

# Southeast Biomass: Highest and Best Use

## Non-food Biofuels from Sustainable Forest Resources

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President and CEO

# Who is Catchlight Energy?



- Catchlight Energy LLC (CLE) is a 50/50 Chevron and Weyerhaeuser joint venture.
- Our Mission is to commercialize the large scale production of liquid transportation fuels from sustainable forest based resources.
- Our Vision is to be the leader in delivering advanced biofuels “from forest to fuel”.

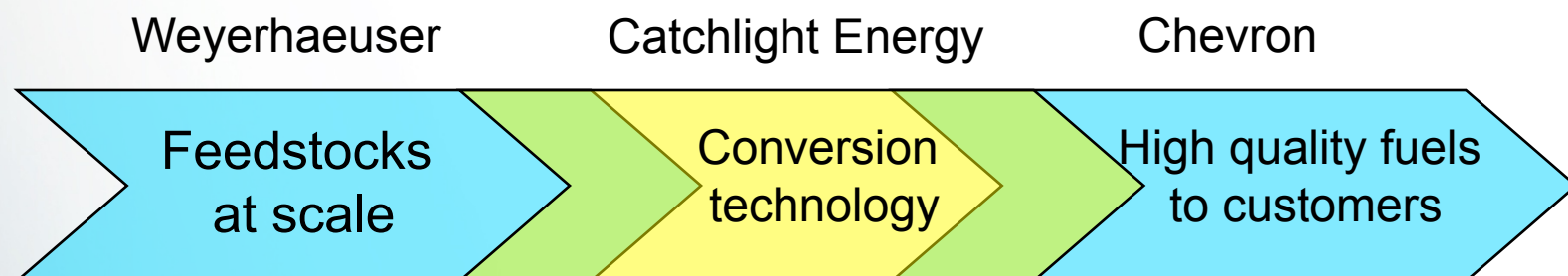
To accomplish this we will:

- Research, develop & commercialize the technologies & business models to produce 2<sup>nd</sup> generation biofuels
- Leverage synergies between CLE, WY, CVX and 3<sup>rd</sup> parties

# CLE's End-to-end Value Chain



Enables “Forest to Fuel” Solution



Leverages the strengths of two leaders in their industries

# Drivers for Joint Venture

- **Develop sustainable renewable energy platform**
  - Climate change and green house gas mitigation
  - Renewable fuels market established & growing
  - Gen I demand capped. Growth to come from 2<sup>nd</sup> Generation biofuels
- **Increase domestic energy independence & security**
  - Domestic energy reduces trade deficits
  - National security
- **Parent's shared view**
  - Cellulosic biofuels important to diversifying U.S. energy supply
  - Growing energy demand & the “end of easy oil” create opportunity for biofuels once economies recover from the current recession
- **Parent complementary strategies**
  - WY: innovative growth and revenue from trees
  - CVX: obtain Renewal Fuel Standard advanced biofuels

# Catchlight Energy LLC Goals



- **Develop Technology & Business Model**
  - Sustainable Supply Chain Business Model
    - biomass at scale
    - engage stakeholders & determine sustainability with science
    - competitive long-term without subsidies
  - Conversion Technology
    - internal and 3rd party
- **Industry leadership through early commercialization**
- **Start in North America**
- **Build, own and operate facilities**

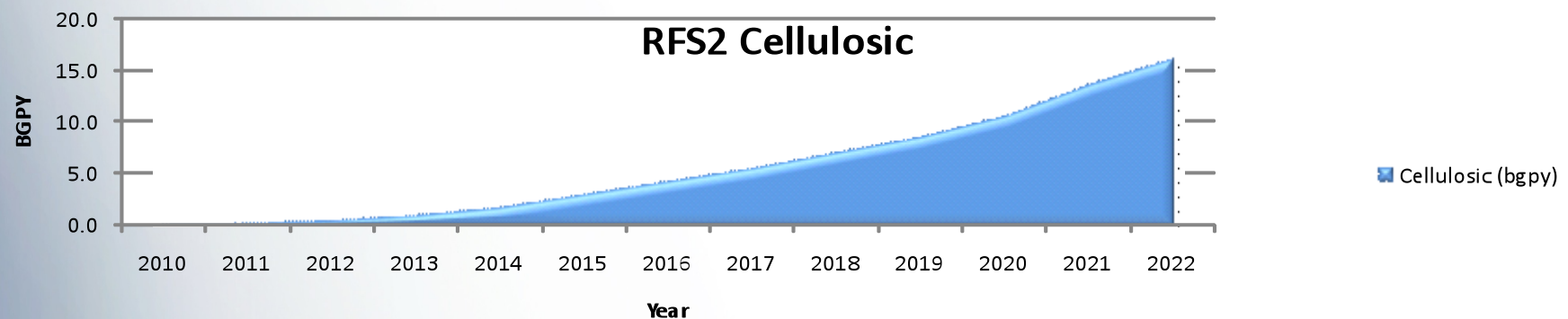
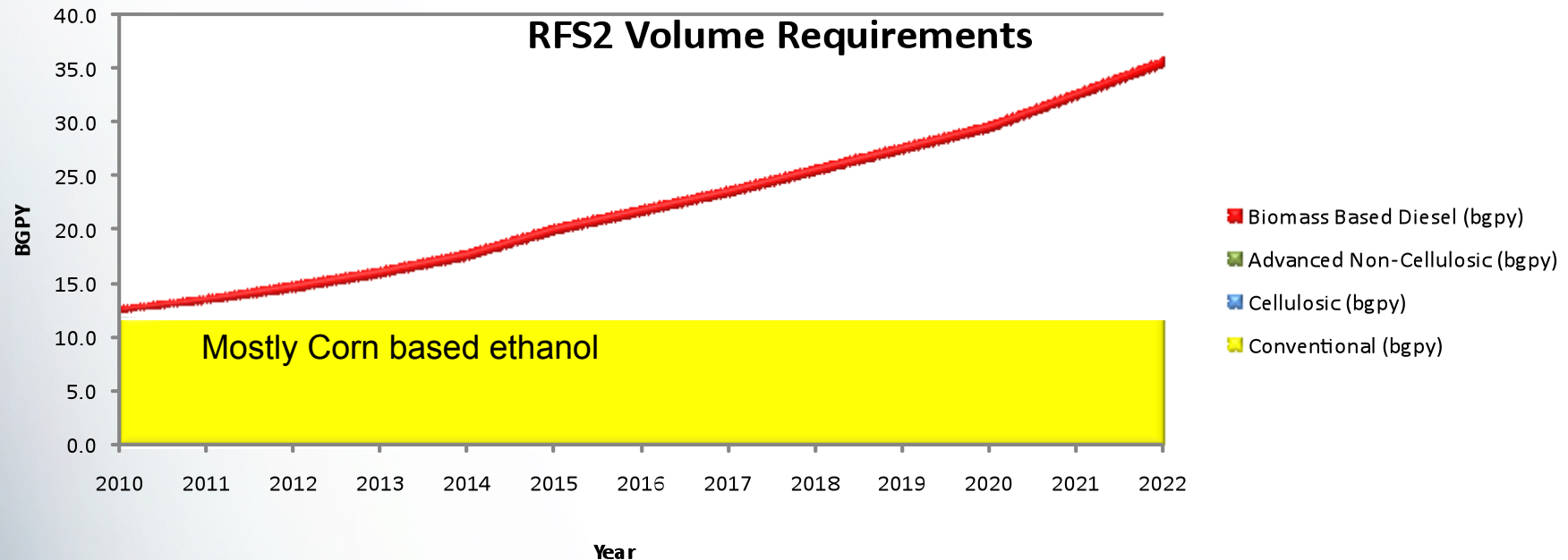
# Our Challenges



- **New and evolving biofuels market**
  - Set by Renewable Fuel Standard(RFS) – regulatory uncertainty
  - Requires rapid ramp up
- **Feedstock scalability**
  - Require tens of millions of tons annually
- **Sustainability**
  - Diverse stakeholders
- **Conversion processes**
  - Currently unproven and uneconomic
- **Logistics infrastructure to collect, process and distribute both feedstocks and biofuel products**
  - Compatibility with present infrastructure is key

# US Cellulosic Biofuels Market

## Defined by the Renewal Fuel Standard (RFS2)



# Feedstock Challenge



- Volume Ballpark Estimates
  - Feedstock/Biomass 10 tons/acre
  - Conversion Process 100 gallons/ton
- Conversion Facility
  - Commercial size, gallons/year 100 million
  - Feedstock supply per facility 100,000 acres
  - Price per facility \$300 to \$600 million
- Requirements to meet the RFS mandate (16 Billion gallons/year)
  - Number of commercial facilities 160
  - Capital requirements to build \$80 Billion
  - Biomass feedstock requirements 16 million acres



# Feedstocks Strategy



- **Forest-based**
  - Build on Weyerhaeuser's existing forestry base
- **Grow energy crops in conjunction with high value timber**
  - Maintain supply for traditional forest products
  - Deliver a new and sustainable resource for biofuels
- **Supplement Weyerhaeuser feedstocks with third party supply**
- **Achieve scale consistent with billions of gallons per year of liquid transportation fuels**

# Why Forest Based?



- Builds on an large existing infrastructure that is consistent with large scale production of biofuels
- Leverages Weyerhaeuser's strengths in managing large scale ecosystems
  - Precision forestry and science-based sustainable forestry
  - Extensive and efficient harvest, handling and transport infrastructure
  - Expertise in feedstock procurement from third parties
  - Expertise in genetic improvement to improve yield, product quality and throughput of conversion processes
- Woody feedstocks can provide superior assurance of supply
- Recognition that forestlands can grow more than just sawtimber alone

# Weyerhaeuser Forestlands Provide the Foundation



# Adapting the Forestry Strategy



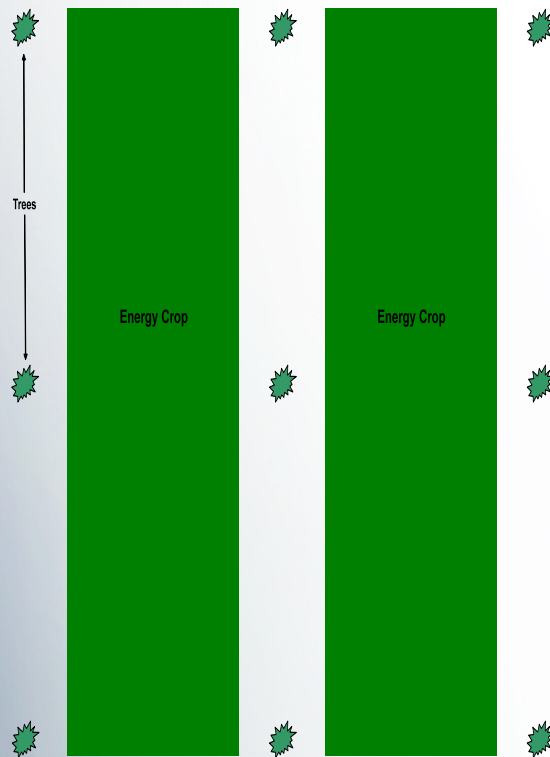
- **Weyerhaeuser's traditional focus has been high value sawtimber**
  - Forests intensively managed for value, not for maximum biomass production
- **During much of the rotation the forest has potential to support production of additional biomass for emerging biofuels markets**
  - Residuals, understory crops, (short rotation) trees, perennials to complement high value timber



# Intercropping of Dedicated Energy Crops

## One example

- Grow strips of pine trees and an energy crop
- Energy crop harvested annually
- Trees managed for wood products and fiber





# Feedstock Sources



**Understory  
vegetation**

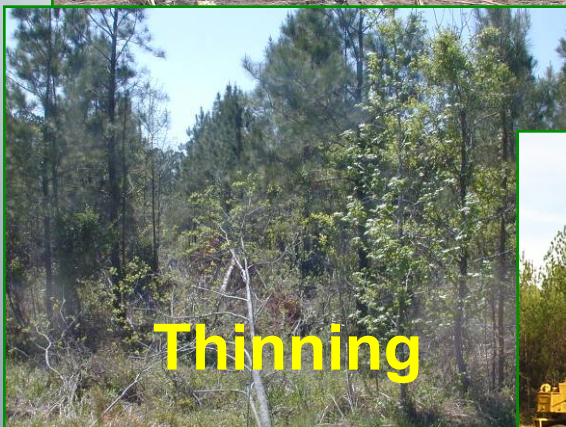


**Harvest  
residual**



**Intercropping**

11/04/2008



**Thinning**



**Thinning  
residuals**



# Feedstock Sourcing

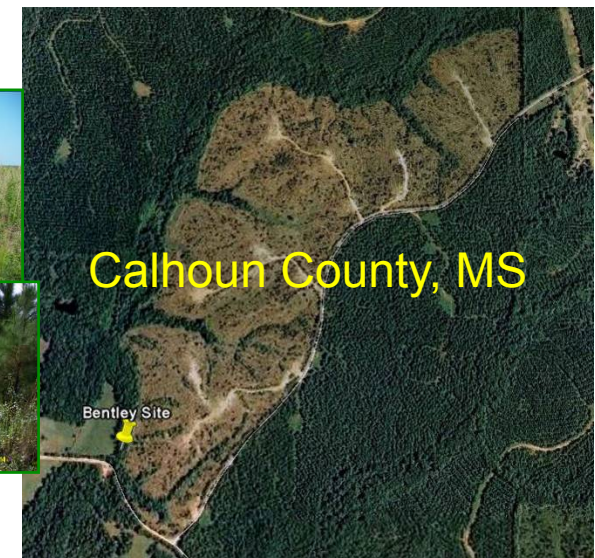
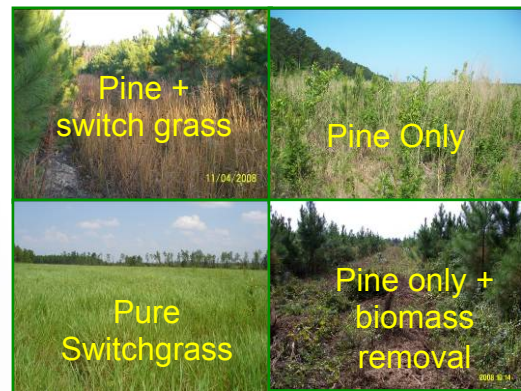


- **Sourcing Buildup for first facilities could be:**
  - **Harvest Residuals**
    - Thinning and Clearcut Residuals with cull understory
  - **Whole-tree woods chips**
    - Either pulpwood or pre-commercial interventions
  - **Dedicated Energy Crops**
    - Switchgrass
  - **Cleanings**
    - Understory removal of competition

# Feedstock Sustainability Research



- We must assure all stakeholders that the system is truly sustainable
- Well positioned to influence legislation, certification schemes, and forestry regulations/BMPs by demonstrating the sustainability of our management and procurement practices
- Large-scale site studies underway with credible research partners (NCASI, key research Universities, ENGOs) exploring:
  - Soils, nutrients, soil carbon, site productivity
  - Wildlife/biodiversity
  - Water quality/quantity
  - Carbon life cycle analysis

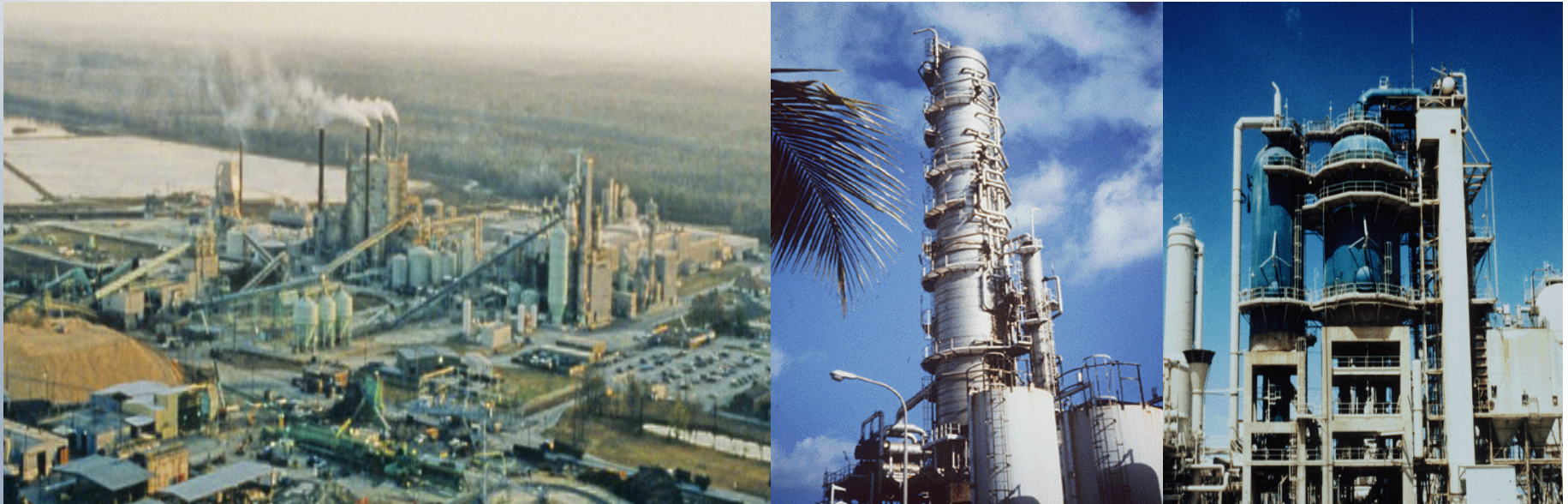




# Conversion Technology



- Catchlight Energy builds on the strengths and competencies of its parents
  - WY: feeding, & converting biomass
  - CVX: chemical and thermochemical conversion to liquid transportation fuels



# Conversion Technology



- Range of bio-fuel products
  - Ethanol and other alcohols
  - Hydrocarbons
  - Intermediates
- Manufacturing facilities likely to involve multiple technologies
  - Biological
  - Thermochemical
  - Chemical/catalytic
- We do not expect to do it all alone; third party technology will be important to our success



# Logistics/Infrastructure



# Logistics / Infrastructure



- Highly distributed nature of biomass does not fit the traditional centralized refining model
- Matching continuous conversion processes with a discreet harvest system is a challenge
  - Biomass supply varies through the year
  - Season to season variability with perennials
  - Assuring security of supply – multiple feedstocks?
- Overcoming the feedstocks / conversion conundrum
  - a market must exist before feedstocks will be planted
  - but feedstocks must be available before conversion facilities will be built

## Learnings since CLE's formation



- It will not happen as quickly as first thought
- Technology is not the only challenge
- Key driving forces are outside our control
  - Volatile energy prices; uncertain federal policy
- No single technology is likely to dominate
- Ethanol alone is not the answer;
  - Hydrocarbons should also be in the portfolio
- Competition for forest resources is inevitable
- A consistent and predictable government policy is essential

## The Heritage of the Parents



**"The power of Human Energy to find newer, cleaner ways to power the world"**



**"Releasing the potential in trees to solve important problems for people and the planet"**

**These are the ideals that created Catchlight Energy**

We acknowledge the risk and uncertainties, but —

We believe Catchlight Energy is uniquely positioned to make large scale, renewable transportation fuels from a sustainable forest resource a commercial success