Forest Bioenergy – An Introduction

Bringing Bioenergy
Opportunities to
Eastern Fresno County
May 22, 2014

Tad Mason, CEO
TSS Consultants

TSS Consultants

- TSS established in 1986 – principal focus was biomass to power
- Continue to assist project developers, government agencies, utilities, and tribal entities with bioenergy development and projects – biopower, biogas, biofuels, and bioproducts

What is Biomass?

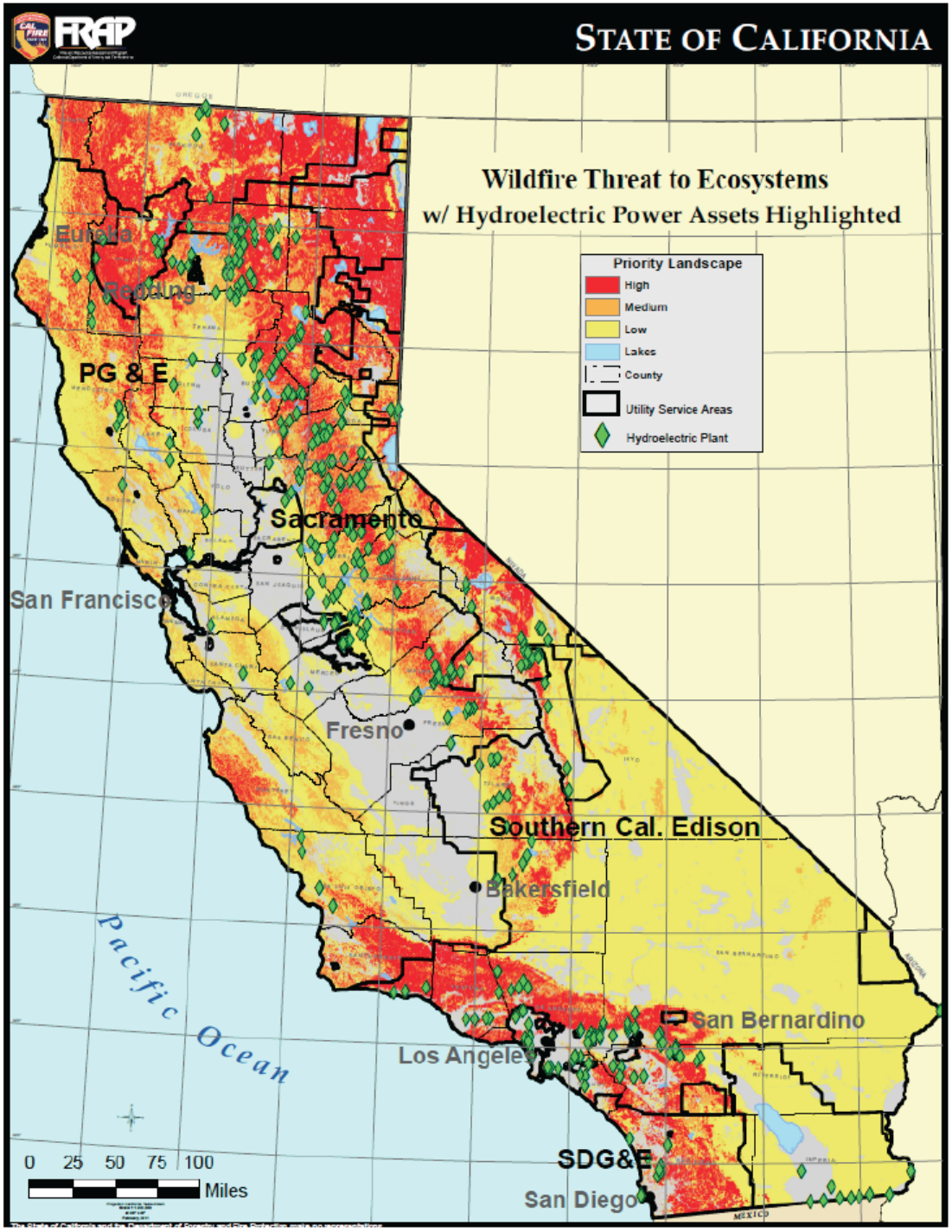
- **Biomass** – any solid, nonhazardous, cellulosic material derived from: forest-related resources, solid wood wastes, agricultural wastes, and plants grown exclusively as a fuel.*

*based on the definition of biomass in the 2005 Energy Act

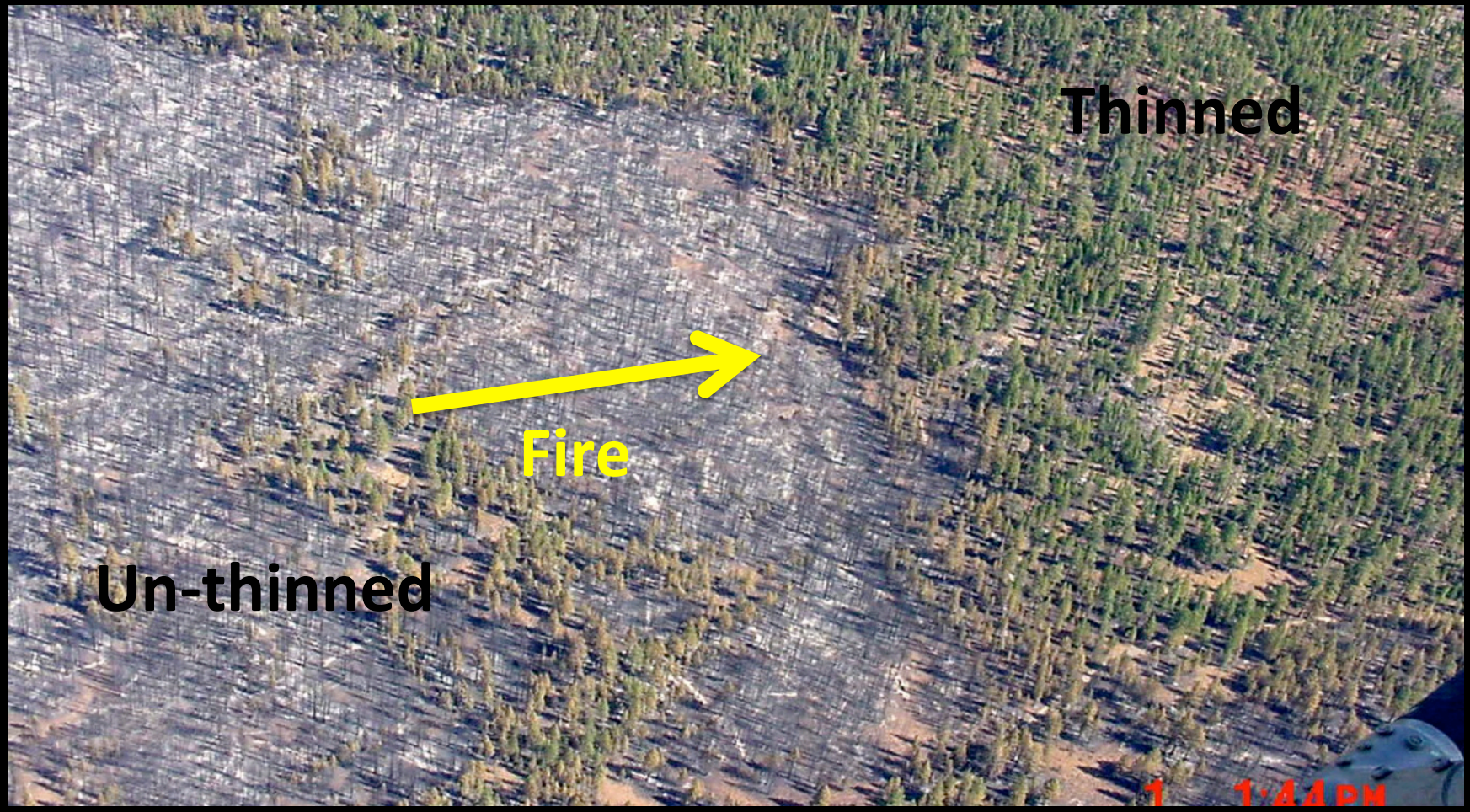
Potential Benefits of Biomass Utilization

- Renewable energy, transportation fuels, and bio-based products
- Provides base load (24/7) electricity
- Turning a waste into a product
- Air quality benefits
- Greenhouse gas reduction
- Rural economic development
- Healthy forests/reduce wildfire potential

Why are healthy forests important?

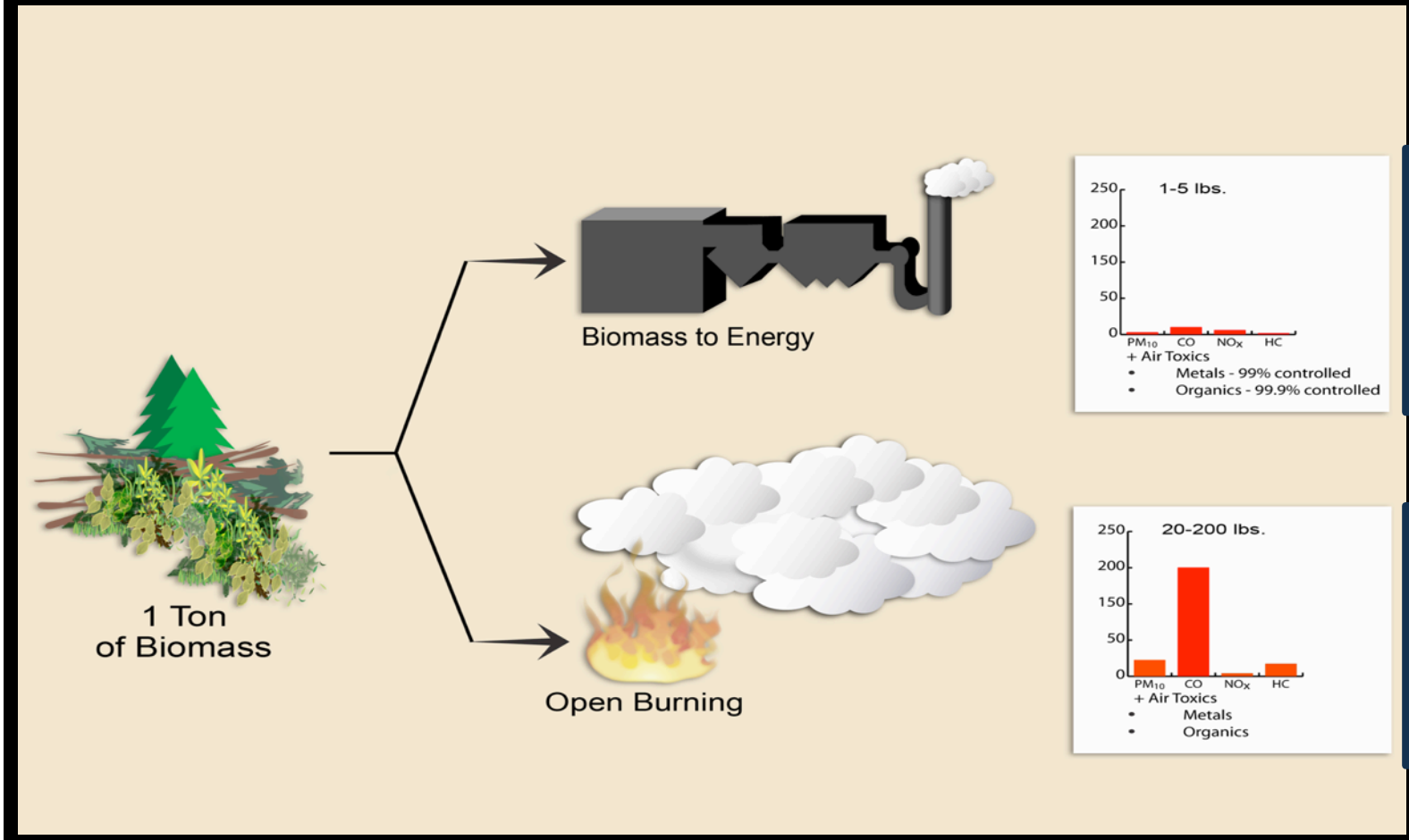


Positive Effects of Fuel Treatments



Cone Wildfire, Lassen National Forest, September 2002

Woody Biomass Energy Production - Reduces Overall Emissions from Open Burning



Controlled Facility Combustion 1-5 lbs of pollutant released to atmosphere per ton of fuel

Uncontrolled Open Combustion 20-200 lbs of pollutant released to atmosphere per ton of fuel

Graphic courtesy of Placer County Air Pollution Control District

New Influencing Factors Effecting Bioenergy Facilities

- Growing waste disposal issues/opportunities
- Renewable energy gov't mandates/incentives including Senate Bill 1122
- New financial and owner groups looking for renewable energy business deals
- Fossil fuel pricing – abrupt current and future price increases
- Acceleration in the development of new biomass to energy conversion technologies
- Greenhouse gas reduction opportunities

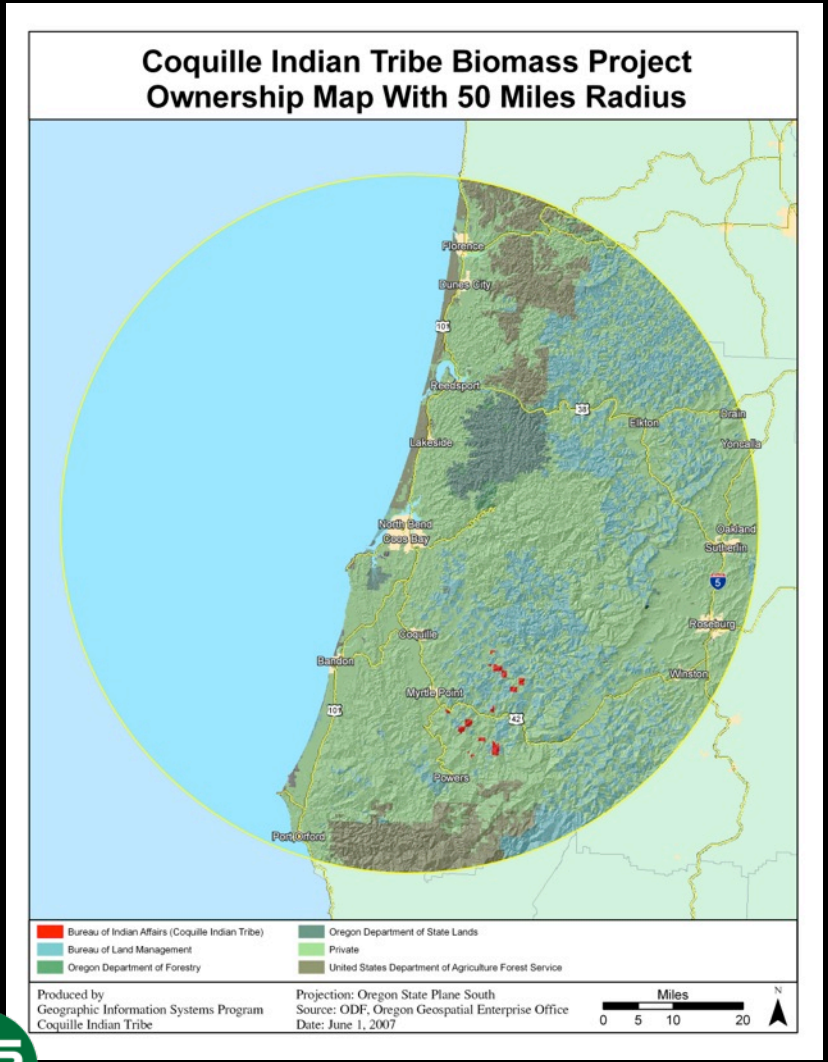
SB 1122

- Enacted in 2012
- Requires 250 megawatts of biomass power procurement:
  - 110 megawatts from wastewater treatment, organic waste diversion, food processing, and codigestion
  - 90 megawatts from dairies and agricultural waste
  - **50 megawatts from sustainable forest-sourced biomass**
- Rules being developed at CPUC under the Renewable Market Adjusting Tariff (Re-MAT) proceeding

Principal Steps of a Bioenergy Project

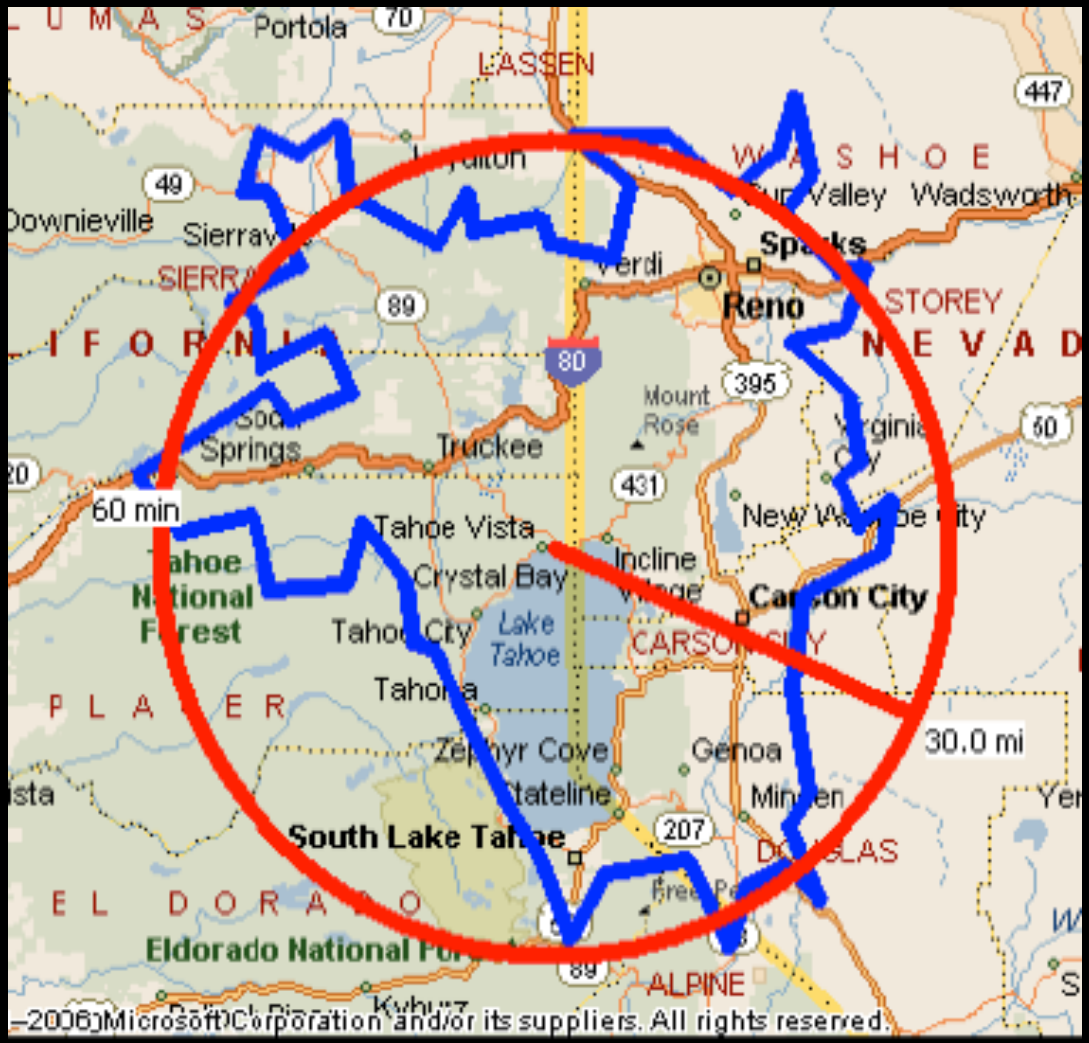
- Resource Assessment
- Siting and Environmental
- Technology Selection
- Project Economics/Financial Analysis
- Secure Feedstock with LT Agreement(s)
- Off take Agreements (power/heat)
- Secure Project Financing
- Design and Construct

Biomass Resource Assessment – Doing the Assessment



- Assess available resources within a physical and economic boundary
- Begin with available data and information
- Interview potential sources and others knowledgeable of local and regional biomass resources
- Scaling the potential facility

Resource Assessment Mapping



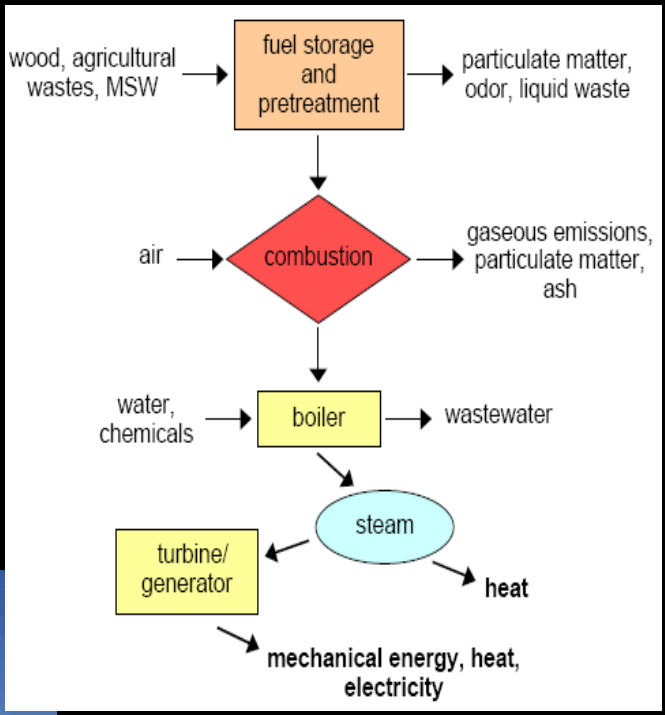
Biomass Feedstock Assessment – What is necessary to know?

- Sustainable long term supply located within close proximity (< 50 miles)
- Economically available
- Environmentally available
- Meets quality specifications
- Available in quantities and from diverse sources that support project financing
  - ✓ Minimum 10 year supply, 70% under contract
  - ✓ At least 2.5 – 3 times facility usage (fuel supply coverage ratio

Technology Evaluation & Selection

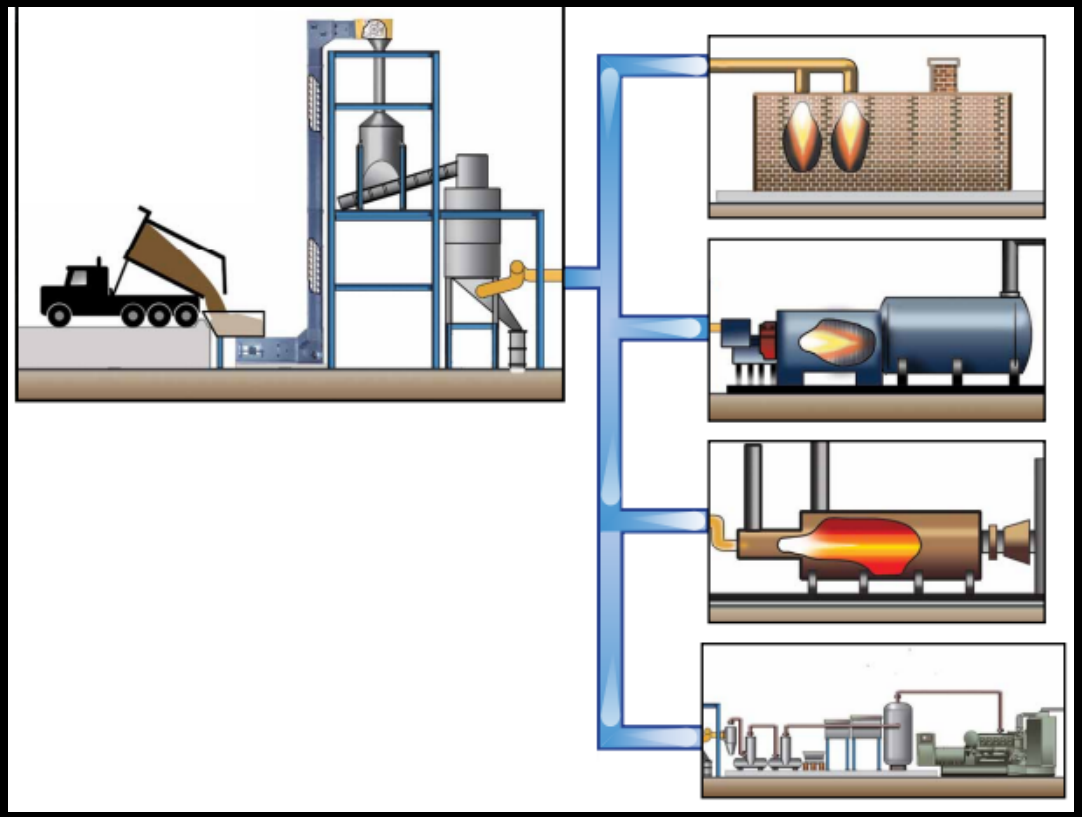
- Search for most appropriate technology considering project location and biomass supply
  - ✓ Ability to convert local supply into heat, power, and/or transportation fuels
  - ✓ Must meet local permitting specifications
- Technology should be proven
  - ✓ Operates efficiently on available biomass supply
  - ✓ Operates cleanly on available biomass supply
  - ✓ Appropriate for site and local/regional resources

Combustion Technology



Gasification

Gasification converts biomass to a combustible gas (a.k.a. syngas)



Phoenix Energy
(Ankur)

All Power Labs

Biochar

- Process
  - ✓ Thermochemical treatment, developed through gasification
  - ✓ Separates water, VOCs, & hemicellulose in woody biomass. Also breaks the cellulosic structure of the wood at 700-1000°C
  - ✓ Produces a carbonaceous residue

    Biochar can be between 75%-85% fixed carbon
  - ✓ Results yield 7%-20% of the original mass

Site Selection Considerations

- Location relative to feedstock resources
- Current Land Use Zoning
- Power grid capacity and infrastructure
- Community Support
- Site conditions/site availability
- Potential collocation of value-added enterprises

Potential Sites in Eastern Fresno County

- Auberry mill site
- Shaver Lake Sites
  - Substation
  - Former landfill
  - Former sawmill
- US Forest Service – Sierra NF
- Sierra High/Middle School

Project Economics

- Sustainable and economical fuel supply
  - ✓ Fuel/feedstock supply typically represents the highest variable cost for a biomass facility
- Existing incentives
  - ✓ Production Tax Credits
  - ✓ Local incentives – enterprise zone
- Markets for power, heat, fuels, and byproducts
  - ✓ Market support justifies capital investment
- Return on investment
  - ✓ Return on Investment (ROI) of 20%+

Implications for Eastern Fresno County

- Reduces potential for wildfire
- Improved air quality (fewer wildfire and open burning emissions)
- Conversion of wood waste to renewable power
- New, sustainable, family wage jobs

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