



Utilization Challenges and Opportunities: Attracting Private Investment

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Presentation Outline

1. Overview of PJ-based bioenergy utilization pathways
2. Impediments to private sector investment
3. What it takes to engage the private sector
4. Potential payoff for Nevada, the region, and the U. S.
5. Summary and conclusions



Key Energy Technology Challenges: (Biomass-to-Energy from PJ can address each segment)

Implementing Renewable Gigawatts at Scale



BARRIERS

- . Cost
- . Reliability
- . Infrastructure
- . Dispatchability

Displacement of Petroleum-Based Fuels



BARRIERS

- . Cost
- . Life cycle sustainability
- . Fuels infrastructure
- . Demand and utilization

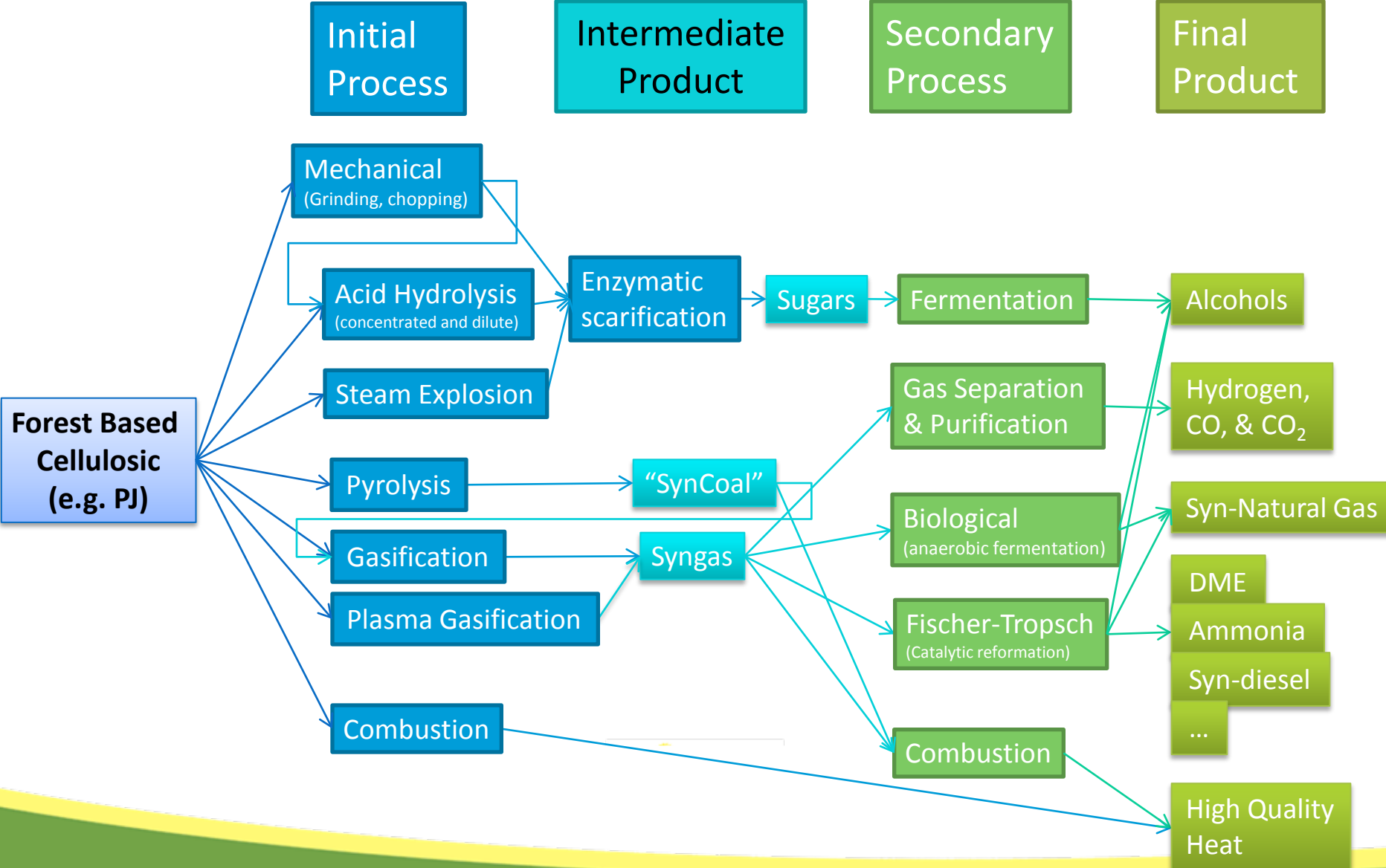
Reducing Energy Demand of Buildings, Vehicles, and Industry



BARRIERS

- . Coordinated implementation
- . Valuing efficiency
- . Cost
- . Performance and reliability

Bio-Energy Pathways: Many Options for PJ Utilization



PJ Bio-Energy Opportunities

- Optimize methods to use PJ in power generation
 - Direct combustion (standalone fuel or co-firing with coal)
 - Gasification, plasma gasification, pyrolysis
- Explore the use of PJ for the production of high performance oxygenates as (a) chemical intermediates or (b) fuels to supplement or replace gasoline or diesel fuel

Key to Success:

Optimize forestry management practices to ensure a long term, sustainable supply of renewable fuel, while minimizing adverse environmental impact



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What Impedes U. S. Energy Sector Investment?

- Market price of energy not reflective of true cost
- Lack of energy price transparency
- Regulatory/policy uncertainty
- Many of the benefits of long range innovative activities accrue to parties other than those making the investments
- Highly fragmented, regional markets
- Massive capital requirements to scale
- Under-investment in federal R & D and commercialization
- Incumbents not incentivized to invest in transformative R & D
- Many good business opportunities do not fit traditional VC risk/return model

Incumbent R & D spending

1. Oil and Gas Companies

- R&D focused primarily on exploration technologies to increase recoverable reserves and incremental efficiencies in refining
- Limited R&D expenditures in transformative technologies
 - \$600 Billion/year in ethanol subsidies aren't helping!

2. Utility Companies

- Regulations and price signals do not incentivize innovation

Energy Sector Innovation: Severely Underinvested

- % of revenue spent on R & D
 - Health care sector: 2.0 %
 - Agriculture: 2.4 %
 - IT: 10 %
 - Pharmaceuticals: 10 %
 - **Energy sector: only 0.3 %**
- Annual federal energy R & D expenditures (non-defense)
 - 2010 (excl. ARRA) - \$3 Billion; 1980 - \$8 Billion (real dollars)
 - Less than 25% of 1980 levels when measured as % of GDP
 - One-time ARRA infusion - \$13 Billion over few years
 - Health care, national defense, space exploration - \$20-30 Billion/sector

To attract investment ...

Need 2 thriving (and interconnected) Ecosystems

Clean Energy Ecosystem

Technology Innovation Ecosystem

- *Energy Technology Development*

Talent

Entrepreneurs
and Business
Experts

IP

Academia, Nat'l
Labs, Corp. R&D

Capital Sources

Public grants,
angel, and VC

Key Influencers

Customers,
Regulators, Ind.
Incumbents

Deployment Innovation Ecosystem

- *Energy Project Development*

Talent

Entrepreneurs
and Business
Experts

Know-how

Finance, EPC, EIS,
permitting, feedstock
acquisition, energy
sales, O & M
contractors, etc.

Capital Sources

Private Equity,
Banks, fed. loan
guarantees

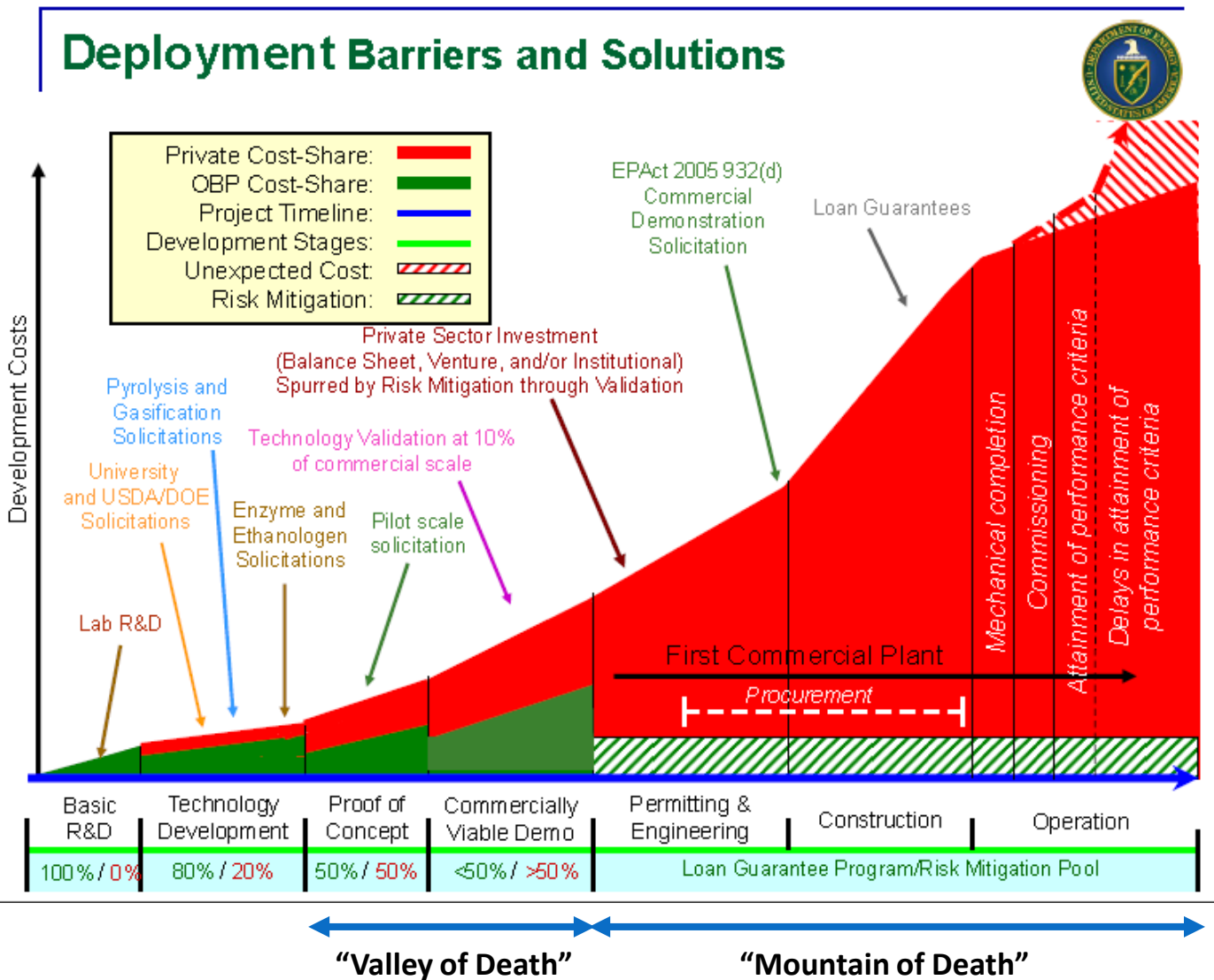
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The "Death Zones" of Energy Technology Commercialization

(Example: Biorefinery)

Deployment Barriers and Solutions



Significant Variations in Major Energy Markets

	Power & Thermal	Transportation Fuels
Regulatory Environment	Highly regulated, balkanized markets (state and federal)	Less regulated, commodity market (mostly federal)
Market Concentration	Low	High
Capital Investment	Very High, primarily private owners	High, but less, private ownership (in U.S.)
Resource Base	Domestic (Coal, Uranium, NG, Hydro)	Foreign (Oil)
Pace of Change	Slow	Faster

Both face significant environmental pressures / regulation

Attracting private investment capital (or ... winning the battle for developer “mind-share”)

Since developers will focus on projects within their portfolios exhibiting the least amount of resistance, we must:

- Turn our vast % of federal lands into an advantage
 - Reduce permitting lead times (Time = Investment Risk)
 - Ensure availability of long term (20+ years) PJ supply
 - Pro-actively engage in federal legislative and agency proceedings to encourage new sources of bioenergy to be explored and commercialized
 - R & D funding
 - Loan guarantees
 - Tax credits
 - Enact state and federal policies to enable transmission infrastructure to be built (esp. for export)
- **Key is to reduce project uncertainty: Start with 1 or more a well-developed demonstration project**

Successful implementation in NV

1. Lead with Nevada's strengths

- We have the resource (and it must be treated!)
- We have the geography/market access (esp. California)
- We have a design-build (legacy) workforce
- We are pioneers in developing large scale renewables (solar & geothermal)

2. Attract large multi-national RE project developers (“Anchors”)

- Position Nevada as the preferred location to provide the workforce to address project development impediments (Nevada's exportable “know-how”)
- Requires significant skills development and business attraction efforts
- **Requires aggressive actions to overcome development hurdles**

→ Manufacturing and R & D will naturally follow

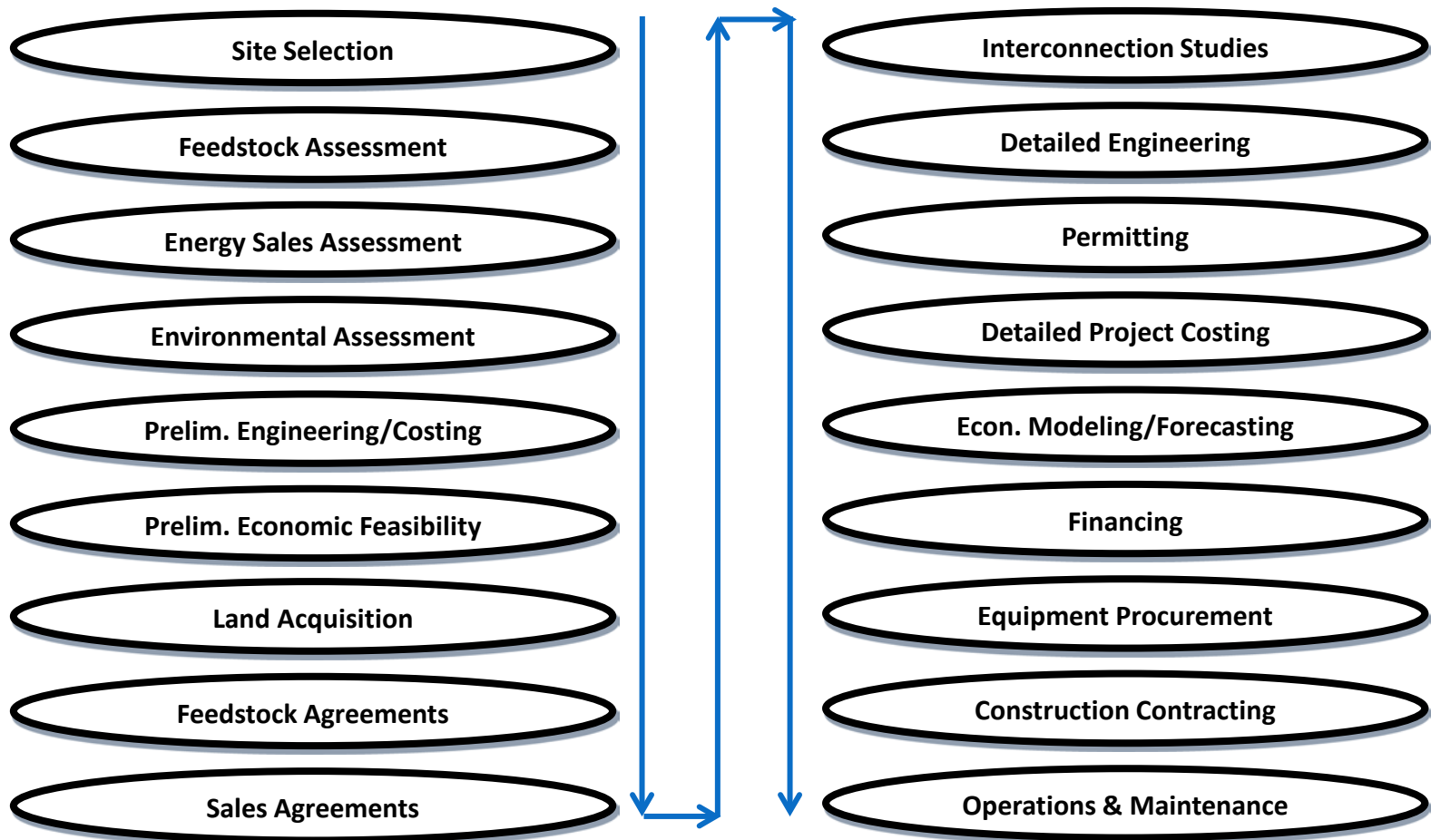
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The payoff: Many types of good paying jobs!

(& an opportunity to reverse the cash-drain from fossil fuels imported into Nevada)



Energy Production and Export

- Is it worth the effort?

(Seems to be working for Wyoming's economy ...)

	<u>Nat'l Rank</u>
2007 Per Capita Personal Income (PCPI)	5
% Change in PCPI 2001-07	1
% Change in Total Employment 2001-07	3
% Change in Total Wages 2001-07	1
% Change in LowEd Industry Wages 2001-07	1
% Change in HiEd Industry Wages 2001-07	2
% Wages from HiEd Attainment Industries	50
% of Population with Bach+ Degrees	41
% of Population with Assoc Degrees	3

Extracting Nevada's vast renewable energy resource base has the potential to drive our economy across both low- and high-educational-attainment sectors

Summary and Conclusions

- Biomass-to-energy will play a significant role in transforming our energy economy
 - Need cost effective and environmentally sustainable solutions to food-based energy crops (PJ is part of the answer)
- Pinyon and Juniper represent an opportunity to leverage a growing environmental problem into a productive societal solution
- With appropriate federal and state support, Nevada and the western U. S. can lead the way
 - Need to overcome barriers within the “Valley of Death” & the “Mountain of Death”
 - Demonstrate superior environmental stewardship and economic returns
- Demonstration project(s) will expose the risks, effectuate solutions, and ultimately attract private capital

What is NIREC?

- Independent 501(c)(3) nonprofit organization founded by the State of Nevada in 2007
- Mission is to accelerate the commercialization of renewable energy technologies in Nevada
 - Increase Nevada's innovative capacity
 - Drive knowledge-based employment
- Today, we do this through:
 1. Providing grants/investment capital to fund early stage RE innovations (assist in overcoming the “valley of death”)
 2. Overcoming barriers to widespread commercial deployment





Transforming Clean Energy Ideas into Sustainable Enterprises

Thank You!
