# *Policy Role in Second-Generation Bioenergy in the U.S.*

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# Limitations of 1st generation biofuels

- Limited oil replacement potential
- Significant effect on agricultural markets and prices
- Only modest energy efficiency and GHG reductions (except for sugarcane ethanol)
- Emerging negative public perceptions

# U.S. bioenergy targets: Large role for 2nd generation bioenergy…

- **2003 – Department of Energy Road Map goals for 2020:** biofuels (10%), biopower (4%) and biomaterials (18%)

- **2007 - President Initiative "20 in 10"** (replace 20% of energy from petroleum in 10 years)

- **2007 (December)- Energy Independence and Security Act**
  - ✓ Renewable Fuel Standard (36 billion gallons by 2022; 21 billion from "advanced" biofuels)
  - ✓ R&D for biomass research ($1.2 billion)
  - ✓ Cost sharing/grants for 2nd generation biofuel plants
  - ✓ CAFÉ (vehicle fuel) standards to increase to 35 miles/gallon (40% increase)

# 2nd generation bioenergy requires diverse array of biomass feedstock

**Second-generation (Short Term)**

**Agricultural residues**
Corn stover,
Wheat straw,
Rice straw

**Forest residues**
Logging residues,
Fuel treatment residues
Forest thinnings

**Urban wood waste**
Secondary mill residues
Municipal solid waste
Construction/demolition wood

**Second-generation (Long Term)**

**Grassy energy crops**
Switchgrass,
Reed canary grass,
Miscanthus,
Mixed grasses
Sorghum

**Short rotation woody crops**
Willows,
Hybrid poplar,
Pines,
Cottonwoods,
Eucalyptus

# Short-term 2nd generation biomass: **Agricultural residues**

- Agricultural residues represent potentially large biomass resource
- BUT soil conservation (erosion prevention) is key constraint
- Economic viability hinges on new infrastructure for collection, handling and storage

# Short-term 2nd generation biomass: **Forestry Biomass**

- High costs of harvesting, handling, and transport
- Lack of competition between residues and fossil fuels (co-firing)
- Competing uses between bioenergy and pulp/paper industry
- Forest thinning (fire prevention): High costs/technical constraints

# Long-term biomass: **Herbaceous energy crops**


Since 1980's DOE focused on switchgrass

In 1990s, intensive DOE-funded research on:

- yield
- varieties
- management

Other options:

Sorghum

Miscanthus

Energy cane

# Long-term biomass: **Short Rotation Woody Crops**

**High biomass yield**
**High density/frequent harvest plantations**
Photo: Jake Eaton, Potlatch Corporation


- Most SRWC not yet used for energy (for pulp/paper industry)
- SRWC face price constraint: {Pulp/paper <Biomass < Coal}
- SRWC cost/price competitiveness is location specific

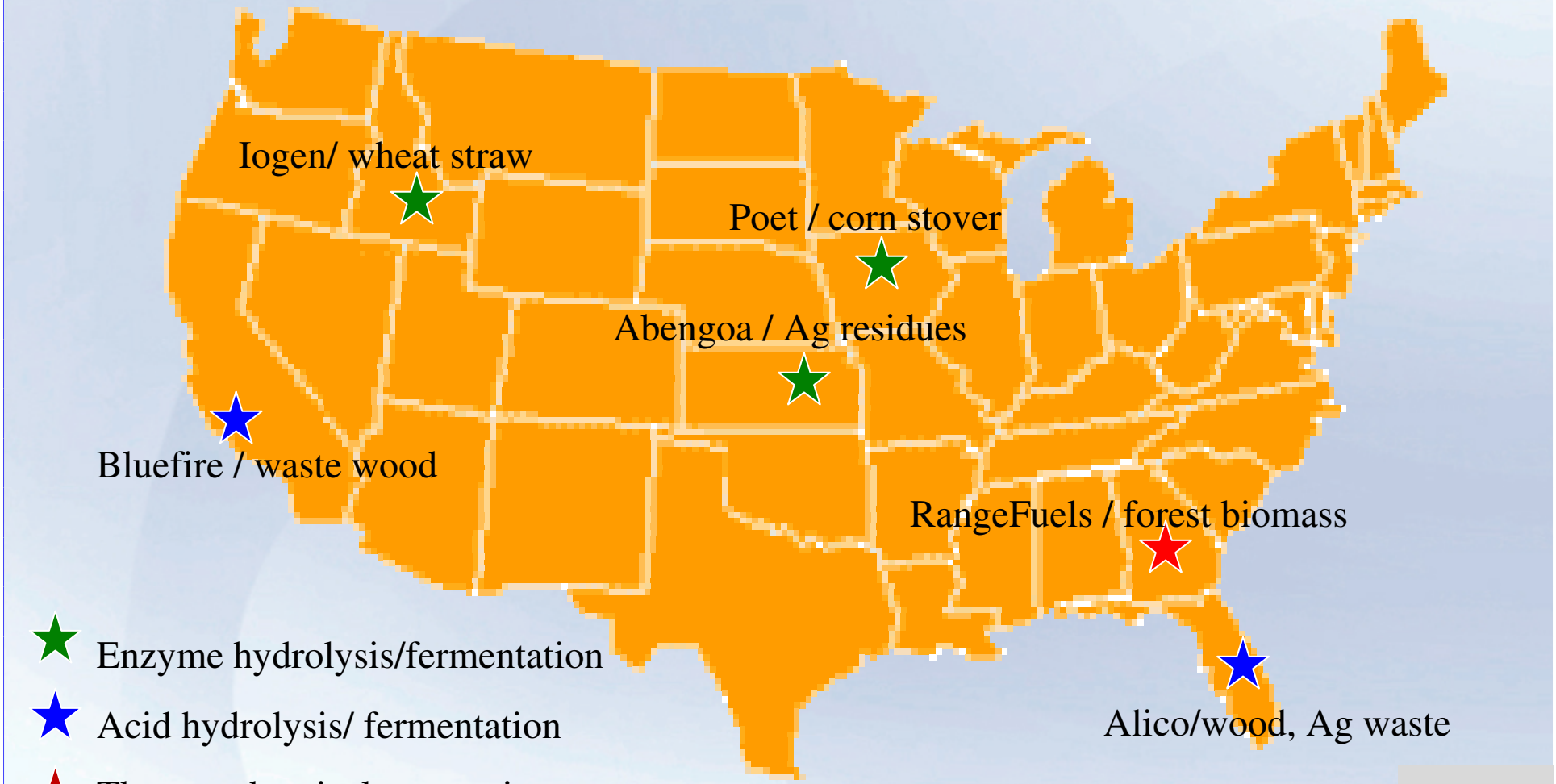
# 2nd generation biofuels & biopower: U.S. R&D priorities

- Biofuels: Major R&D focus on cellulosic ethanol (DOE-led)

  R&D target: Improve process economics (investment capital; feedstock costs)

- Biopower: R&D push for biomass gasification/biomass co-firing
- DOE funding and cost-sharing for first commercial plants

# First U.S. commercial cellulosic biofuel plants (with DOE cost-sharing)



# U.S. policies for 2nd generation biomass/biofuels: Current state of play

- Policies still evolving (EISA 2007includes RFS, but not RPS)
- Policies apply at different levels (local, state, national); some are biomass-specific, others target renewables broadly (wind, solar)
- Need for policy balance (bioenergy vs. conservation; CRP)
- Increased R&D funding in feedstock development (harvest technology, yields), processing technology, 1st plants cost-sharing
- Demand-enhancing policies (flex fuel vehicles; E85 gas stations)

# Final thoughts – What could this mean for developing countries?

- Will biomass-rich developing countries benefit from these technological innovations in bioenergy? If so how?
- Will they become source of raw biomass or can these technologies be transferred and help stimulate regional economic growth?
- Are there unintended consequences—resource depletion (land, water, forests), diversion of scare resources away from food production and toward bioenergy?
- How will biomass-constrained developing countries be affected?