Decarbonization of the Recycled Paper Industry via Staged Pressurized Oxygen-Combustion

AWARD #DE-FE0032515

RECIPIENT ORGANIZATION
Washington University in St. Louis

TEAM MEMBER ORGANIZATIONS
Prime: Washington University in St. Louis (WUSTL)
Electric Power Research Institute, Inc. (EPRI)

PRINCIPAL INVESTIGATOR
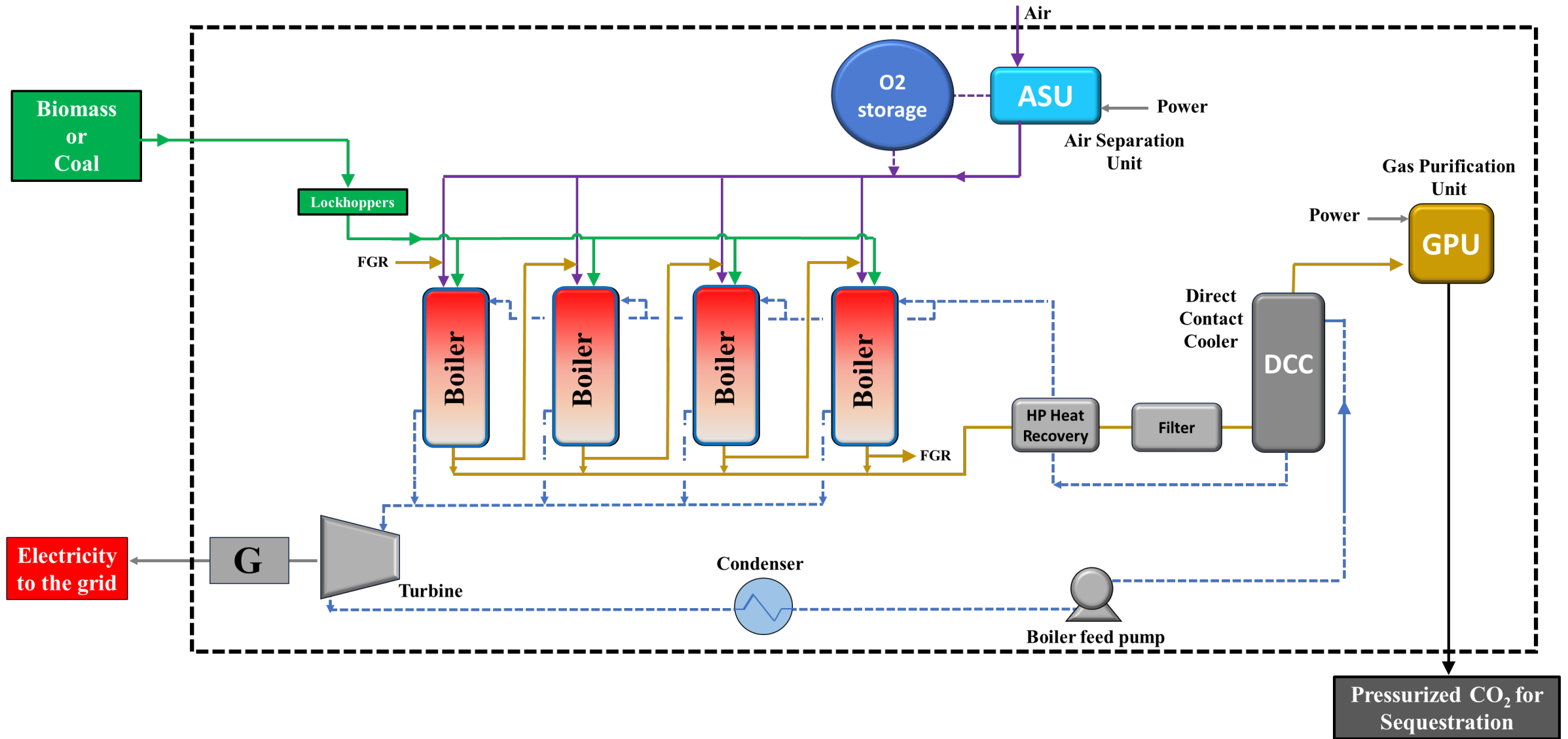Dr. Richard L. Axelbaum (WUSTL)
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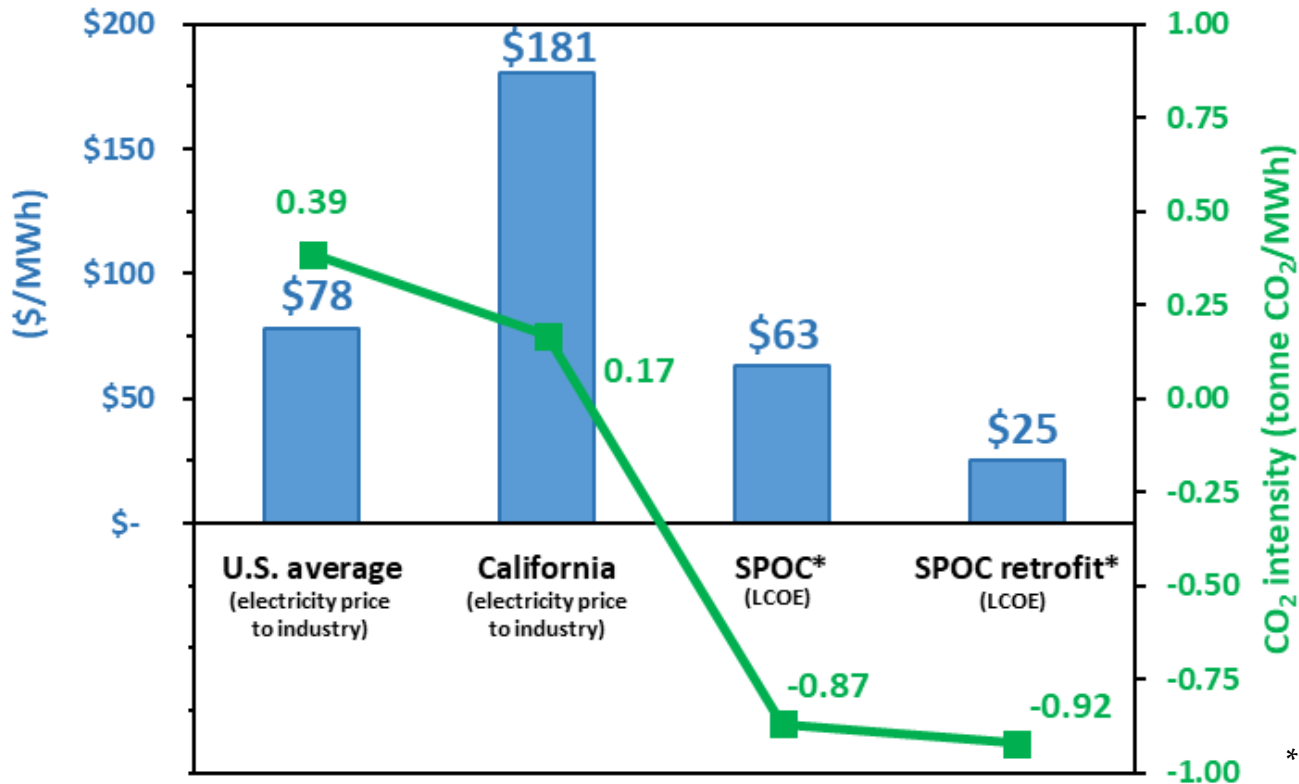
DOE funds: $250,000
Cost Share: $62,566
Total Costs: $312,566

Staged Pressurized Oxy-Combustion (SPOC) Technology

Advantages of the SPOC Technology

> ➢ Much **higher efficiency than PCC**
> ➢ **Lower cost** than competing CCUS technologies

Industry in U.S. pays on average $78 per MWh and <u>emits 0.39 tonnes</u> of CO_2.

With SPOC they could pay as little as $25/MWh* (LCOE) and <u>remove 0.92 tonnes.</u>

* Assumes 65 MWe, $60/tonne for biomass and $85/tonne CO_2 tax credit

- Reduced recycle → improves efficiency
- Recovery of latent heat → improves efficiency & reduces cost; produces 16% more steam
- Unique pollutant removal → reduces cost
- Reduced size (modular) → factory manufactured and shipped by ground transportation
- Improved burnout → improves efficiency, reduces cost, higher fuel flexibility
- Oxygen storage → adds flexibility; produce O_2 with curtailed wind and solar

Decarbonization of the Recycled Paper Pulp Industry via Staged Pressurized Oxy-Combustion (SPOC)

Concept & Approach

Cogeneration with SPOC can supply low-cost, carbon-negative steam and electricity for this industry and other industrial processes

Project goals:

➤ Improve SPOC technology to ensure performance and cost is substantially better than for today's baseline boilers with PCC, and achieve 15% or lower product costs with 95% or more CO2 capture.

➤ Address critical technology gaps and improve overall system performance technology for application to biomass.

Screening TEA shows promise:

➤ Total net energy efficiency:
  89% for SPOC vs 63% for PCC

➤ Cost of energy:
  $44/MWhr (coal); $64/MWhr (bio)

➤ Reduction in product cost compared to PCC:
  15% (coal); 17% (bio)