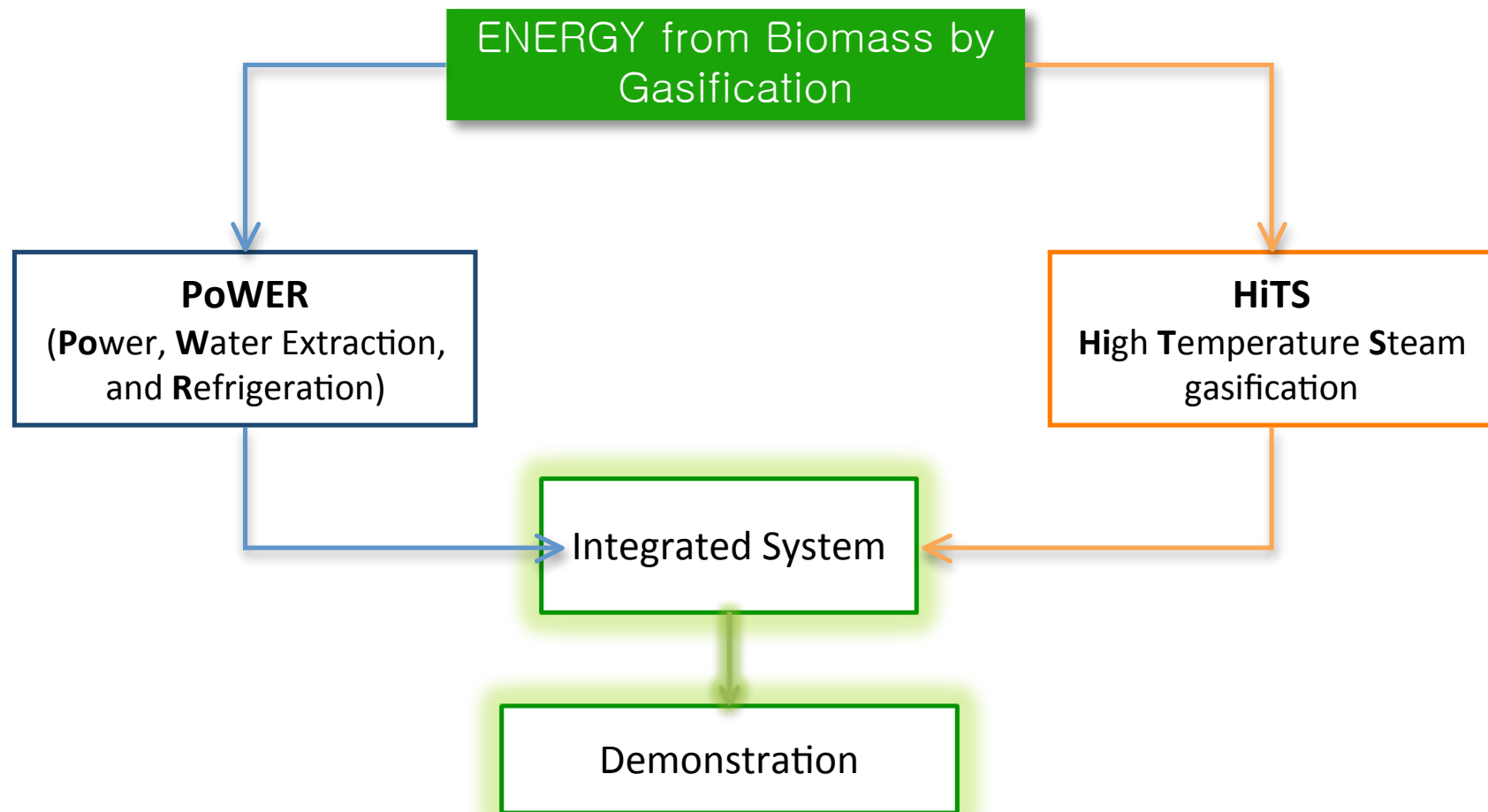


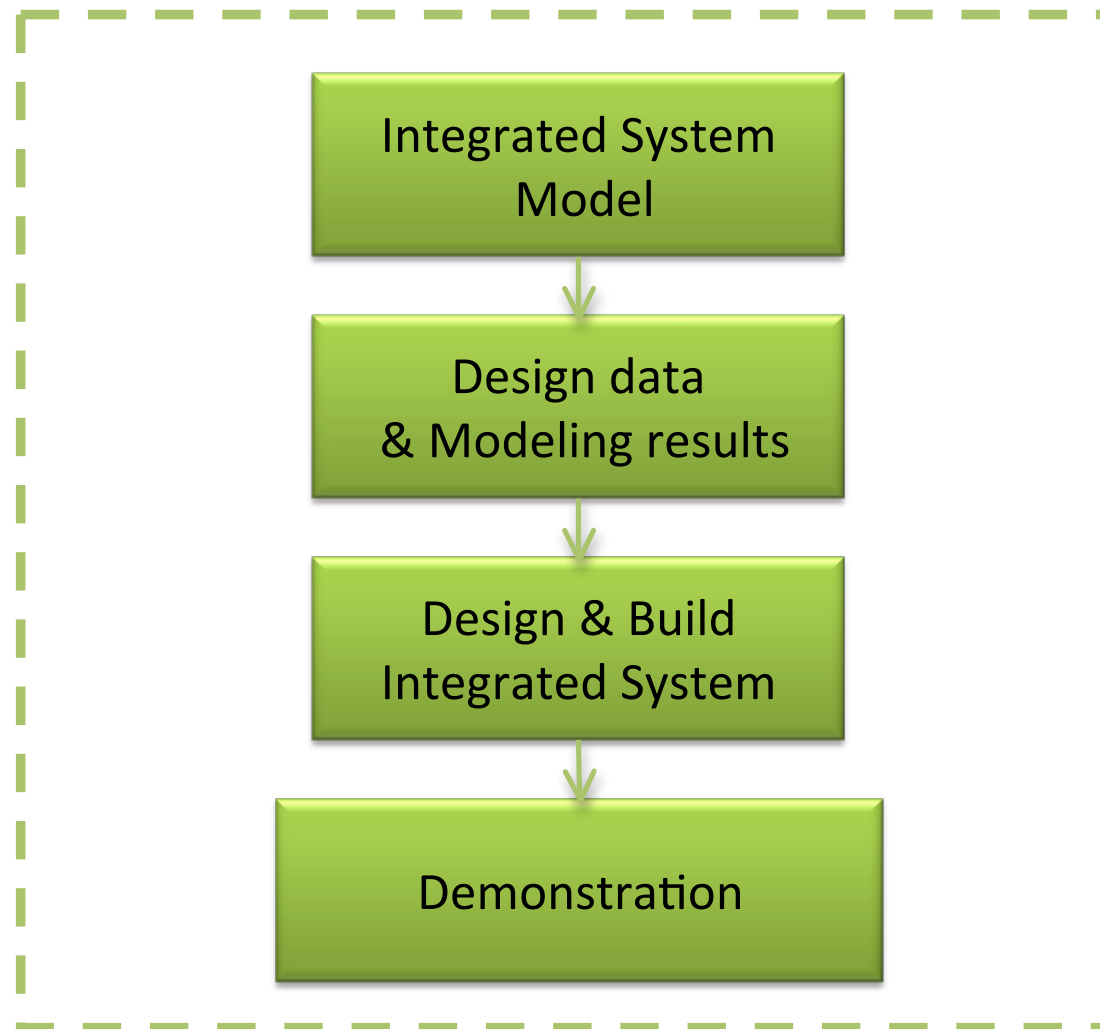




# 3.2 HiTS



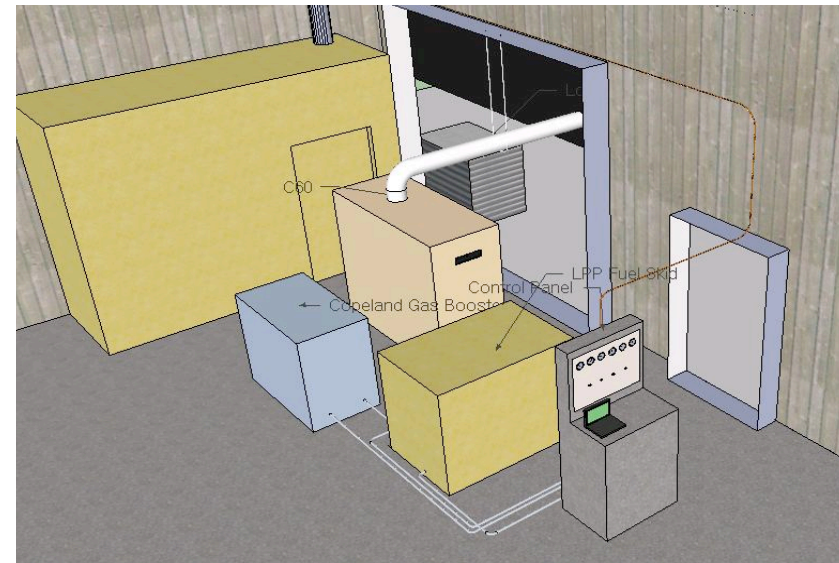




# 4. Research Facilities at UF



- UF Gator Gasifier, Capstone C60 & Copeland Gas Booster



# 4. 1.Modifications to Gasifier



- Hearth section redesigned to hourglass shape
- Top hopper sized to match the reduction circle
- Original engine upgraded to 20KW Ford engine
- Dedicated engine designed for gaseous fuels
- Hearth section insulated to facilitate tar cracking
- Installation of TC and Pressure sensors for DAQ
- Flow measurement using Gas Meters installed

# 5. Demonstration unit

## ➔ Integrated HiTS-PoWER System Schematic

