



The Federal Role in Fostering Biorefinery Investment

The View of a Technology Developer



U.S. Department of Energy

Energy Efficiency and Renewable Energy

*Bringing you a prosperous future where energy is
clean, abundant, reliable, and affordable*



- Emerging cellulosic ethanol company
- Goal: the lowest cost producer of Ethanol; greatest environmental benefits
- Based in Berwyn, PA and Burnaby, BC
- Parent is a public company (LEC:TSX-V)
- 40 employees
- Fully integrated biorefinery pilot plant
- \$30 million of DOE funding pending for “10% scale” demonstration plant



Lignol's Biorefinery Technology

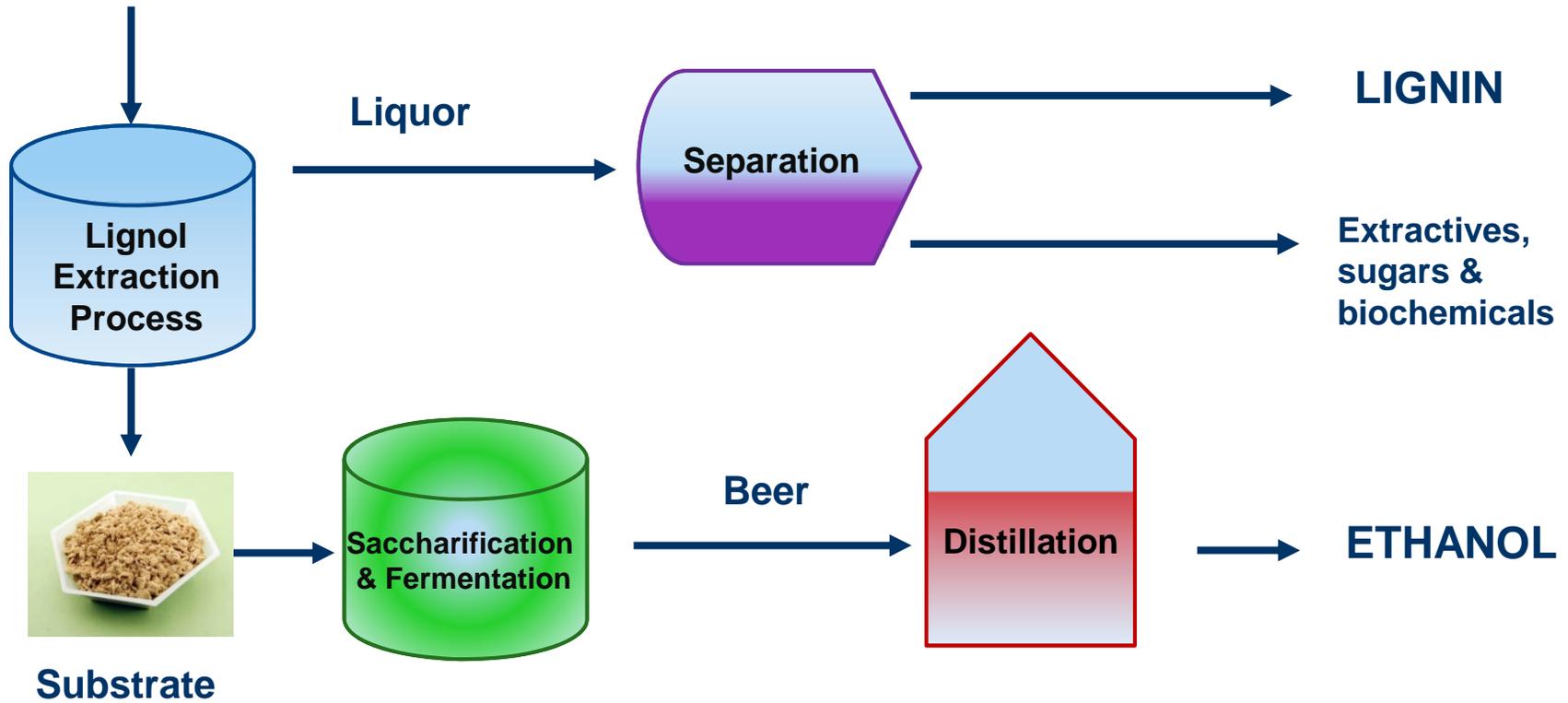


Biomass



Hardwoods, Softwoods, Agri Residues

High-yield ethanol production
and high-value biochemicals
(High Purity Lignin, HP-L™)



- Versatile biorefinery with multiple products such as Cellulosic Ethanol , HP-L™ lignin and furfural
 - *Process economics enhanced by multiple revenue streams - process can be economic at smaller scale*
- Well-proven organosolv pre-treatment process provides very clean cellulose substrate and unique lignin-based co-product
 - *Enzymatic saccharification enhanced by clean substrate - smaller enzyme dose, faster bioconversion*
 - *High value HP-L™, compared with other “lignins”*
- Co-products displace petrochemicals
 - *Significant additional GHG emissions reductions beyond transportation fuel benefits*



- Capacity: 1 tonne per day (dry basis)
 - Fully integrated mini-biorefinery
 - Fully instrumented
 - Industrial equipment
 - Rated at 25,000 gallons/yr ethanol
- Feedstocks: Hardwood & softwood, agricultural residues, energy crops
- Products: Cellulosic Ethanol, HP-L™ lignin, furfural, other chemicals
- Operation: 24/7 in campaigns



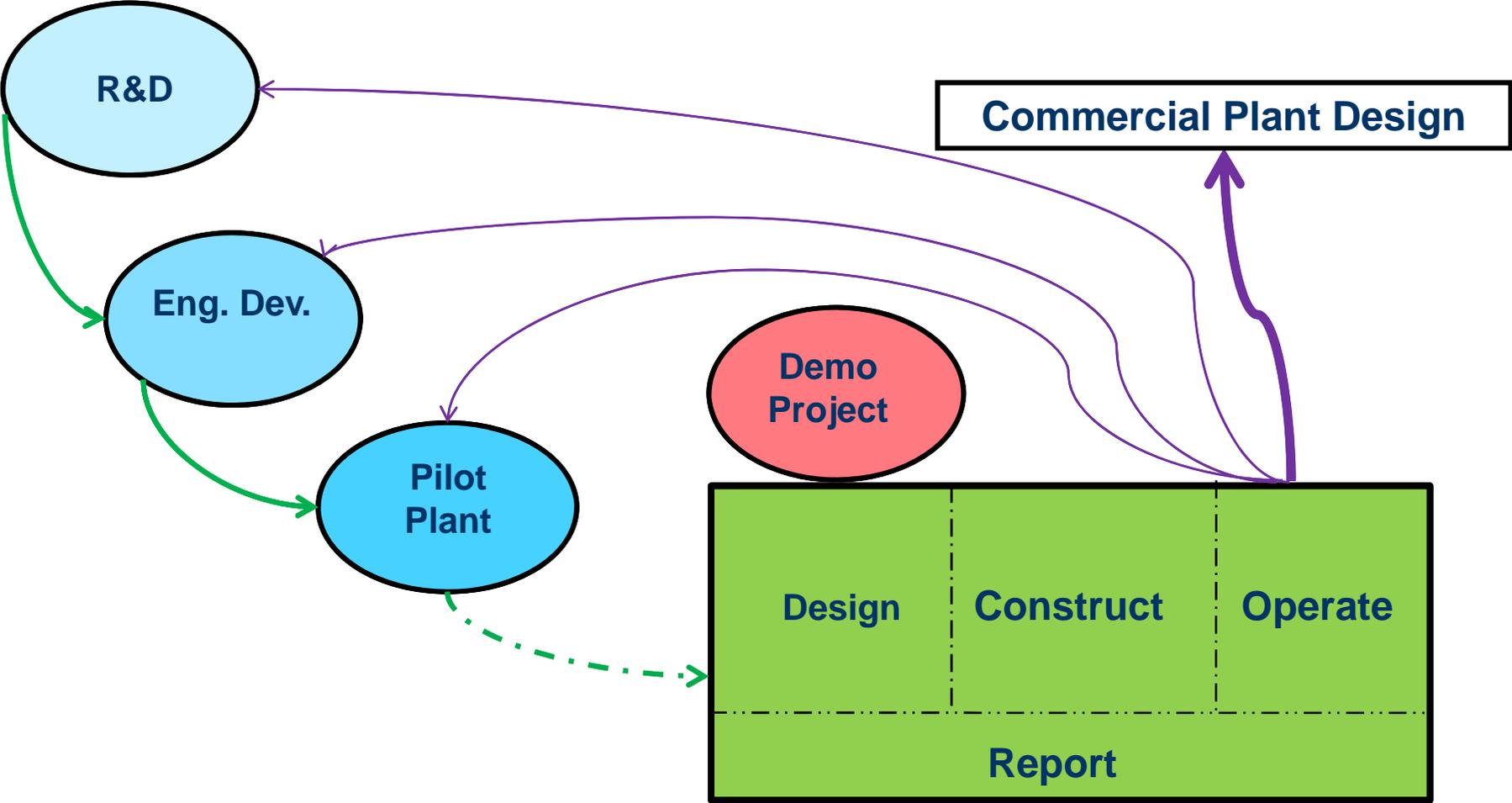
Lignol's Integrated Pilot Plant



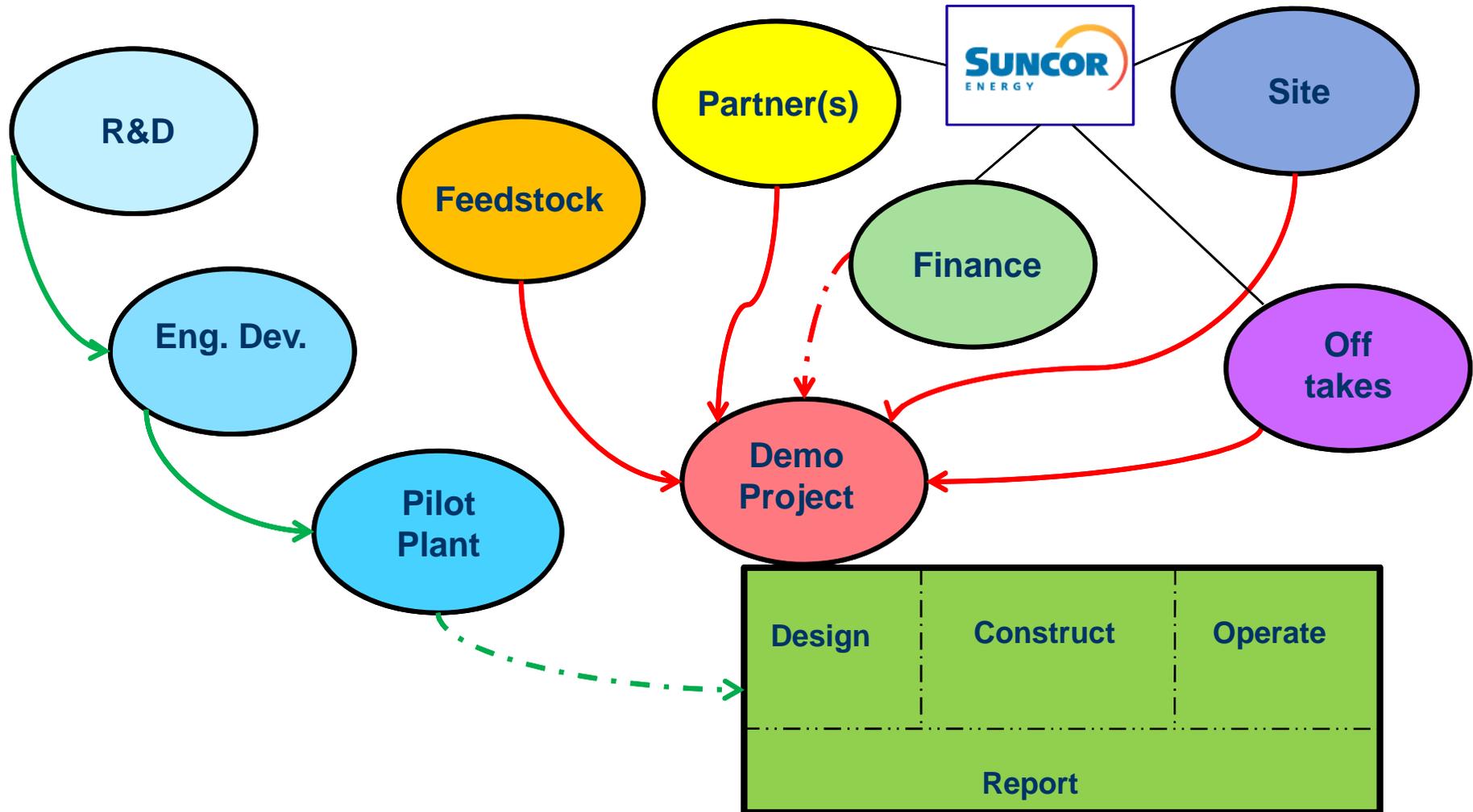
- August 2007 - Applied for DOE funding under the “10% scale” program
 - 100 tpd hardwood/softwood feedstock, 2.5 million gallons/yr
 - Planned partnership with Suncor, project adjacent to Commerce City, CO refinery
 - Total cost ~ \$80m, \$50m from Suncor
- January 2008 - Advised of selection to negotiate an award of \$30m
- August 2008 - Approval to move the project site to Grand Junction, CO
- September 2008 - Project development agreement with Suncor
- October 2008 - Signed Cooperative Agreement with DOE



Project will Validate Commercial Plant Design



Project Structure



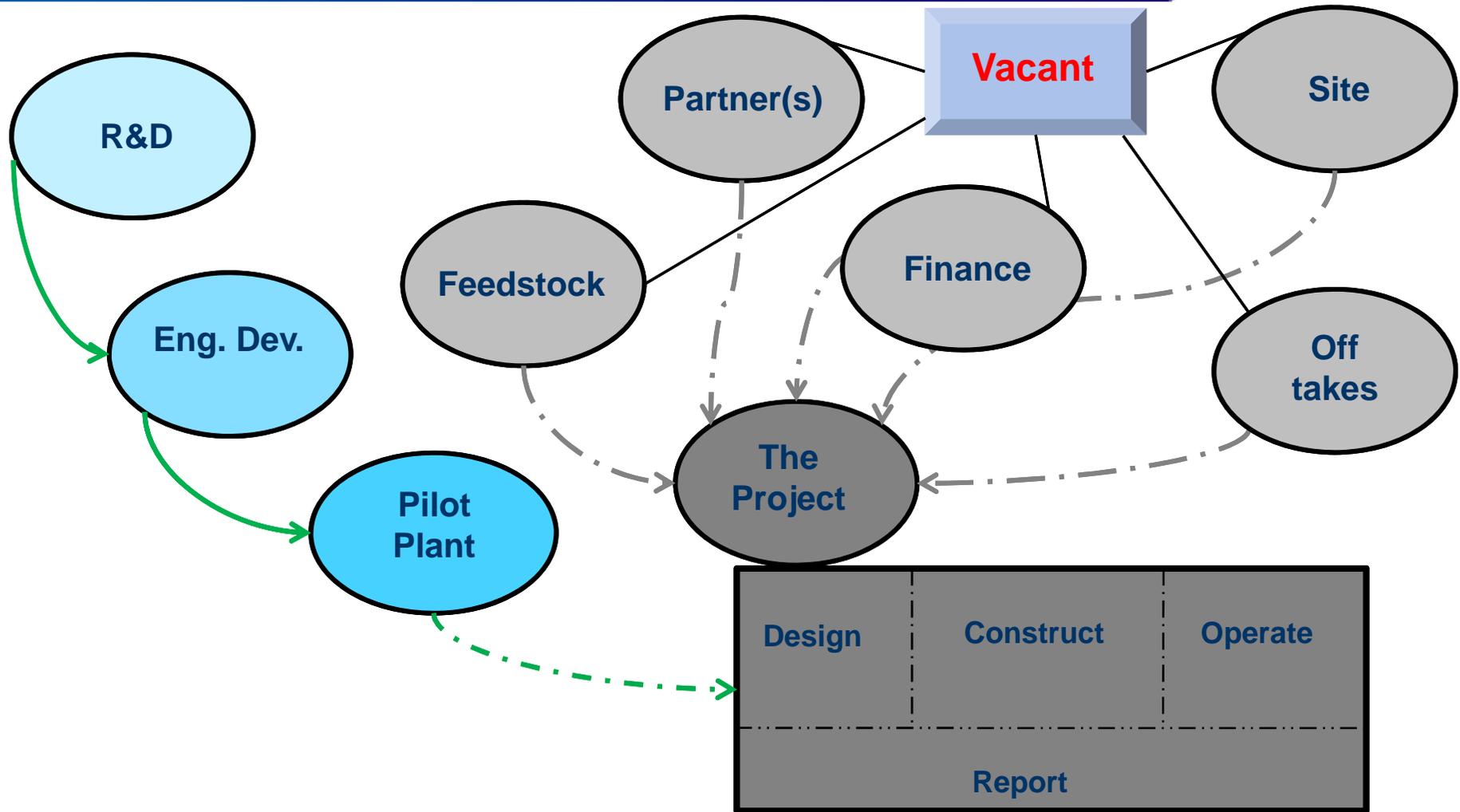
Lignol's Demonstration Plant Project - Post-award



- September 2008 - Completed pre-award negotiations
- October 2008 - Signed Cooperative Agreement with DOE - started Budget Period 1 of the project
- February 2009 - Advised DOE that Suncor withdrawing support for the project due to economic conditions
- March 2009 - In discussions with DOE about procedures for restructuring the project
- Potential changes to project:
 - Partners
 - Location
 - Feedstock
 - Capacity
 - Financing structure
- Requested guidance on additional financial assistance from DOE



Major Project Elements now vacant



The Present Reality for Lignol's Project Development



- Major players with strong balance sheets few and far between
- Suncor not our partner anymore
- Credit tight
- Capital constraints
- Lower energy prices - ethanol prices low
- Blending wall in US
- Projects stalling - demonstration and commercial



Lignol's Adapted Approach



- Single partner vs. consortium approach with strategic investors
- Multi-sector - chemical co's vs. energy players
- Brownfield sites - co-locate with pulp mills, ethanol plants
- Adapting our project to extend the useful life of demonstration plant
 - Expand capacity
 - Leverage other technology players to add value



Commercial Projects vs. Demonstration Projects



	Demonstration	First Commercial
Technology risk	High	Moderate (first plant)
IRR	-5 to 0%	10 to 20%
Capital cost	\$50 -100m	\$150-300m
Available DOE grants	50% up to \$30m	40% up \$80m
Private equity required	\$25 -50m	\$90-220m
Debt	zero	Very limited

- “...it has to be losing money to be a demonstration project.”
- If it’s going to be difficult to finance commercial projects, how will demonstration projects be financed?
- Without demonstration projects, how will commercial projects ever be built?



What will it take for demonstration plants to be built?



- 2- 5 year project shelf life
- Brownfield projects - revitalizing stranded assets, co-locating
- DOE “dating service” to match and combine existing recipients into well-funded projects
- Capital contributions up to 85%
- Support for operating deficit (2-5 years)
- Producer credits for biofuels and co-products to ease operating burden
- Mechanism for mitigating feedstock pricing risk
- Cross-border funding between US and Canada



What will it take for commercial plants to be built?



- Successful demonstration plant projects
- Investors will be motivated by a combination of certainty and money
 - Grants and loan guarantees
- Long term policy framework
 - Certainty - clear legislative commitment
 - Low carbon fuel standards
 - Producer credits
 - GHG credits to producers (leverage and monetize)
 - Feedstock pricing risk mitigation
 - Increasing blending mandate - 5%, 10%, 15%, 25%, 85%
 - First to the post pricing protection



Thanks



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