



# Financing, Incentives, and Market Development

Wednesday January 30, 2019

# Introductions



# This Session Will Explore

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- The role of private and public financing and incentives sources
- The importance of creating sustainable markets for bioresource products
- Leveraging financial mechanisms to enable long-term project viability.
- Effective and efficient ways to recognize non-monetized benefits.
- The context of doing business in California

# The Panel

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- Laurie ten Hope, California Energy Commission
- Rohit Shukla, Larta Institute
- Ted Kniesche, Fulcrum Bioenergy
- Jeff Passmore, Scaling-Up & Passmore Group

# Overview



# Attracting private sector participation is critical for deployment of biotechnologies

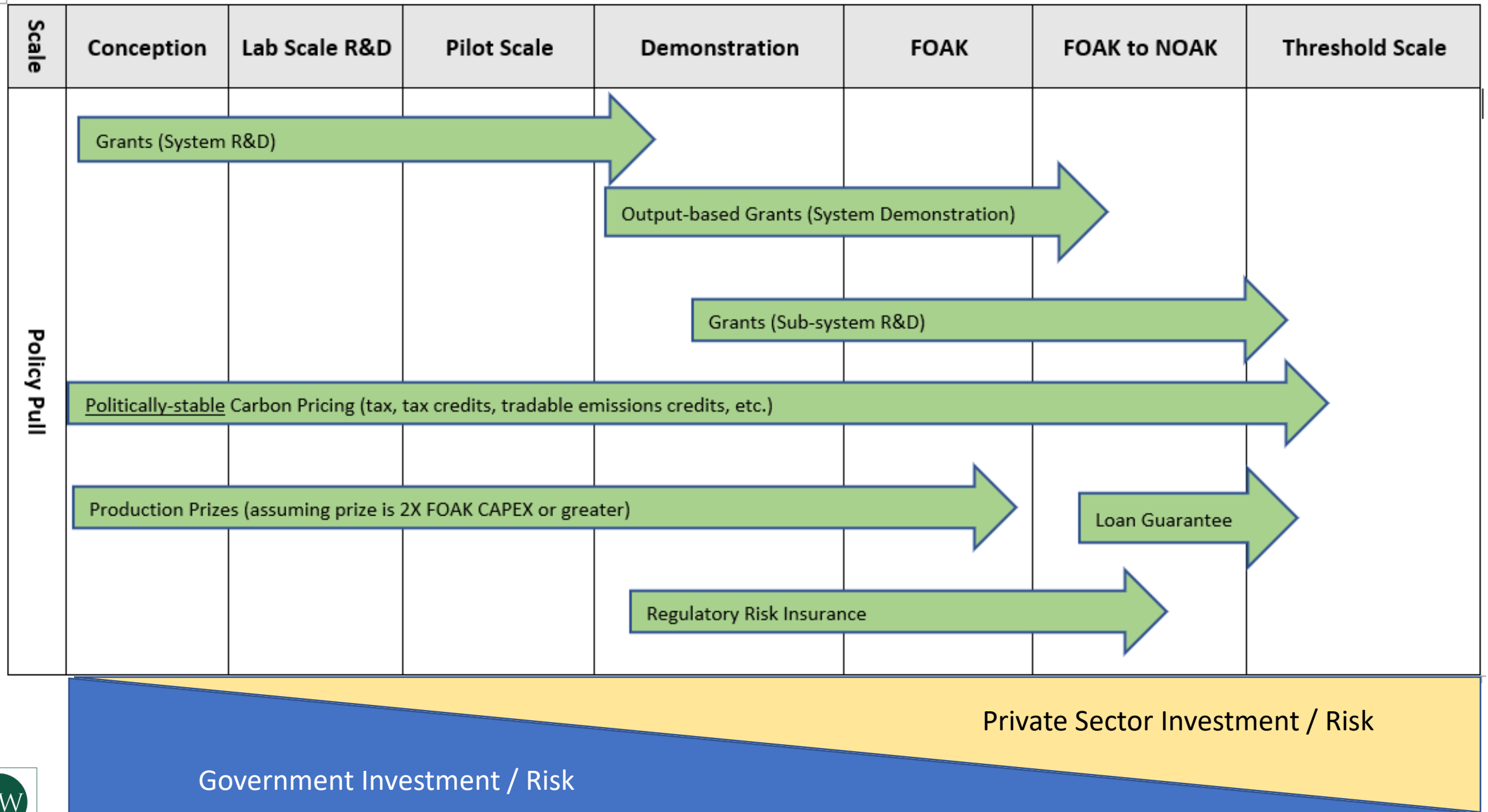
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- Private sector financial resources vastly outstrip government resources
- Private-sectors expertise is essential to matching technology innovations with durable market opportunities
- The government may be a helpful initial customer – but only for some products – and only if additional market demand is likely to exist elsewhere

# Policy tools work best in combinations

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- Combinations of policies are better than solo policies to attract and sustain interest from the appropriate investors for the technology stage
- Stable, long-term, technology-neutral market signals are the best (e.g. certain types of tax credits or low-volatility emission trading markets)
- Grants, tax credits, and carbon pricing markets – when correctly combined – become a far more powerful market signal than each is individually
- Policy should be thought of as part of an innovation ecosystem connecting and encouraging researchers, universities, entrepreneurs, incubators, established market participants, and investors of every stripe





# The Role of Government

Laurie Ten Hope, Deputy Director, California Energy Commission  
Energy Research and Development Division

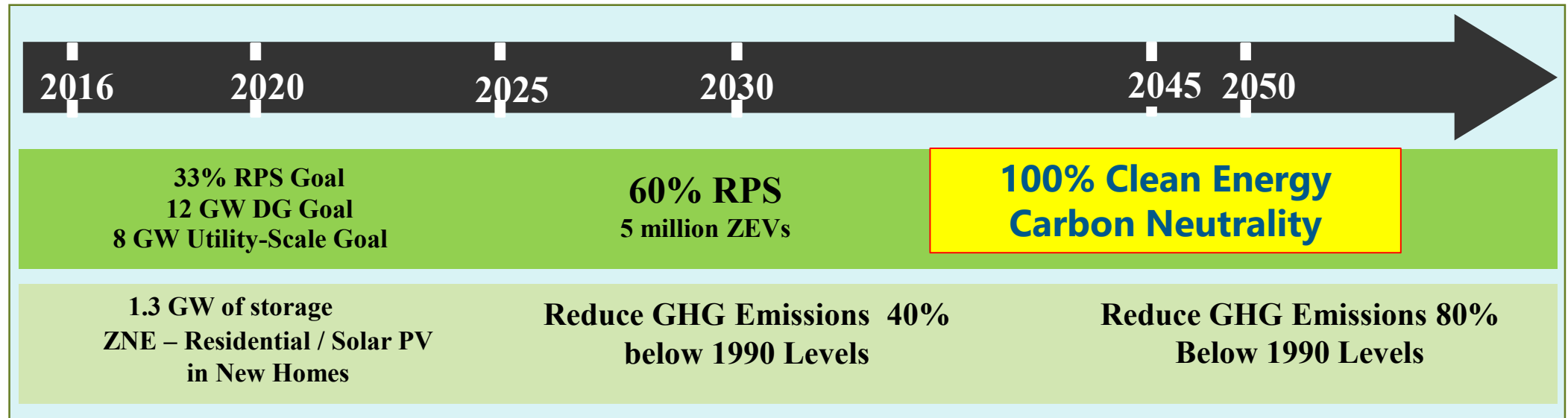




- CEC investments in new technologies
- How these fit with bio-economy technology developments
- How CEC policies build on & enhance pricing policies (e.g. LCFS)
- CEC success stories



# CA Policy Drives Innovation



## Bioresources Role in Meeting Policy Goals

- ❖ *Key is to improve bioenergy's value proposition to ensure a role in California's clean energy and carbon neutrality goals.*
- ❖ *Explore technological advancements to expand the current capacity.*
- ❖ *Can bioenergy operate flexibly to support intermittent resources?*

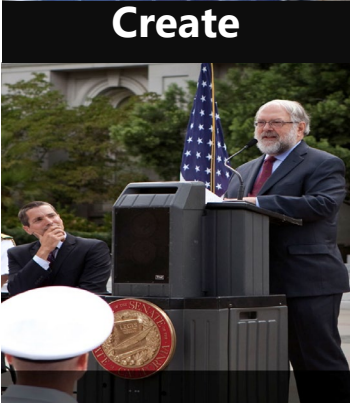




# CEC RD&D Investments Advance Innovation



Create



Inspire

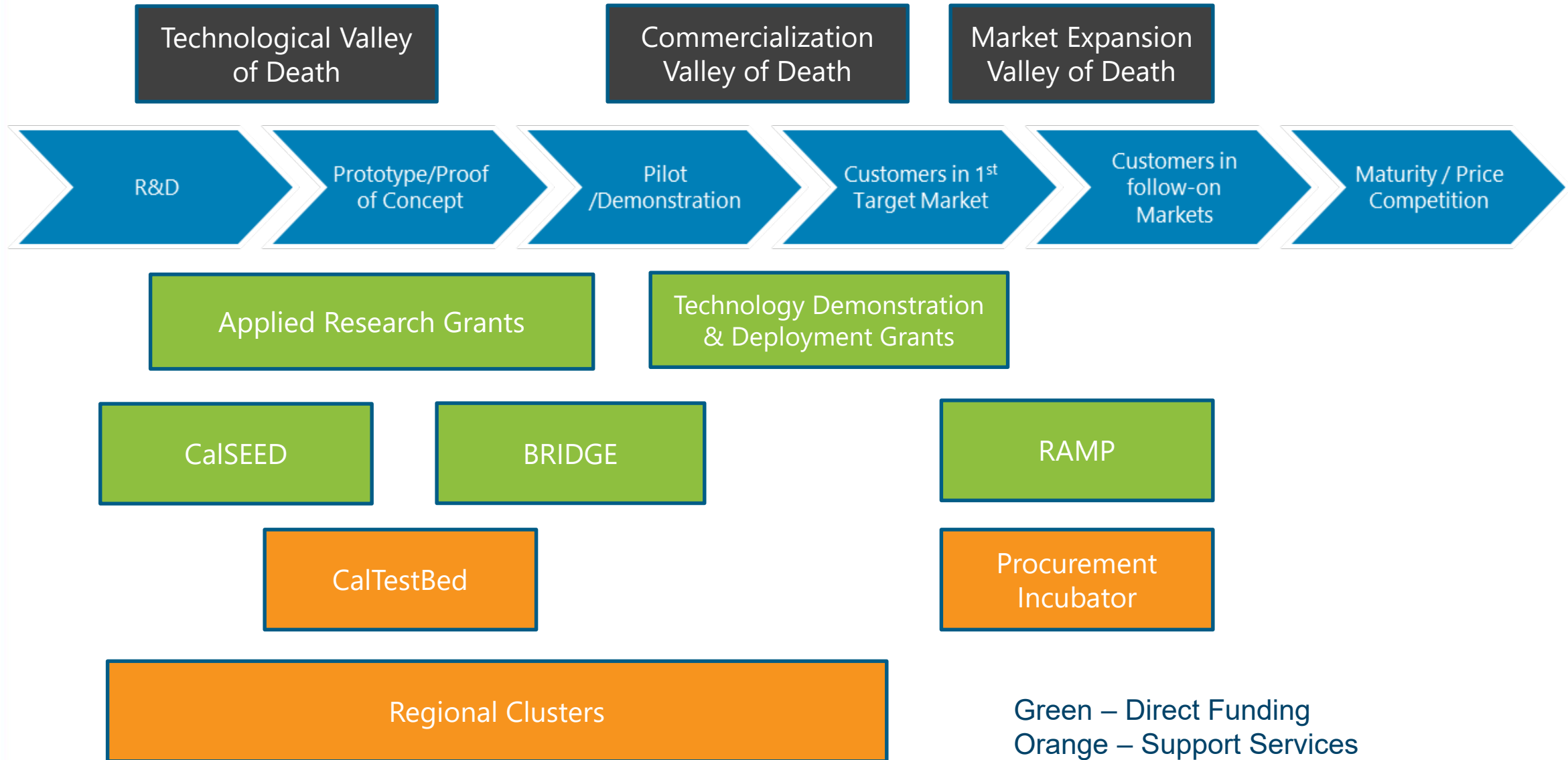


Collaborate

- ❖ **Electric Program Investment Charge** - Invests in technology development in each stage of the innovation pipeline, from feasibility to full scale demonstrations to commercialization.
- ❖ **Natural Gas Research, Development and Demonstration Program** - Funds R&D to conserve and reduce use of fossil-derived natural gas.
- ❖ **Food Production Investment Program** - Supports accelerated adoption of advanced energy efficiency and renewable energy technologies that will reduce GHG emissions at California food processing plants.
- ❖ **Low Carbon Fuels R&D Program** - One-time expenditure authority to advance low carbon fuels for the transportation sector.



# EPIC Investment Portfolios





# EPIC Bioenergy Technology: Biochemical Conversion

## West Star North Dairy Biogas

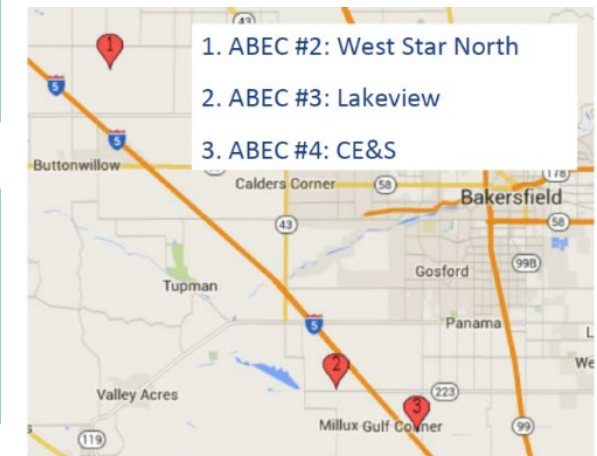
- Located in Buttonwillow, CA, it has an advanced double-cell, double-lined lagoon
- 1 MW renewable electricity with storage potential; Generation of ~7,000MWh/yr

## Lakeview Farms Dairy Biogas

- Located in a cluster of dairies outside of Bakersfield; designed as mini-hub for electricity generation and spoke for gas production
- 1 MW renewable electricity; generation of ~5,500 MWh/yr; Plan for R-CNG for transportation

## Carlos Echeverria & Sons Biogas

- Located in Kern County cluster; demonstrates use of waste heat from the engine to cool milk and advance economics
- 1 MW renewable electricity; generation of ~7,000 MWh/yr; R-CNG transportation fuel



## Kompogas Community-Scale Organic Waste-to-Energy Facility

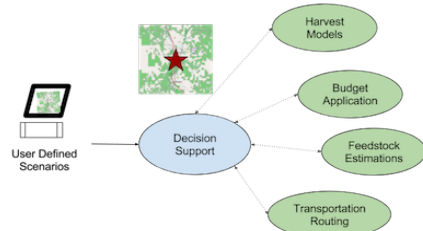
- A state-of-the-art high-solids anaerobic digestion system designed specifically to meet the organics diversion goals of San Luis Obispo County
- 600 kW renewable electricity from biogas; also produces liquid fertilizer and compost



# EPIC Bioenergy Technology: Thermochemical Conversion

## Decision Support for Siting Bioenergy

- Robust web-based facility siting application
- Quick economic feasibility and environmental performance of potential bioenergy facility



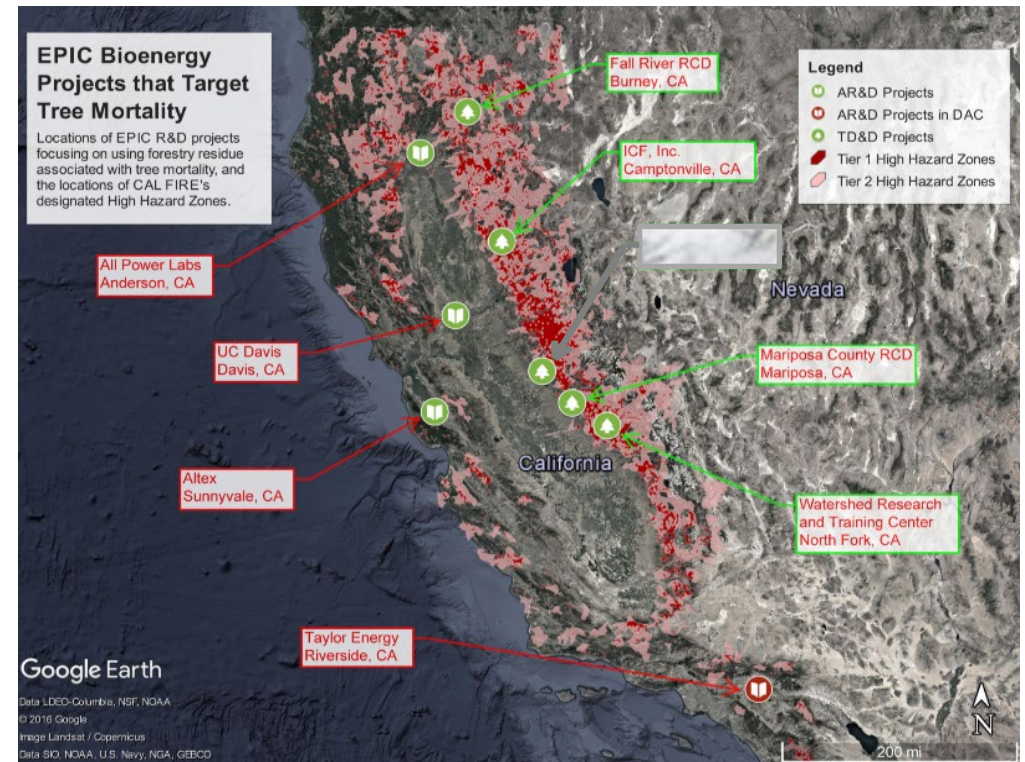
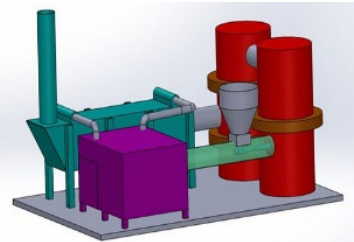
## Powertainer + Gasification Platform

- Multi-modal power and products to process forestry waste
- Scale-up of Powertainer to 210-250 kW with CHP module



## FORPOWER Technology

- Modular power system converts forest slash to power at viable cost
- Based on indirectly-fired gas turbine system using a novel heat exchanger and a gasifier



## Taylor Energy's Gasification

- Woody biomass gasification that uses input of pulse-combustion & pulse detonation to drive the process
- Intended for communities in 3 -12MW range





# Biogas Technologies in the NG Research

- **Advancing Clean Energy through Biogas, Biomethane, and Natural Gas**
  - Innovative technologies and strategies for converting biomass resources to biogas and for cleaning and upgrading biogas to renewable natural gas.



Skid-mounted subsystem to convert landfill gas to RG via a novel cleanup and upgrading technologies.



Las Gallinas Bioenergy Recovery System.



- **Renewable Natural Gas from Woody Biomass**
  - Developing cost-effective means for converting woody biomass to renewable natural gas via methanation of syngas from fluidized bed gasifier

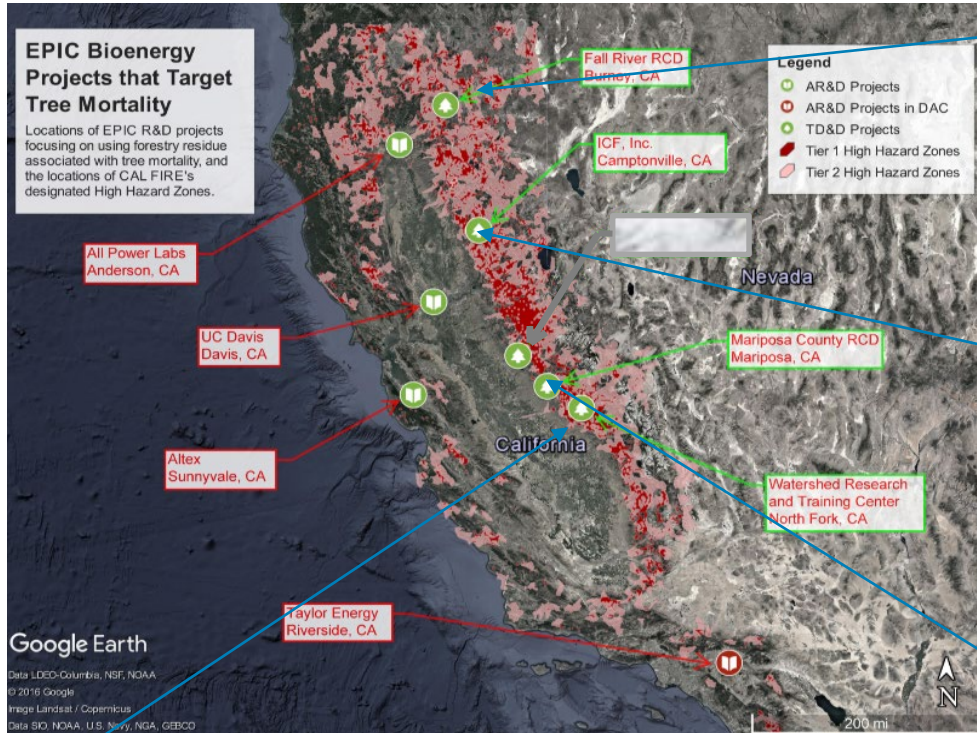


Photo of the fast internally circulating fluidized bed gasifier at the Woodland Biomass Research Center



# Bioenergy Demonstrations to Address Tree Mortality

## Thermochemical conversion solutions

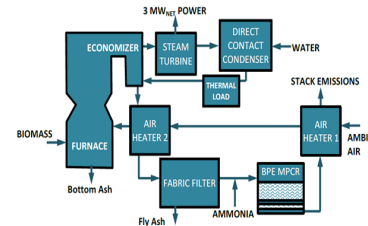


### Burney-Hat Creek Bioenergy Project



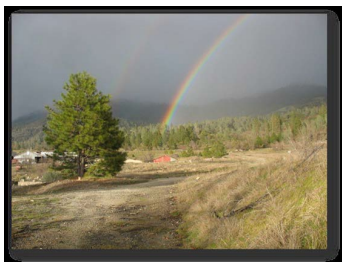
- Rotary gasification system based on rotary drum dryer design
- 2.88 MW system consuming 22,000 BDT per year of forest biomass
- Heat and biochar byproducts

### Camptonville Biomass-to-Energy Project



- Integrates advanced emissions controls & state-of-the-art low water condenser with boiler- steam turbine
- 3 MW system from ~ 30,000 BDT per year of forest biomass

### North Fork Community Bioenergy Project



- Adapts GE's integrated biomass gasification system and engine
- 1 MW (will expand to 2 MW) system using sustainably harvested forest biomass

### Mariposa Biomass Project



- Bioenergy facility using Cortus Energy's WoodRoll gasification technology
- Capacity of 2.2 MW forest management waste



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HIGHLIGHTING ENERGY INNOVATION  
**BY THE NUMBERS**

DOLLARS AWARDED  
**\$470 MILLION**

PROJECTS AWARDED  
**279**

MATCH FUNDING  
**\$223 MILLION**

**FEATURED PROJECTS**

**TRENDING**

**LIGHTING**

**DISADVANTAGED COMMUNITIES**

**MICROGRIDS**

**WASTEWATER TREATMENT**

**RENEWABLES FORECASTING**

**High-Fidelity Solar Power Forecasting Systems for Solar Plants**  
This project will focus on the development and validation of tools capable of monitoring ...  
READ MORE

**Demonstrating Energy Efficient Drying for Walnuts**  
This project will demonstrate a novel infrared technology for walnut drying at pilot and ...  
READ MORE

**Advance Wastewater Treatment Using Forward Osmosis**  
This project will demonstrate an advanced water treatment technology that uses ...  
READ MORE

**Bringing A New Generation of LED Lighting Solutions to Market**  
The purpose of this agreement is to design and develop innovative light-emitting diode ...  
READ MORE

**City of Fremont Fire Stations Microgrid Demonstration**  
The project will design and build low carbon-based microgrids at three fire stations ...  
READ MORE

**Very Low-cost MEMS-based Ultrasonic Anemometer for Indoor and HVAC Use**  
This project will develop low-cost, lowpower, accurate, calibration-free, and compact ...  
READ MORE

# Engagement Opportunities

EPIC Innovation Showcase:

<http://innovation.energy.ca.gov>

Social Media - blogs, tweets and video features of research projects:

<http://calenergycommission.blogspot.com/>

<https://www.youtube.com/user/CalEnergyCommission>

Opportunity E-mail List Serve:

<http://www.energy.ca.gov/contracts/epic.html>

# Out of the Lab & Into the Market

Rohit Shukla, Larta Institute



Ideas, energized.

# Market knowledge is necessary to turn lab/technology success into commercial success

- Researchers typically have limited exposure to markets and customers
- Successful commercialization starts with seeking stage-appropriate partners and objectives
- R&D & demonstration grants are helpful – but only if the technology can serve a sustained & specific market demand



## *Commercializing solutions that feed, fuel and heal the world*

- Larta founded 1993, under State of California mandate
  - “CalTIP” (PVEA funds)
    - Matching funds to California S&T companies with federal awards
    - Program sunset: 2002
- Since 2003: commercialization partner to several science-based agencies of the U.S. Government
  - DOE, NIH, USDA, NSF, NIST
  - Focus on commercialization of publicly-funded research- viz. assisting small, innovative companies around strategy, planning and action focused on:
    - “Reduction to use”: what, why, how
    - Channel and customer development: who, when
    - Derivatives from core: licensing, additional partnership development

# What We do



## **Strategic introductions**

potential customers, industry events and connections, and strategic partners



## **Commercialization Strategy Plans**

barriers to entry, competitive matrices, 18 month roadmaps



## **Market Acceleration Services**

roadshow presentations, regulatory path development, licensing path development, term sheet reviews, coaching on negotiations

## LARTA'S WORK IN CALIFORNIA

# 7,191

CA COMPANIES

ASSISTED SINCE 1993

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# 136

CA COMPANIES IN WATER,  
ENERGY/CLEANTECH AND AG  
ASSISTED SINCE 2004

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# \$1.8B+

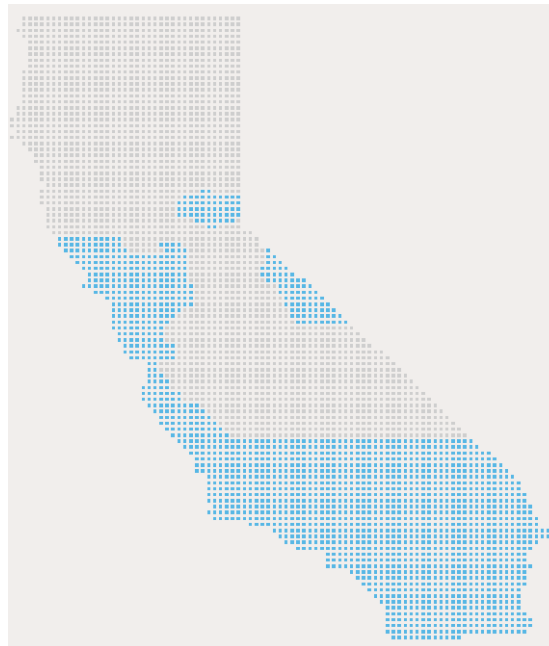
IN PUBLIC AND PRIVATE  
INVESTMENT RAISED BY LARTA  
CA COMPANIES SINCE 1993

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Ideas, energized.



# Larta Institute



## LARTA'S WORK NATIONALLY

# 9,574

COMPANIES IN HEALTHCARE, IT  
AND OTHER SECTORS ASSISTED  
SINCE 1993

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# 1,278

COMPANIES IN WATER, ENERGY/  
CLEANTECH AND AG ASSISTED  
SINCE 2004

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# \$6.7B+

IN PUBLIC AND PRIVATE  
INVESTMENT RAISED BY LARTA  
COMPANIES SINCE 1993

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# Larta's "Tales from the trenches":

## Case studies & Success stories



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## Location: Hayward, CA

- **Technology:** Kiverdi technology uses all natural microbes to transform CO2 and other gases into high-valued oils, nutrients and bio-based products. Its materials can be used in a wide range of sustainably sourced products and industrial applications.
- **Larta's Role:** (Programs: Ag Innovation Showcase)
  - Coaching and mentoring for presentation of value proposition at Ag Showcase in 2016
  - Facilitated strategic introductions
- **Accomplishments:**
  - CEO Lisa Dyson featured prominently in GreenBiz
  - CEO named as 100 Most Creative People in Business 2017
  - Company joins with CO2 Solutions and the VCQ Project to turn CO2 into valuable bio-based products



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**Location:** Berkeley, CA

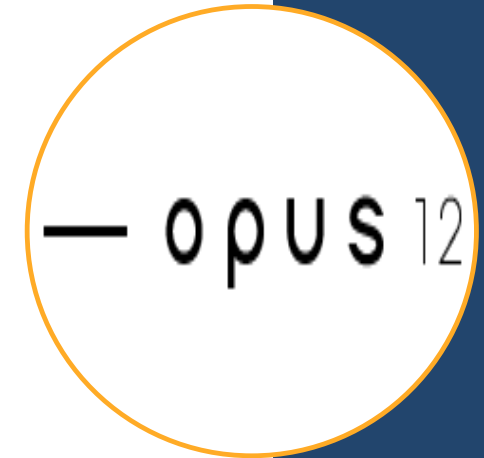
**Technology:** Utilization of waste CO<sub>2</sub> to make renewable chemicals and fuels; electrochemical conversion of CO<sub>2</sub> to CO for use as a fermentation feedstock

**Larta's Role:** (Programs: NSF CAP, DOE CAP)

- Guided development of commercialization plan and strategy
- Strategic Introductions

**Accomplishments:**

- Participating in Techstars Energy Accelerator in partnership with Equinor
- Highlighted as a “progress maker” in the NY Times
- Successfully demonstrated power-to-gas technology with SoCalGas
- Won DOE Phase II award, won NSF Phase II award



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**Location:** Emeryville, CA

**Larta's Role:** (Programs: USDA CAP, DOE CAP)

- Guided development of commercialization plans
- Helped develop go-to-market strategy
- Assisted in developing strategic partnership with joint development partner
- Facilitated introductions and connections with potential customers.

**Accomplishments:**

- Completed Larta's USDA-CAP for 1<sup>st</sup> project (Upgrading Animal Manure Biogas to High-Value Chemicals Using Biological Fermentation) and
- Beginning work for DOE-CAP project (High-Efficiency Conversion of Biomass into Chemicals using Fermentation and Electro-reduction)



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**Location:** San Luis Obispo

**Technology/Solution:**

Design and construction of algae ponds for wastewater reclamation, biofuel production, microalgae feeds and specialty products

**Larta's Role:** (Program: DOE CAP)

- Assisted with commercialization plans
- Provided primary market research
- Developed and provided market sizing

**Accomplishments:**

- Completed DOE-CAP services work for 1<sup>st</sup> project (Algal Bio-flocculation for Solid-Liquid Separation) and
- Beginning work with 2<sup>nd</sup> project (Domestication of the microalga *Scenedesmus obliquus* for biomass feedstock production).



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**Location:** Menlo Park

**Technology:** A new biological gas-to-liquids™ (BioGTL™) and biological gas-to-chemicals (BioGTC™) technology using natural gas.

**Larta's Role:** NSF-CAP1: Commercialization Plan/Strategy

**Accomplishments:**

- The Company's Feedkind® protein was approved as an ingredient in organic systems for animal feed
- Establishing first commercial scale Feedkind protein manufacturing plant in Memphis, TN with NouriTech, the world's largest gas fermentation operation focused on safe, sustainable nutritional ingredients for fish, livestock and pets.
- Raised over \$88M in funding over 5 rounds, most recently a \$40M round in 2017



# Financing The Scale-Up

Ted Kniesche, Fulcrum BioEnergy

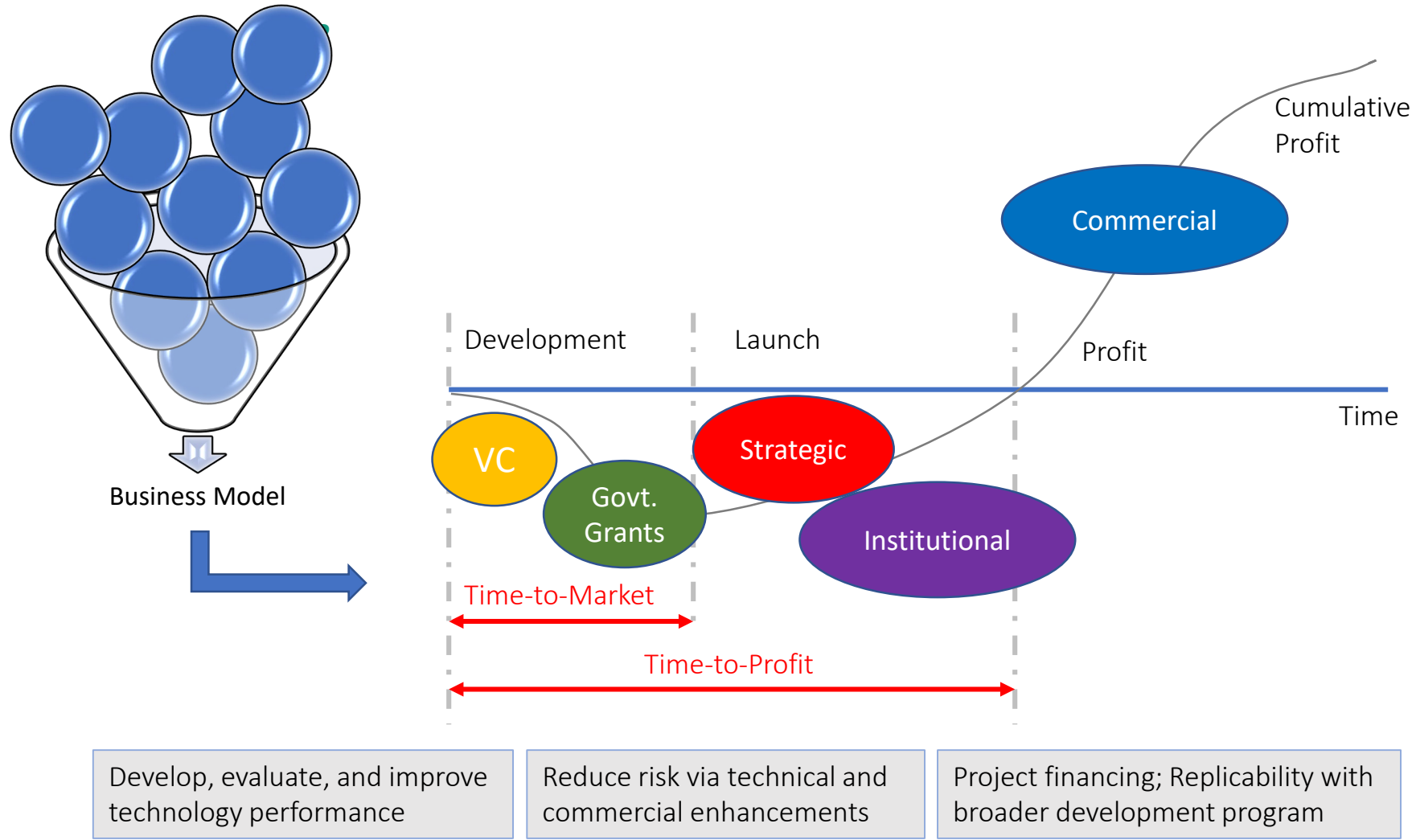


# Key Requirements for Successful Financings

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- Durable Business Model
- Technology Selection
- Focus on Company's Value-Add
- Strong Project Partners
- Compatibility with Long-Term Regulatory Trends
- Project Finance Discipline

# Financing the Scale-up of New Technologies





# Fulcrum: Solving Two Global Challenges

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**Airlines Must Reduce Carbon Emissions**

**Disposal of Waste is a Global Problem**



# Fulcrum's Strategic Partner/Investor Model



**ABENGOA**



**UNITED**



**Marubeni**

**CATHAY PACIFIC**



**JAPAN AIRLINES**



**Over \$200 Million of Equity Financing From Strong Strategic Investor Groups**

# Sierra BioFuels Plant





# Second Commercial Plant Underway

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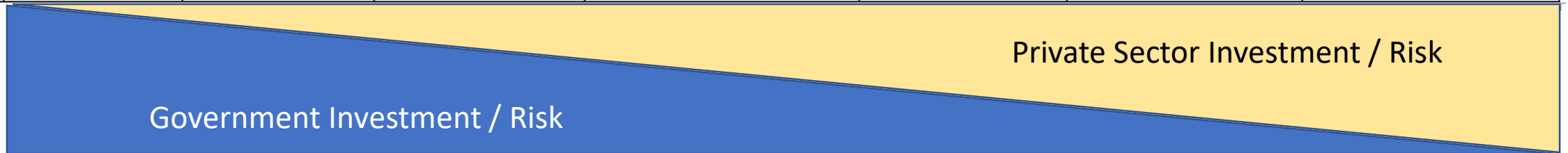
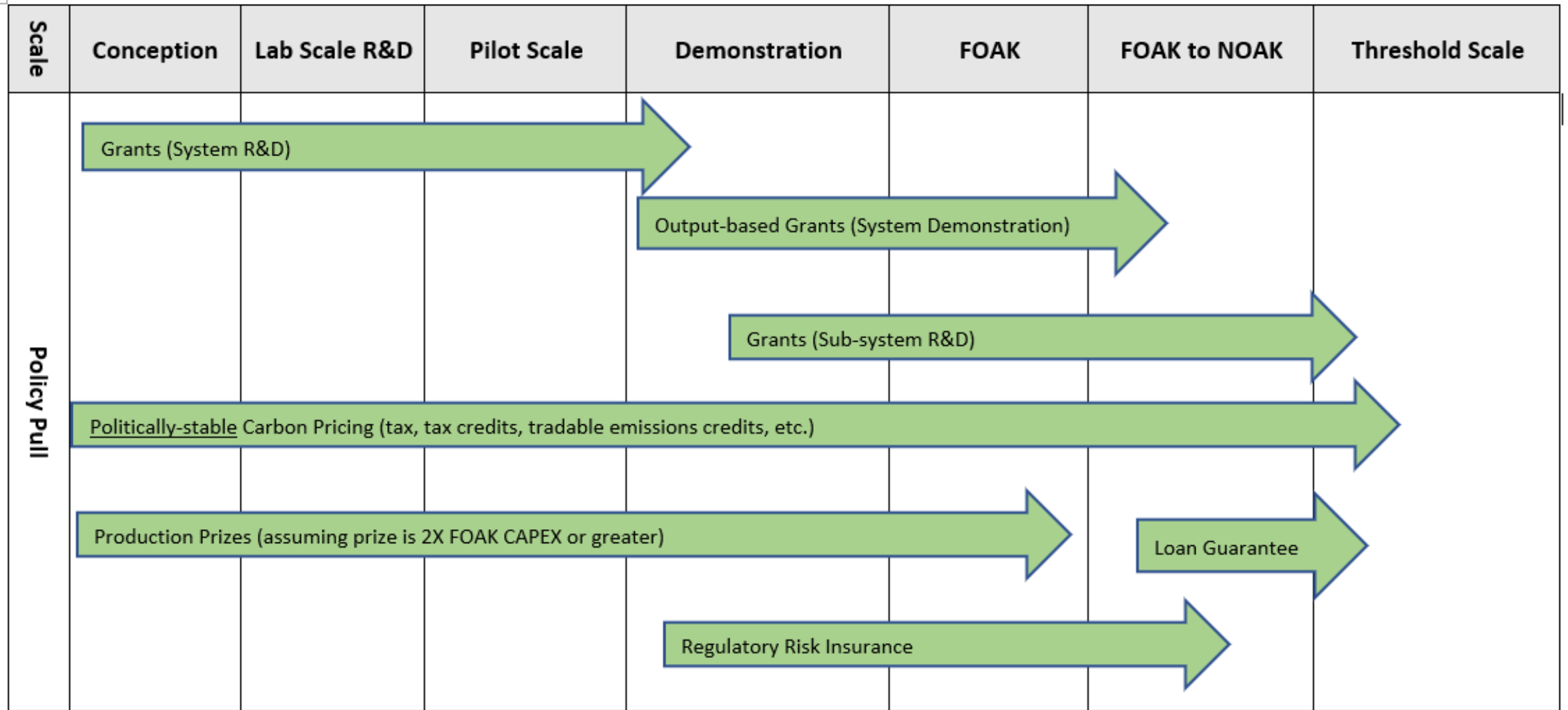
- Chicago Project Location Announced December 2018
  - 3X Capacity of Sierra; 550K Tons of Prepared Feedstock
  - More Than 30 Million Gallons of Fuel per Year
  - Announcement Supported by Indiana Governor, Gary Mayor and Indiana Finance Authority Chair
  - Engineering and Development Activities Underway
- Additional Development Projects Underway in Other North American and International Regions



# Growing to Commercial Scale

Jeff Passmore, Passmore Group Inc. / Scaling Up





# It starts and ends with capital which demands proper management of risk

## Where you need to be for commercial financial close...

- ✓ Project debt and equity in place including construction and interests costs
- ✓ Working capital in place (to pay operating costs)
- ✓ Reserve fund in place (debt service, maintenance, soft costs)
- ✓ Feedstock agreements in place – price and volume
- ✓ Contracts with experienced EPC contractor (including price guarantee) in place
- ✓ Completion guarantee by the project sponsor (with price penalties)
- ✓ Performance guarantee by the project sponsor (with insurance)
- ✓ A line of sight on project cash flows
- ✓ **A demonstrable market** / offtake in place
- ✓ More...More...More (*investors will assume worst case financial outcome and act accordingly*)

# Options for improving revenue, reducing capex, and allocating project risk:

## Co-develop

- build **strategic partnerships** to spread risk (feedstock supplier, off-taker)

## Co-locate with existing infrastructure (“brown field”)

- 1<sup>st</sup> and 2<sup>nd</sup> generation technologies
- bio-based with hydrocarbon based
- build smaller, less capital intensive ‘bolt on’ facilities

## Co-produce fuels and chemicals

- extract the highest value products first (to generate cash flow)
- if possible, start with high margin chemicals, and evolve to low margin fuels



# Let's talk about the Strategics

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Despite policies and programs such as:

- renewable fuel mandates
- RED targets
- LCFS, and/or
- the availability of loans, grants, and loan guarantees

technologies that lack a major strategic investor to provide the bulk of the commercial financing have been challenged

Strategics that have become involved in bio-refinery commercialization are often not looking for government grants or loans. They **want stable policy**. Indeed:

- if it needs government money, it probably is not a good investment
- if it is a good investment, why not finance directly from our balance sheet?

# Still speaking about Strategics

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Yes, large strategic investors have:

- considerable financial and human resources
- more patient money than venture funds

**But – strategics are not interested in one-offs. They will ask:**

- How big an **IRR haircut** will we need to take on that first plant?
- Will this offer a **simple payback** of 5 – 6 years?
- Is this project gov't driven, and if so, do we have **stable policy**?
- Will this investment make a **material difference** to our core business?
- If this project is a **good investment**, why involve gov't financially?
- Do we, the private sector, have to assume **stranded asset risk**?

# And Government? It must recognize that: Certainty is the mother of investment

Assuming bio-economy commercialization is a policy goal (jobs, economic diversification, GHG emissions reductions), governments need to employ economic instruments that:

- offer **long term policy stability / certainty**
- let **markets decide** how best to deliver that policy
- properly **share and allocate commercialization risk** (gov't assumes change-of-law / stranded asset risk)
- **drive innovation and substitution (a material carbon tax)**



# Scaling Up 2019

Delivering a Bio-Circular Economy

November 4 – 6, 2019, Fairmont Château Laurier, Ottawa, Canada

## WELCOME

We are excited to announce that **Scaling Up 2019** will be held from November 4 to 6, 2019 in downtown Ottawa at the beautiful Chateau Laurier Hotel. More news to come including another superb lineup of speakers. Stay tuned and save the dates.

For information on Scaling Up 2018 bio-economy conference, visit [past conferences](#).

# Questions & Discussion