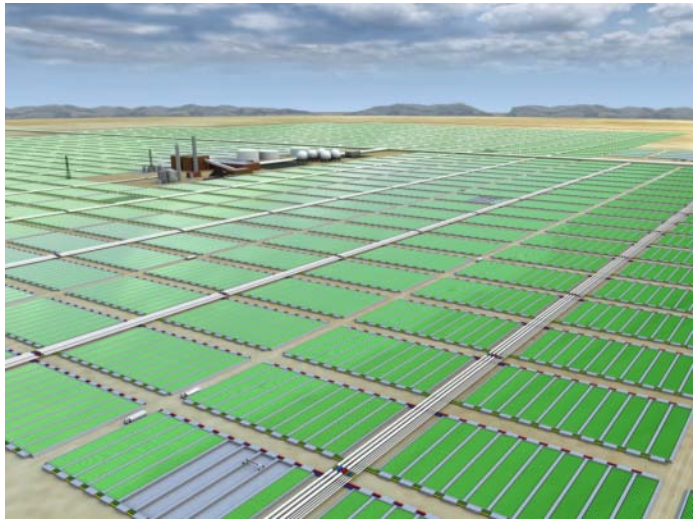
Industry / University Partnerships: Colorado's Unique Model

Dr. Bryan Willson

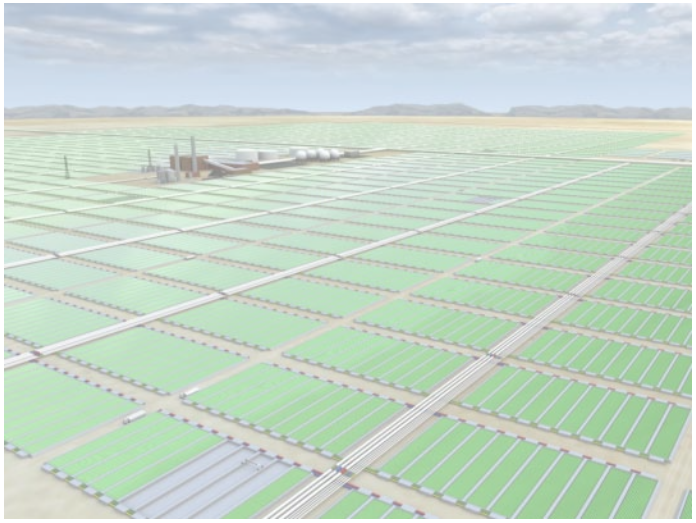
- **Colorado State University**
- **CSU Clean Energy Supercluster**
- **Solix Biofuels, Inc.**
- **Envirofit International, Inc.**



Key Points

- Today's energy challenges are complex and interdisciplinary
- Universities are well-positioned to develop creative solutions
- Corporations have the ability to implement solutions
- Differing cultures in academia and industry can make meaningful partnership challenging
- Colorado has a unique culture of collaborative entepreneurship
- Illustrated with 3 examples

Case Study #1
Envirofit International
A non-profit, global corporation



LOCATION: Fort Collins, Colorado

COLORADO STATE UNIVERSITY
ENGINES & ENERGY CONVERSION LAB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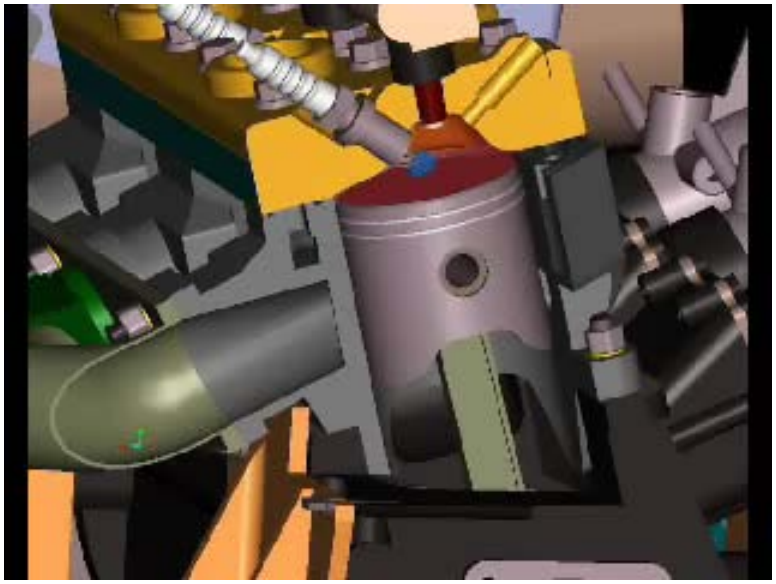
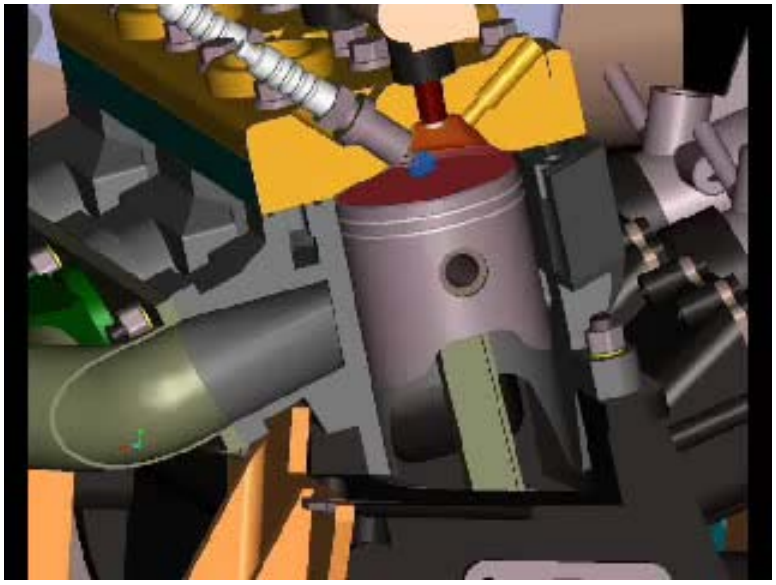


Carbureted 2-Stroke



Direct Injection 2-Stroke

Direct Injection Retrofit Kit

Before Conversion

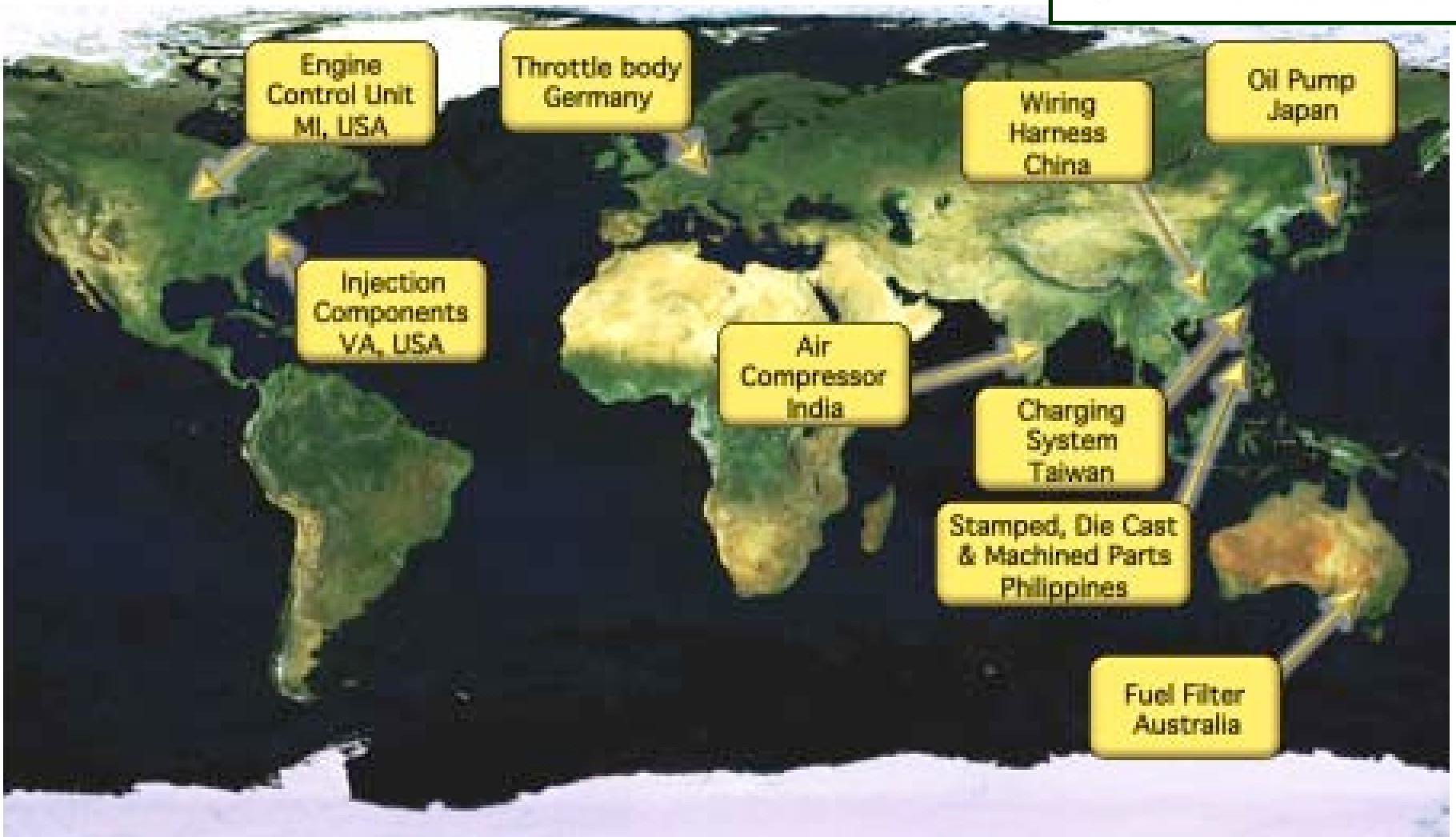
After Conversion

Supply Chain

Yamaha RS100 T Retrofit Kit - Installed

Items Shown:
- Fuel Injector
- Air Injector
- Cylinder Head
- Fuel Pump
- Oil Pump

Items Not Shown:
- Air Compressor
- Engine Control Unit
- Charging System
- Wiring Harness



ENVIROFIT

Tim Bauer

UNITED STATES
2008 Laureate

Retrofitting for the environment

Reduce pollution from motorized tricycles in Asian cities

GALLERY

OVERVIEW
THE PROJECT

Here-and-now solution

In Asia, the ubiquitous motorised tricycle with its two-stroke engine is a major cause of air pollution. Working in the Philippines, American mechanical engineer Tim Bauer and his team have developed a kit to reconfigure these machines, drastically reducing their noxious emissions.

> “At the end of the day, we can improve their lives with a cylinder head, a few brackets, and, of course, hard work. This is our best reward.”

PROJECT LOCATION

The Philippines

Browse all Laureates

Clean Cookstove Program

CURRENT PRODUCT LINE

B-1100

S-2100

S-4100

S-4150

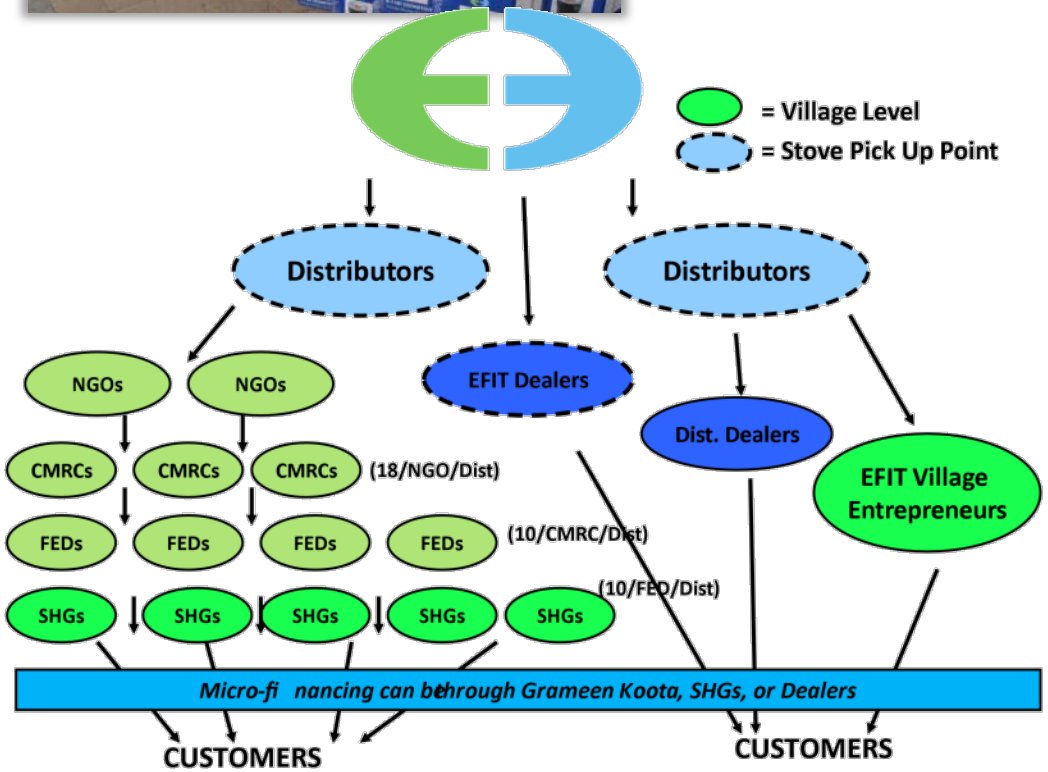
Gen III – Design for Reduced Cost

Importance of Aesthetics


ENVIROFIT
B-1100 COOKSTOVE
Energy-Saving Choolha
www.envirofitcookstoves.org

Manufacturing

Distribution & Sales




THE TECH MUSEUM AWARDS 2005


The Rolex Awards for Enterprise
WINNER 2008
Visit the official website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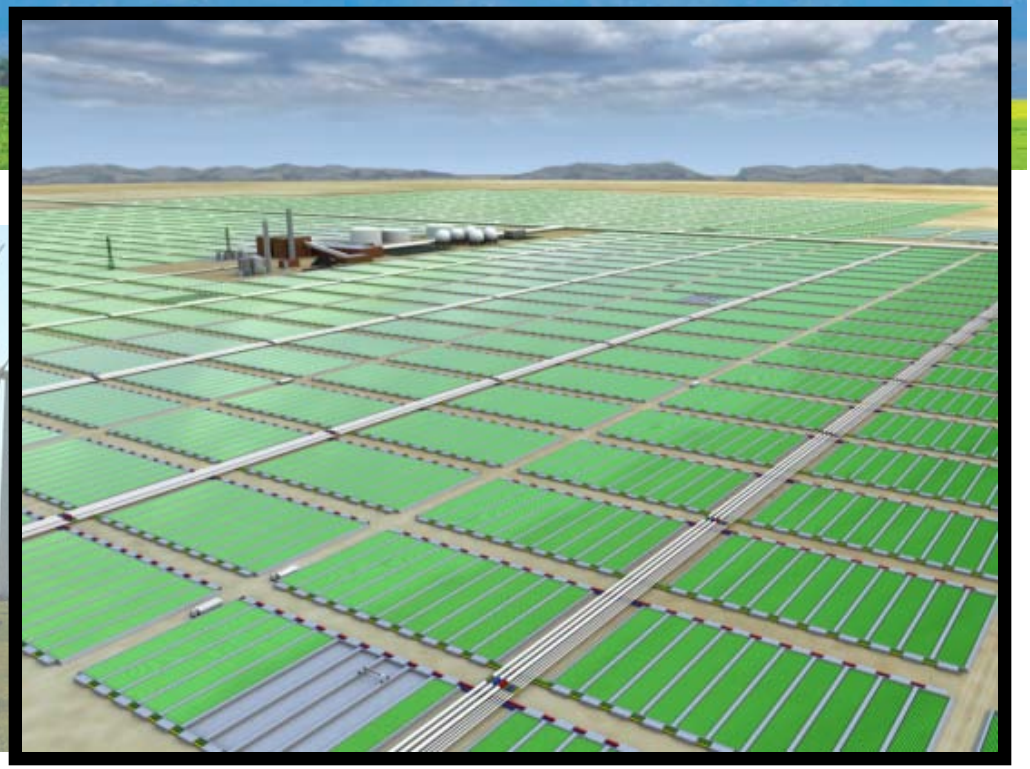
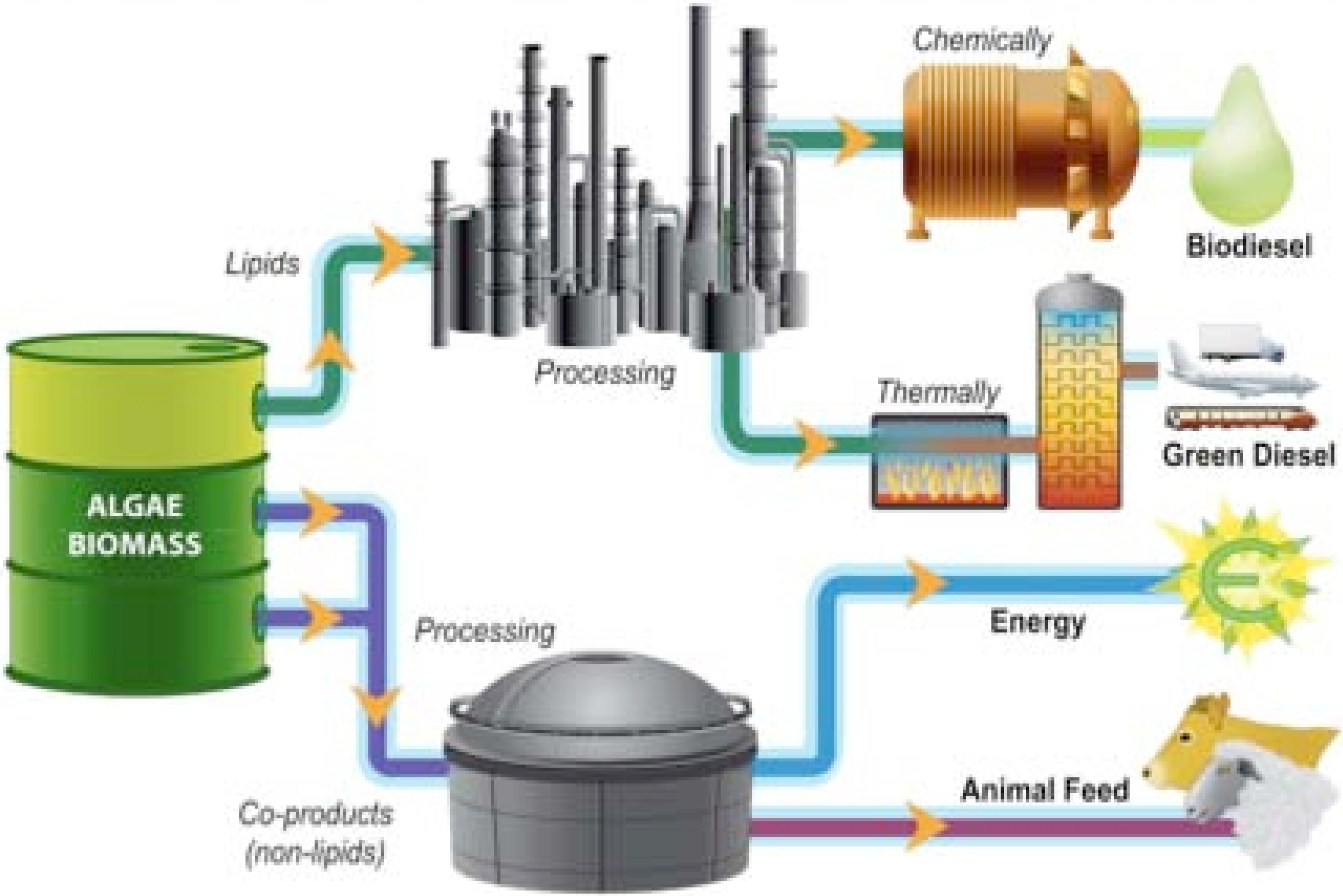
Case Study #2
Solix Biofuels
Fast-growing for-profit startup



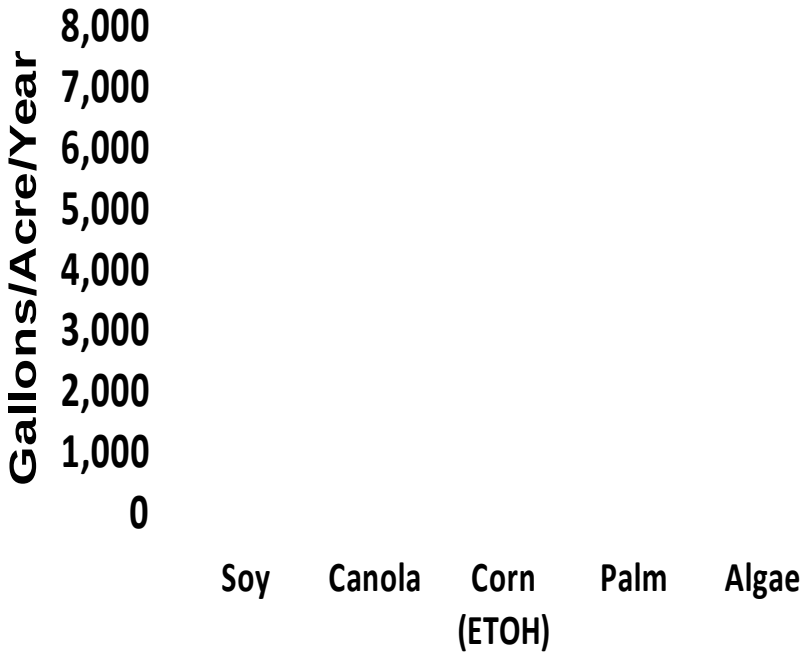
Processing


Chemically
Biodiesel
Lipids
Processing
Thermally
Green Diesel
ALGAE
BIOMASS
Processing
Energy
Animal Feed
Co-products
(non-lipids)

Land & Water Efficiency

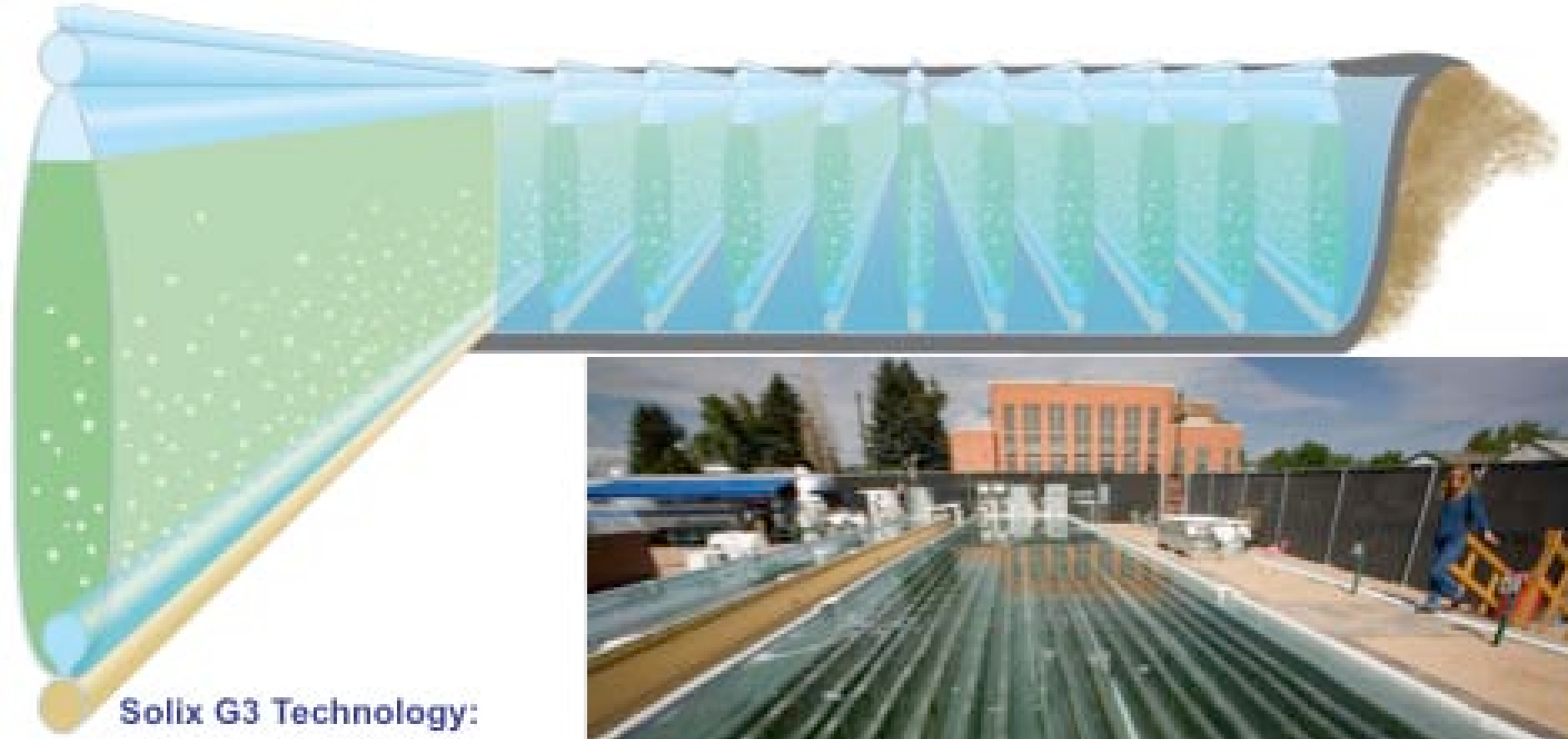
Annual Production

Soybean:	40 to 50 gallons/acre
Rapeseed:	100-150
Mustard:	150
Jatropha:	150-200
Palm oil:	650
Algae est.:	5,000-15,000



Water: Algae culturing typically uses 98% less water than *irrigated* fuel crops (corn, soy, etc.)

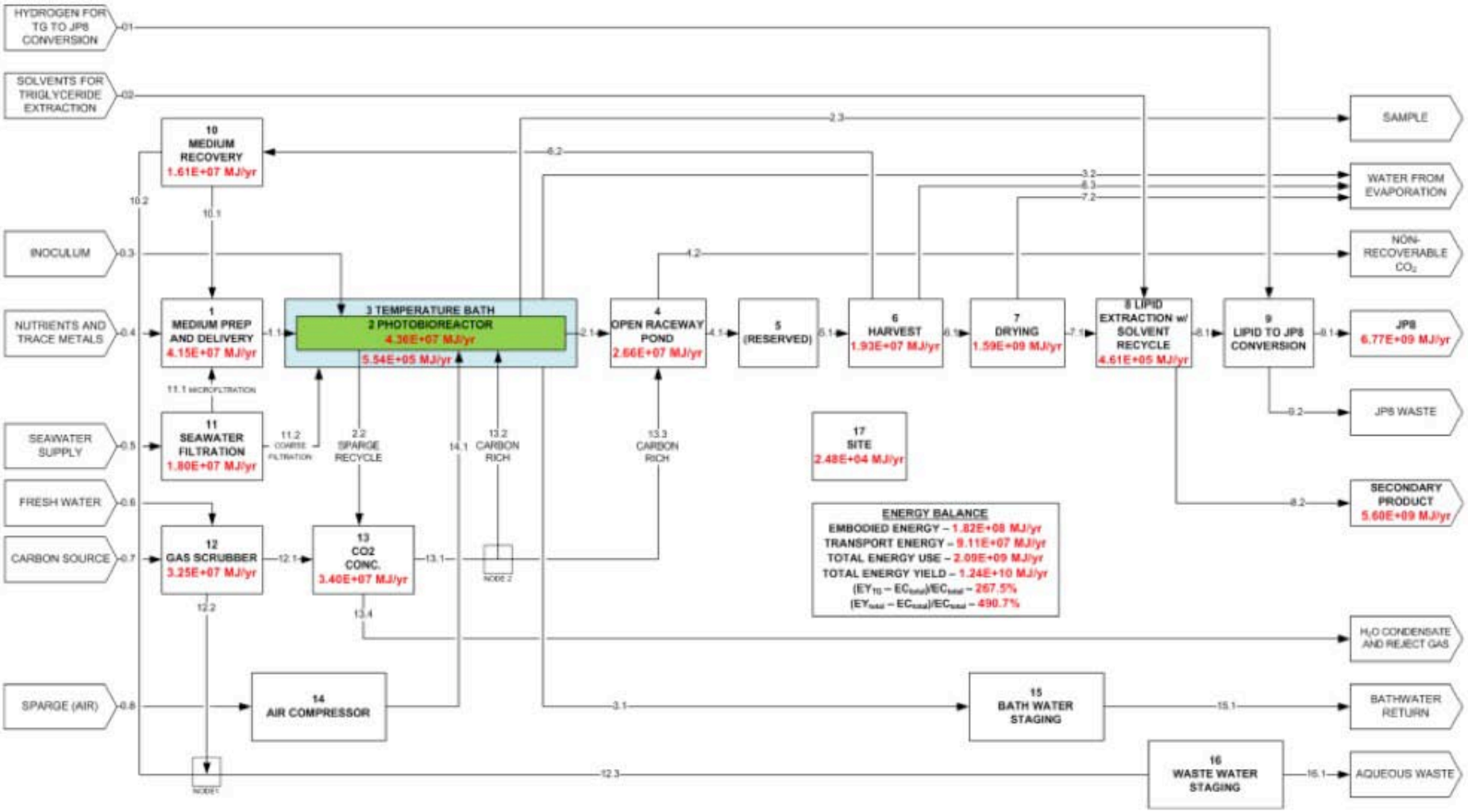
Photo-bioreactor (G3)



Solix G3 Technology:

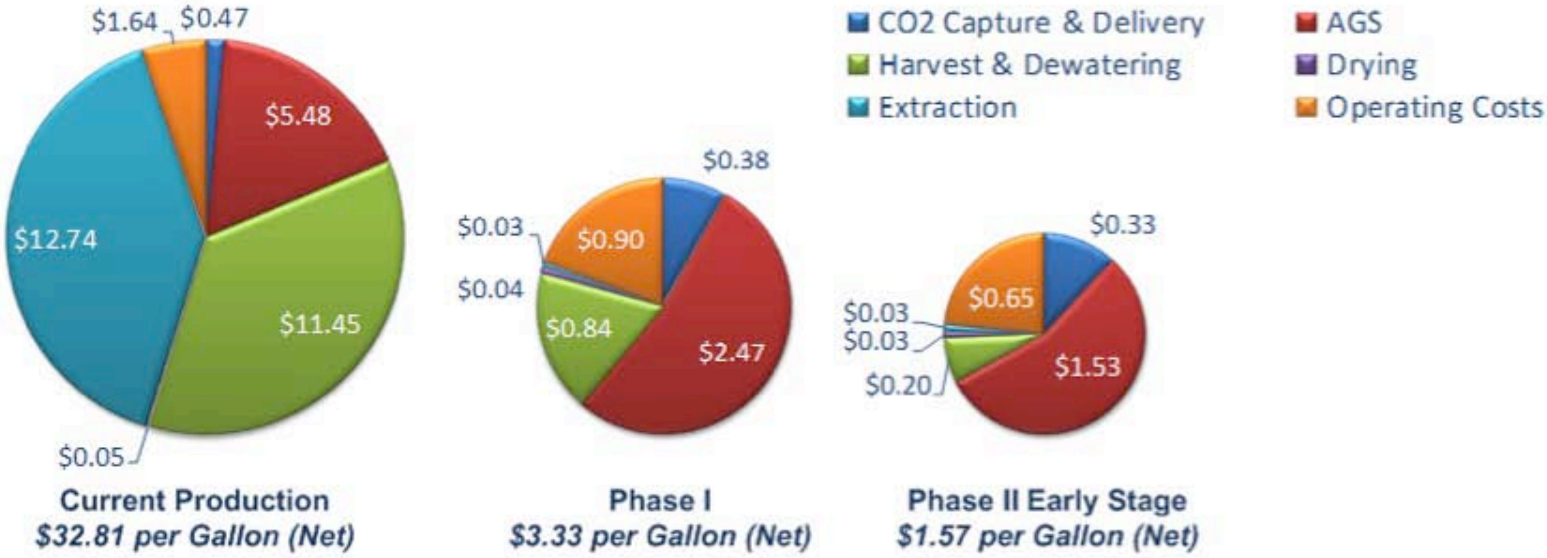
- Extended surface area
- Water supported
- Integrated CO_2 / air sparging
- G4 – membrane exchange in development

System Analysis / Modeling



COST OF TAG PRODUCTION

(Production @ $0.06/kW-Hr)



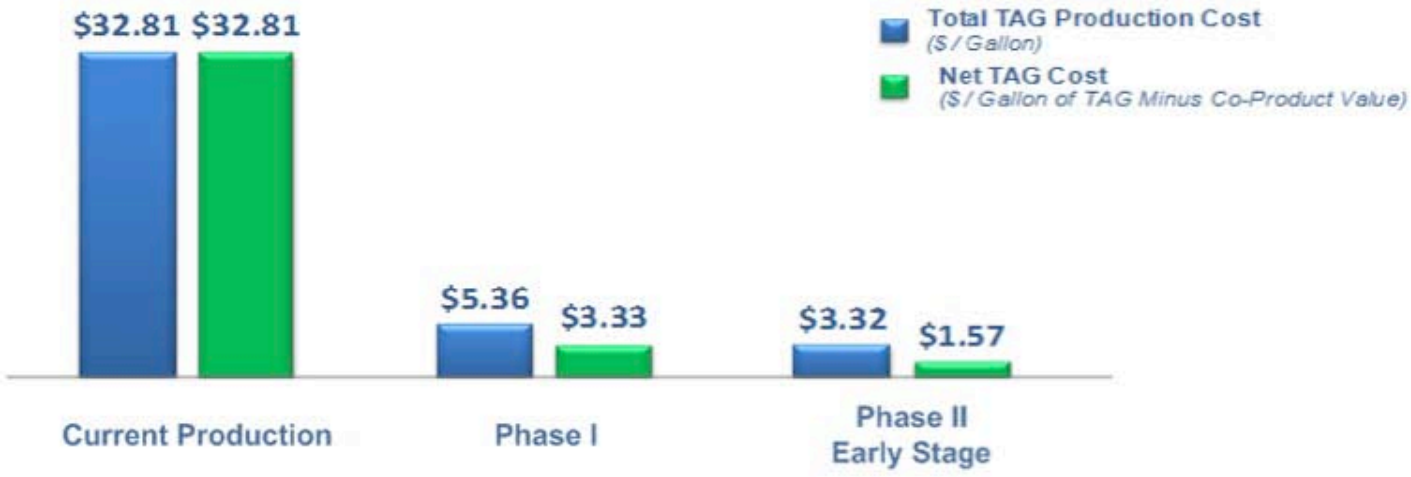
Current Production
$32.81 per Gallon (Net)

Phase I
$3.33 per Gallon (Net)

Phase II Early Stage
$1.57 per Gallon (Net)

Co-Product Impact On TAG Cost

($ per Gallon)



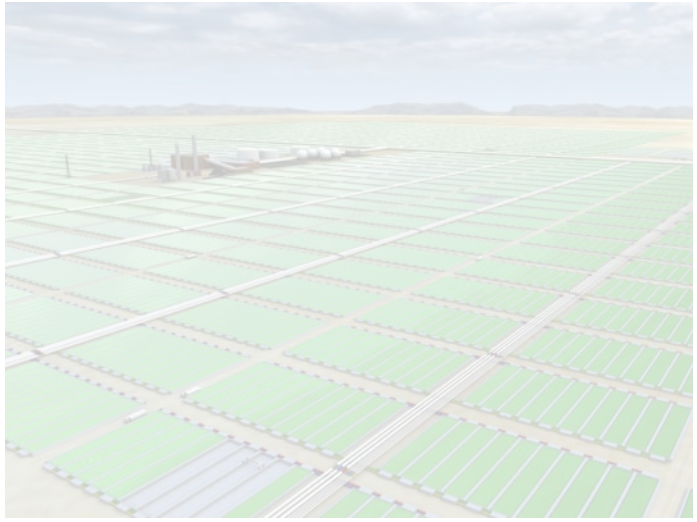
Coyote Gulch

SOLIX

Scale-up in the Desert

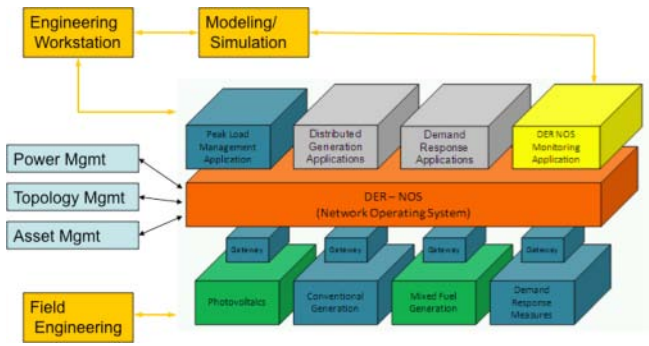
New Site:
Southwest Colorado, Coyote Gulch

Case Study #3
FortZED Smart Grid
Model of regional cooperation



Smart Grids: Fort ZED Fort Collins Zero Energy

- Major DOE R&D program
- Based on region's global expertise in "smart" electric grids & renewables integration
- Uses City, university, & businesses as a test platform
- Unique model of partnership
- Key to meeting City & University climate goals



FortZED Partners

Governor's Energy Office

City of Fort Collins

Spirae

Colorado State University

CATERPILLAR®

InteGrid
Test and Development Laboratory

UniverCity Connections
CSU, Downtown & the Poudre

Colorado State University

CENERGY

Colorado State University's

Clean Energy Supercluster

Dr. Bryan Willson

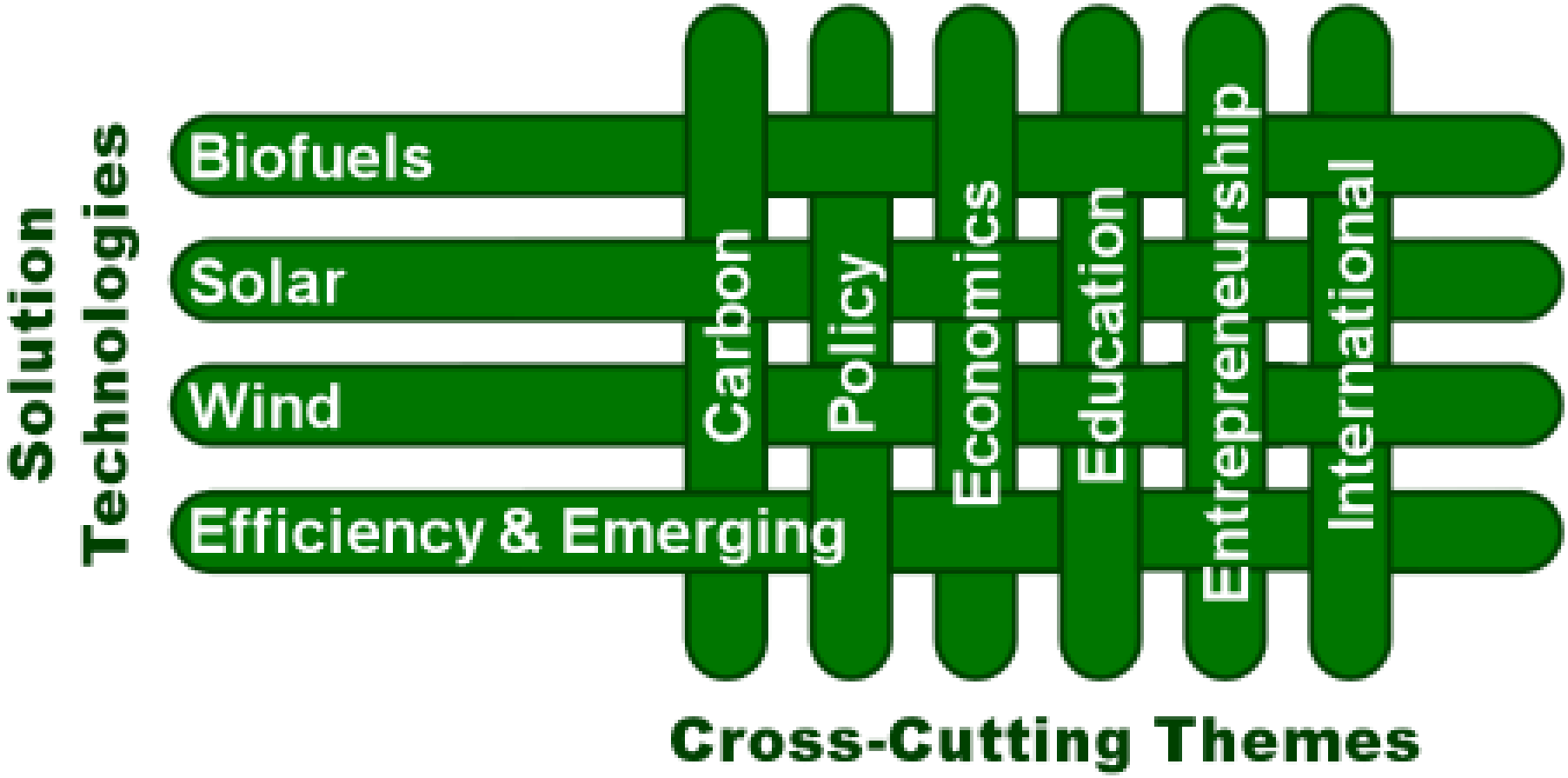
Director, CSU Clean Energy Supercluster

Chief Scientific Officer, CENERGY

Professor, Mechanical Engineering

Director, Engines & Energy Conversion Laboratory

Clean Energy Supercluster



100 Faculty members from all 8 Colleges at CSU

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