California Bioresources Alliance

Session 4:

Fire Risk Reduction & Remediation

Brian Gannon

www.biogas-energy.com

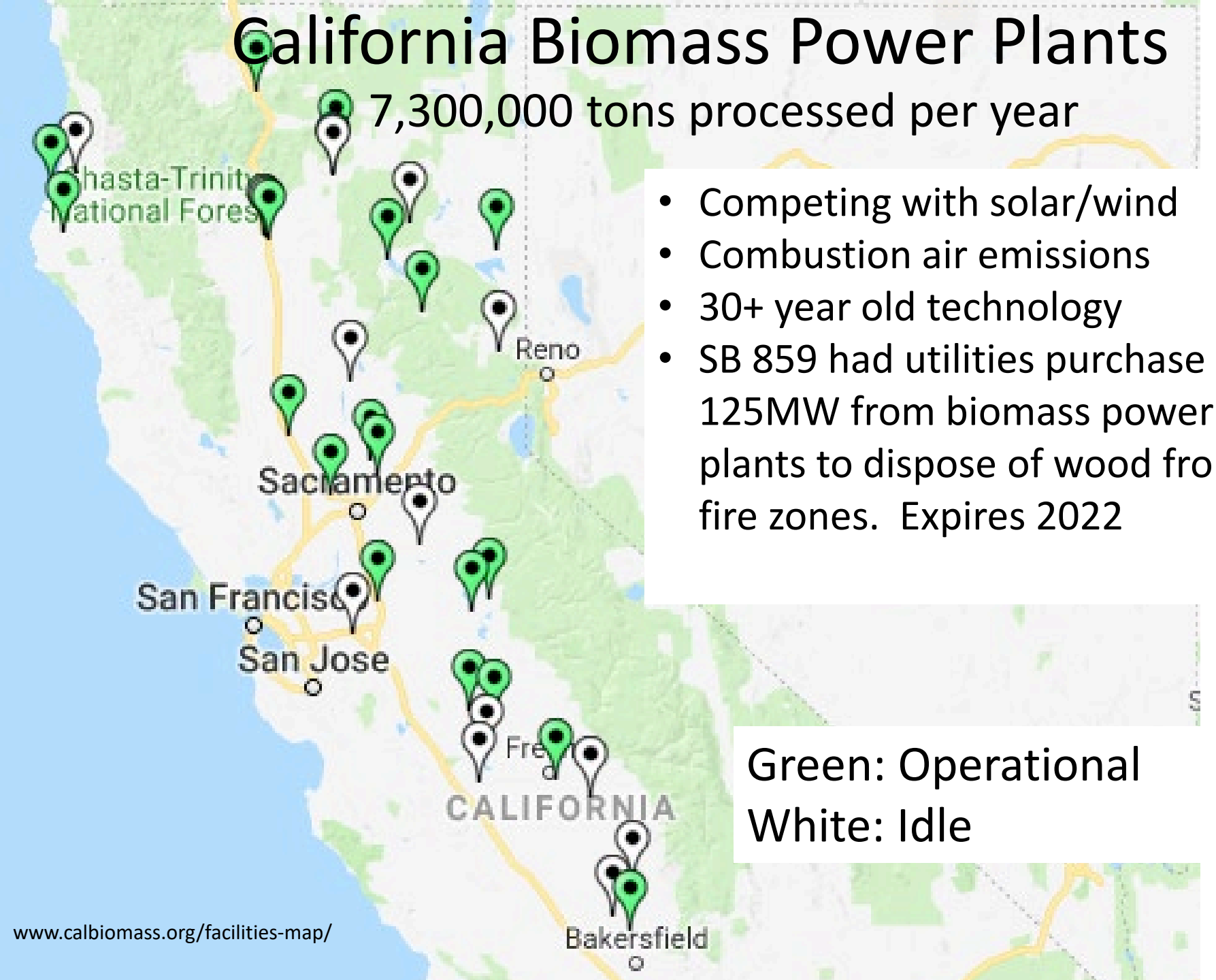
Remove Fuel from the Fire

- Forestry Residues
- Tree limbs near power lines
- Ag Biomass
- Urban wood

OK, but what do we do with it?

California Biomass Power Plants

7,300,000 tons processed per year

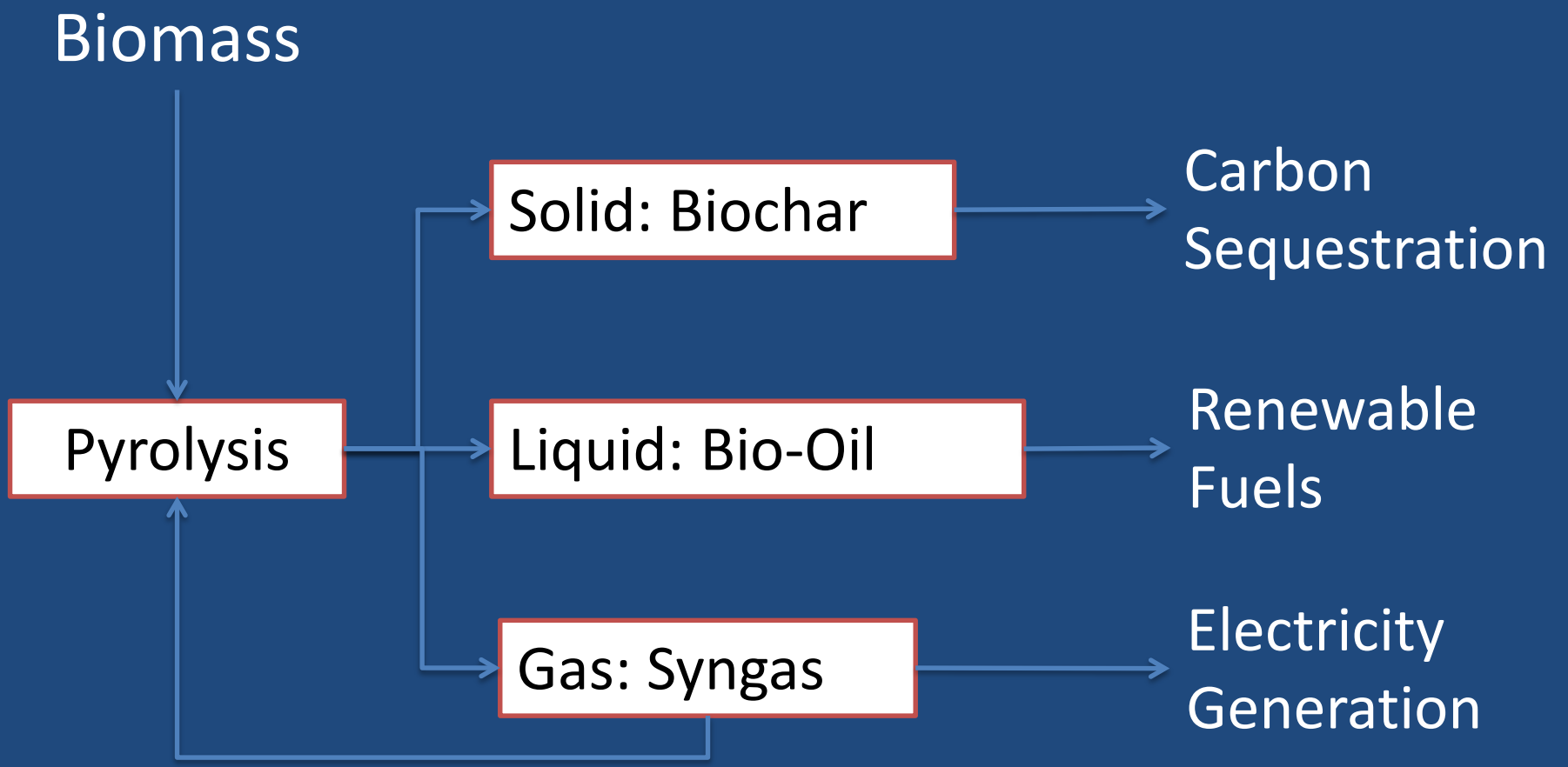


- Competing with solar/wind
- Combustion air emissions
- 30+ year old technology
- SB 859 had utilities purchase 125MW from biomass power plants to dispose of wood from fire zones. Expires 2022

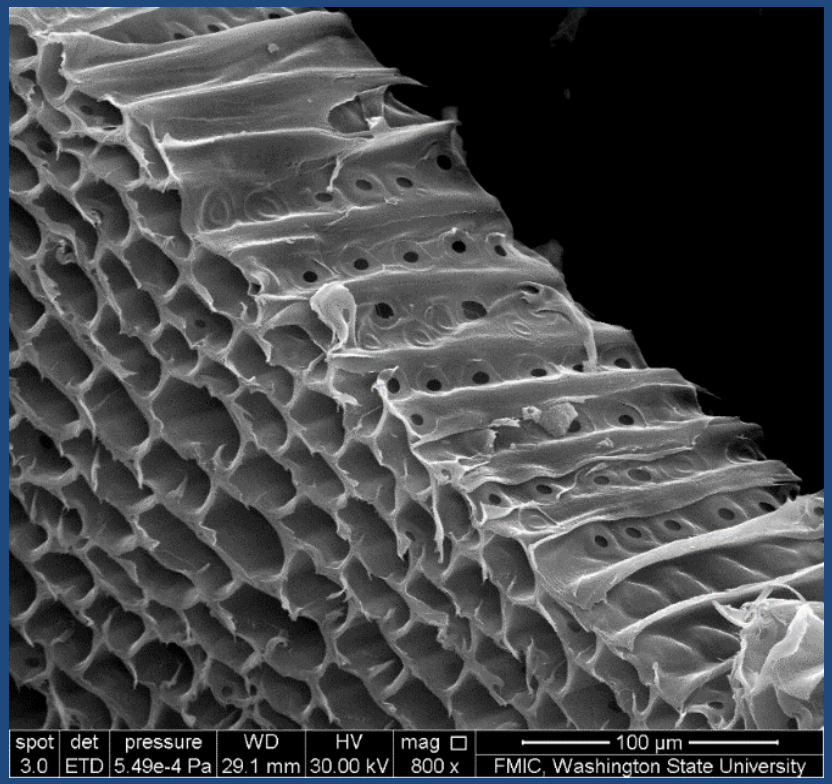
Green: Operational
White: Idle

www.calbiomass.org/facilities-map/

From Fire to Fuel

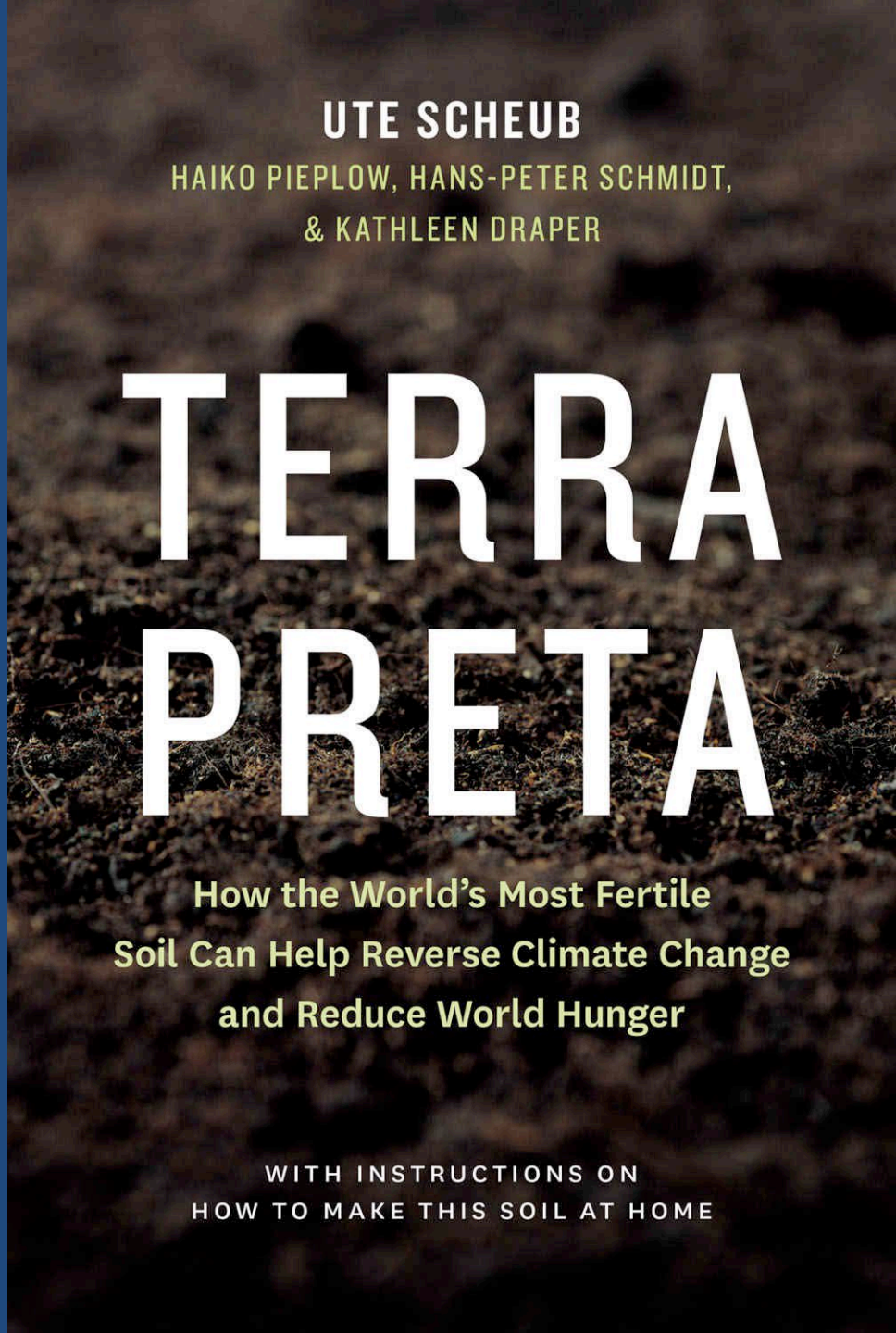


Solid: Biochar



Pine wood biochar

mag. 800X



Gas: Syngas

Electricity, heat & cooling

Liquid: Bio-Oil

Liquid condensate recovered by thermal treatment of lignocellulosic biomass at **<5 second residence time** between **450–600 °C** in the absence of oxygen, **using small dry biomass particles**.

- IEA Bioenergy

Why pyrolysis and bio-oil?

- Decouples production and utilization
- Energy densification
- Easy handling
- Refine into diesel & gasoline
- Biomethane production via anaerobic digestion
- Multiple types of feedstock

Challenges

- Cost of biomass feedstock
- Biomass preparation
- Equipment cost
- Feedstock supply
- Research required for refining

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Innovation for Our Energy Future

Refinery Integration of Bio-oil

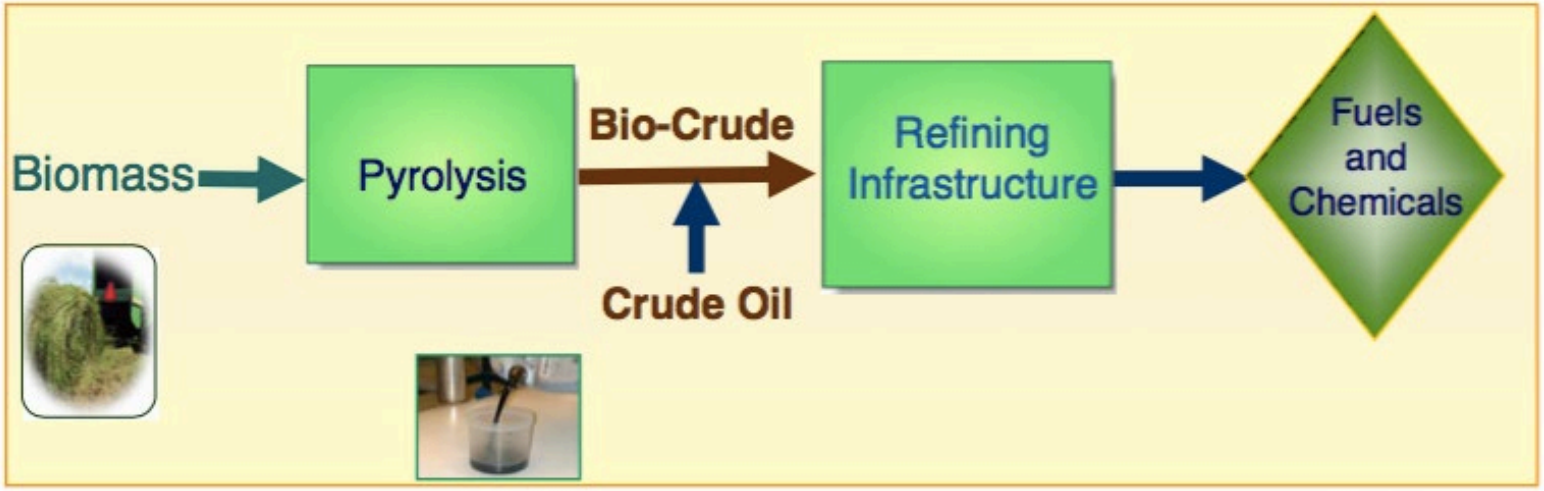
Robert M. Baldwin
Principal Scientist

Presentation to California Air Resources Board

December 13, 2016

The Basic Idea is Simple

Co-Processing Bio-oil with Crude Oil
Integration with Existing Refining Infrastructure

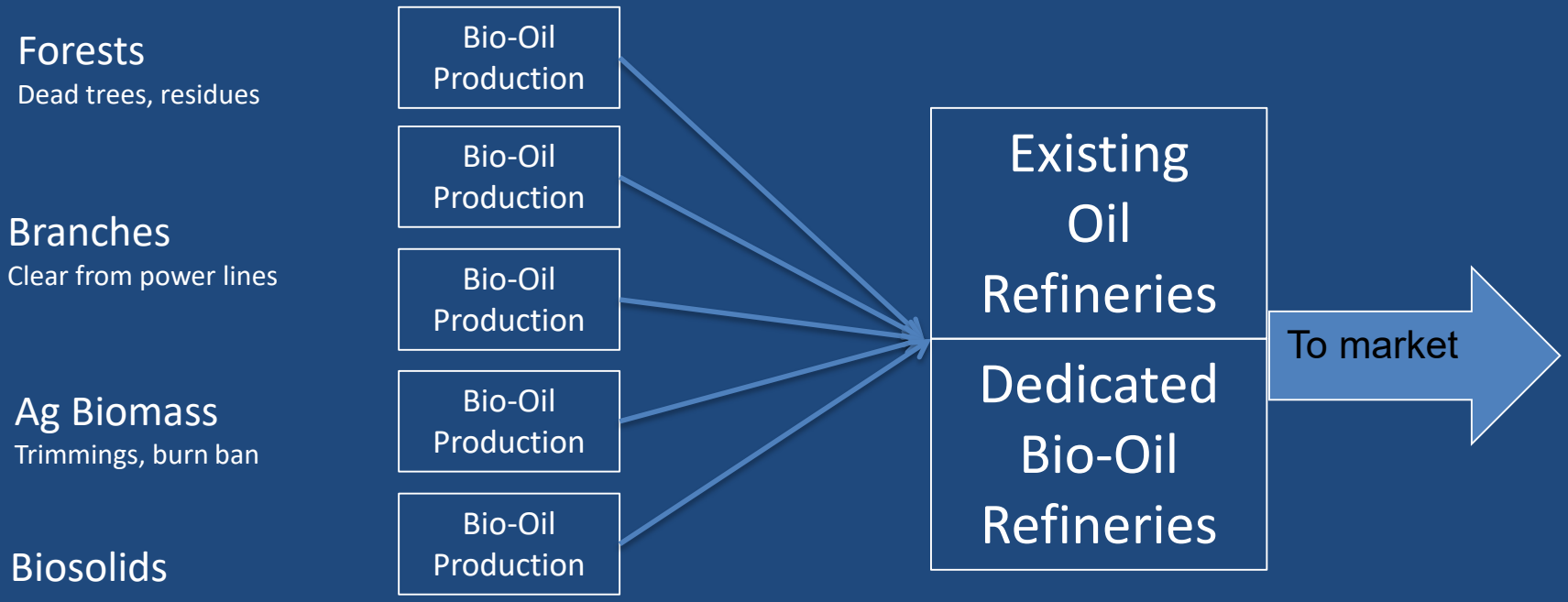


Typical petroleum refinery ≥ 500,000 BPD
Biorefinery @ 2,000 TPD => ~7,400 BPD bio-crude

Production Scale

Distributed Condensation of Energy

Centralized Economies of Scale

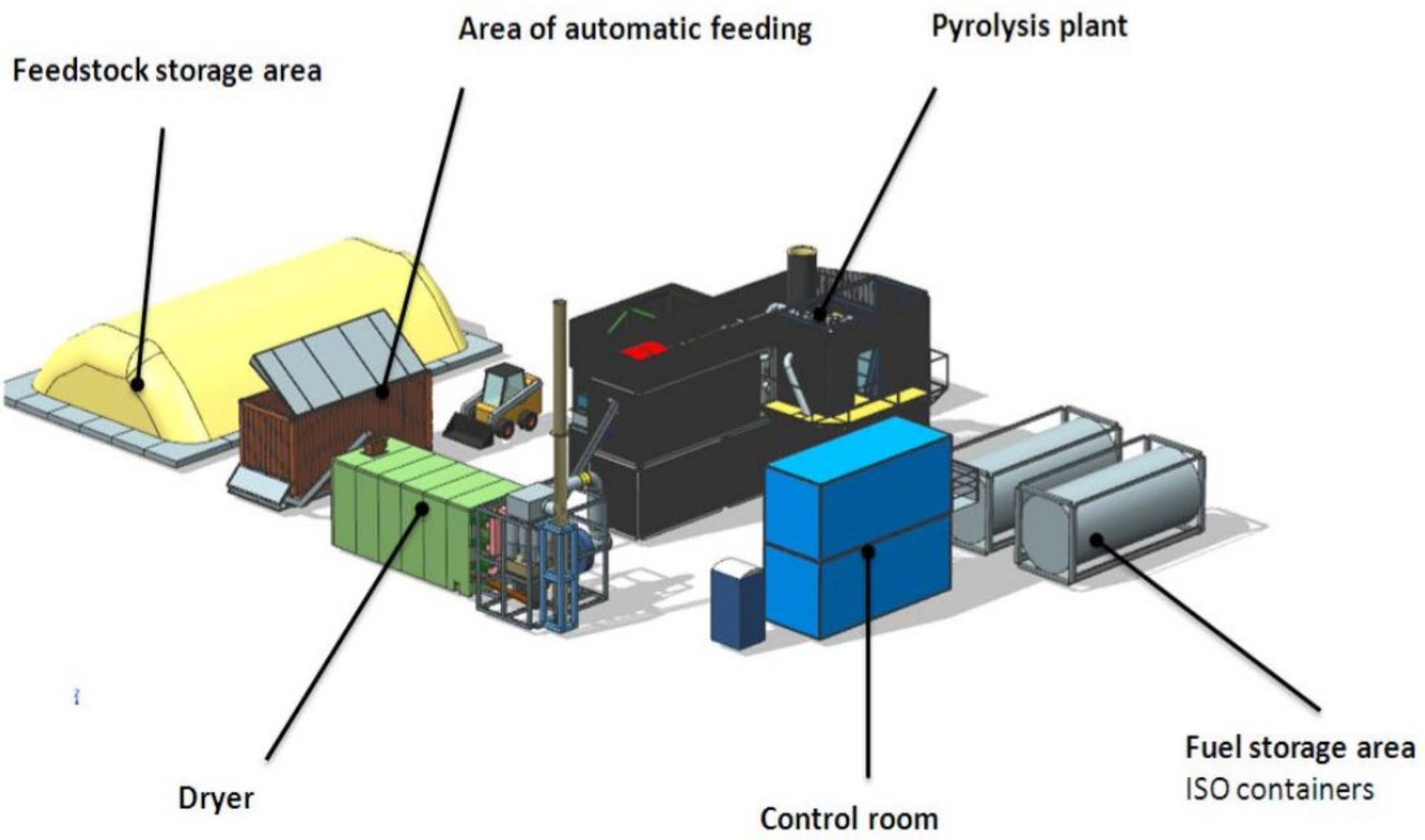


Biomass Energy:
2GJ/m3

Bio-Oil Energy:
25 GJ/m3

Fuel Energy:
36 GJ/m3

Energy Commission Demonstration at Western Placer Waste Management Authority



Pilot Plant

One approach among many

- Create demand for fire fuel biomass
- Sequester carbon in biochar
- Replace fossil fuels with renewable fuels