

Biomass Based Thermal Energy Primer

October 16, 2007

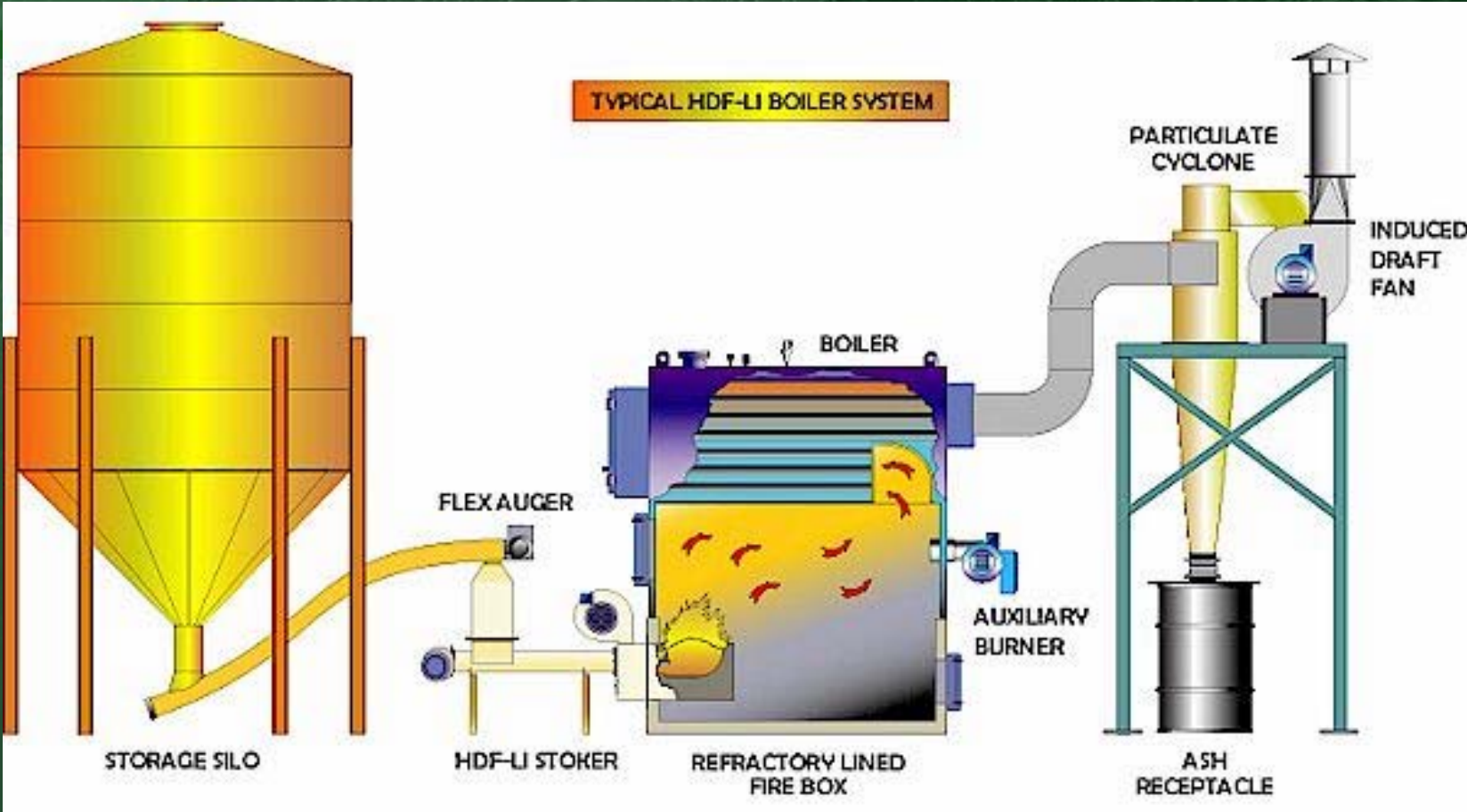
Dan Stevenson, PE
CTA Architects Engineers
406.896.6171
dans@ctagroup.com



Biomass Systems Primer

- 1. System Components and Considerations**
- 2. Combustion .v. Gasification**
- 3. Energy Applications**
- 4. System Concepts**

System Components



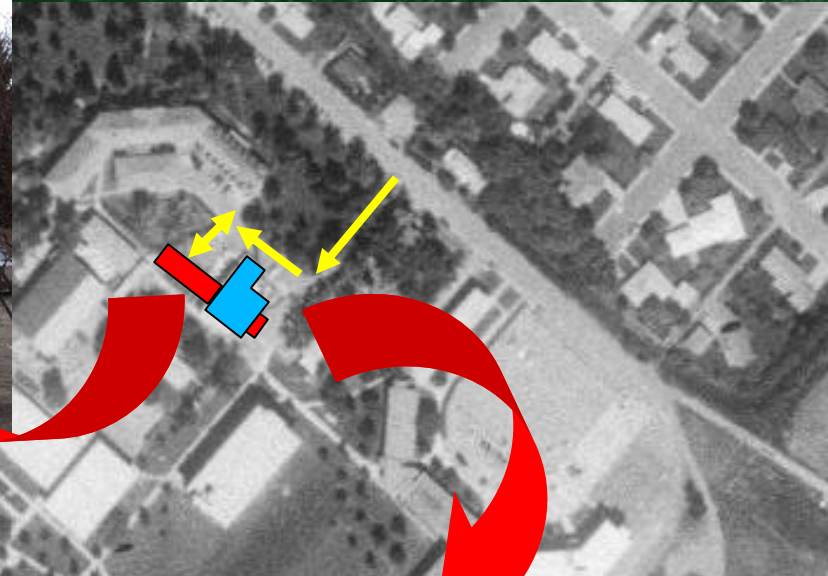
Site Access



Site Access

SAFETY - ACCESSIBILITY - SERVICABILITY

- **Truck Turning Radius**
- **Backing Lane**
- **Traffic Disruption**
- **Pedestrian Flow**
- **Class Schedules**
- **Address campus design standards**



Fuel Delivery and Storage



Fuel Handling



Fuel/Air Metering



Combustion



Gasification



Boiler



Emissions/Stack



Existing Systems:



1. Age
2. Condition
3. Capacity
4. Future Requirements
5. Scheduled Replacement

Mechanical Integration

1. Substantial project cost !
2. Higher % for existing facilities.
3. Retrofit benefits.



Integration Costs

- Biomass systems may be steam, hot water or hot air.
- Facilities heated with electric baseboard heat or with numerous types of systems will have higher integration costs.
- If planning is underway for upgrade or replacement of heating system, biomass can be more readily integrated.

Visioning Energy

- Resolve to change
- Reduce/conserve
- Exhaust passive/natural opportunities
- Realize the benefits of unique assets
- Reclaim energy
- Renewable
- Refuse to maintain status quo
- Recommission
- Share the knowledge,
- Require equal performance of your suppliers.

Visioning Energy

2030 Challenge:

New Buildings/Renovated Space:

Fossil fuel, GHG-emitting, energy consumption performance standard of 50% of the regional (or country) average for that building type.

The fossil fuel reduction standard for all new buildings shall be increased to:

60% in 2010

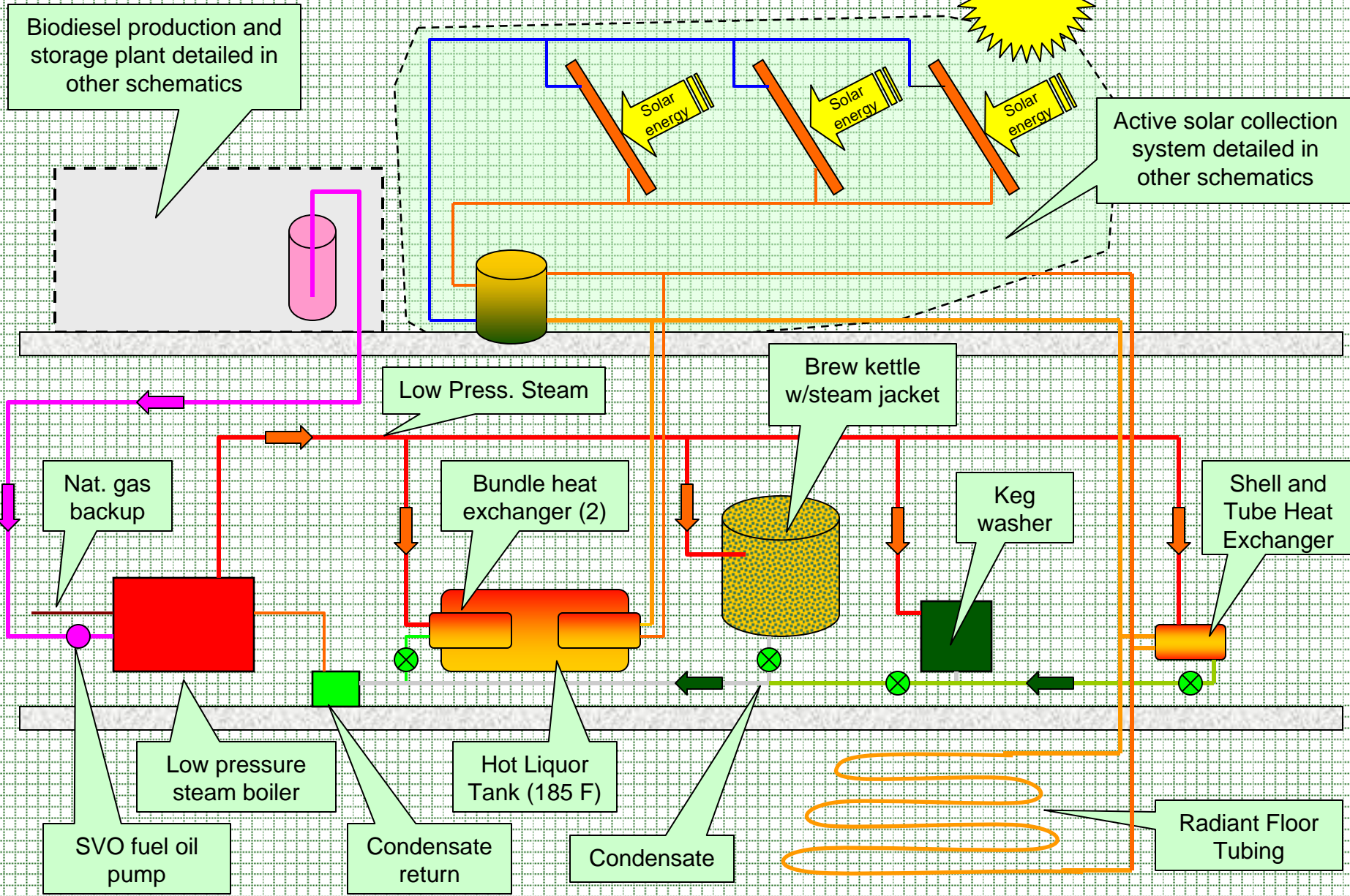
70% in 2015

80% in 2020

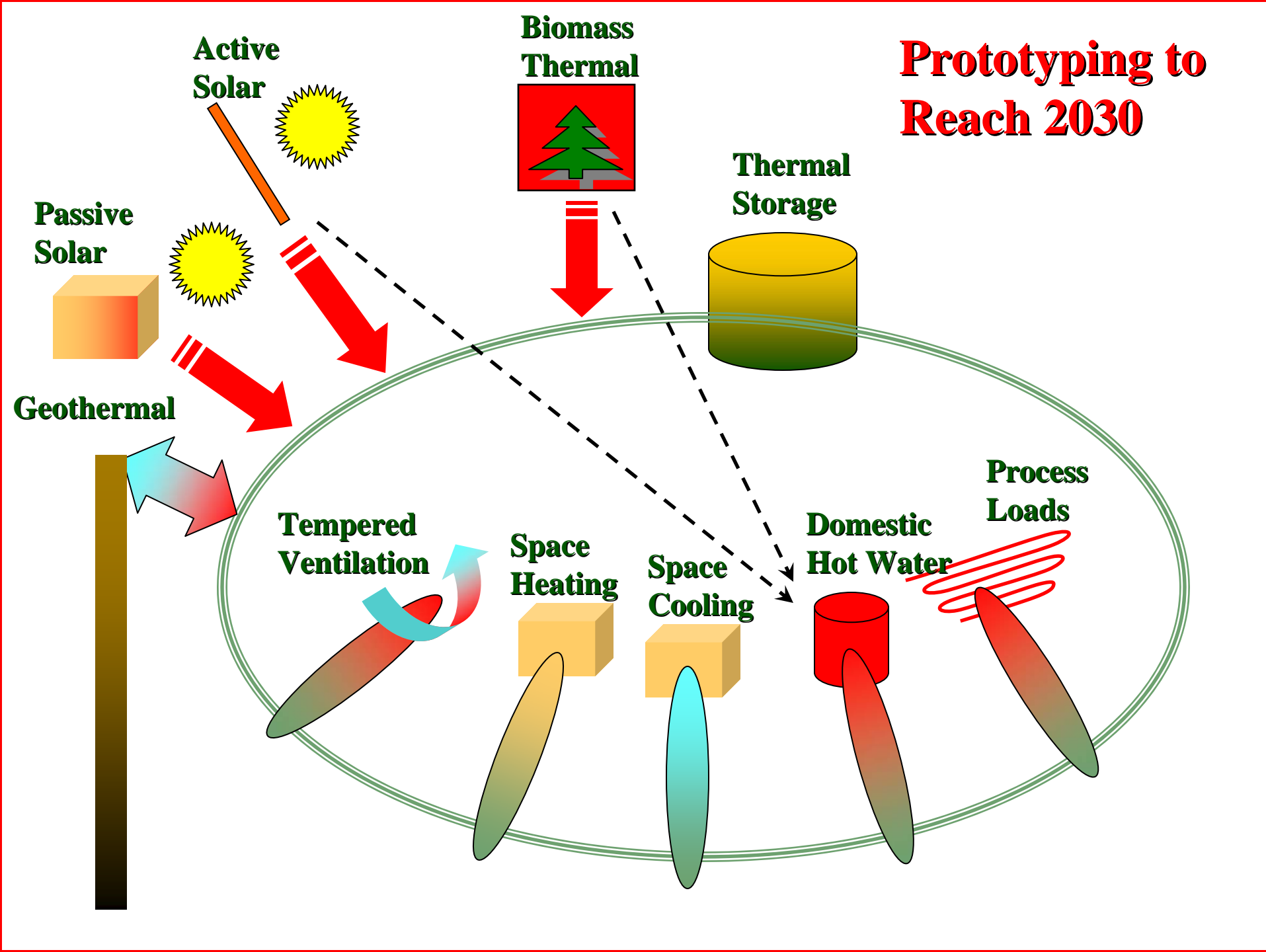
90% in 2025

Carbon-neutral in 2030 (using no fossil fuel GHG emitting energy to operate).

Red Lodge Ales Combined Fuel Boiler Piping Schematic



Prototyping to Reach 2030



Thank You!



Dan Stevenson

CTA Architects Engineers

406.556.7100

dans@ctagroup.com