



The Critical Role of Innovators in Achieving Energy Market Transformation

Maurice Kaya, Project Director
Hawaii Renewable Energy Development Venture, a Project of PICHTR
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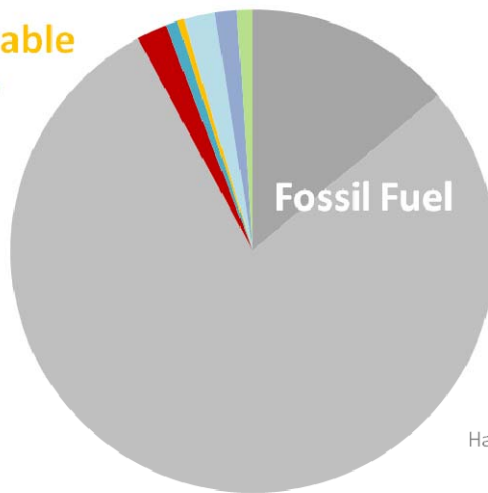
New technologies will be needed for Hawaii to reduce its dependence on oil



Electricity

■ Coal ■ Oil ■ Geothermal ■ Hydro ■ Solar ■ Wind ■ Municipal Solid Waste ■ Biomass

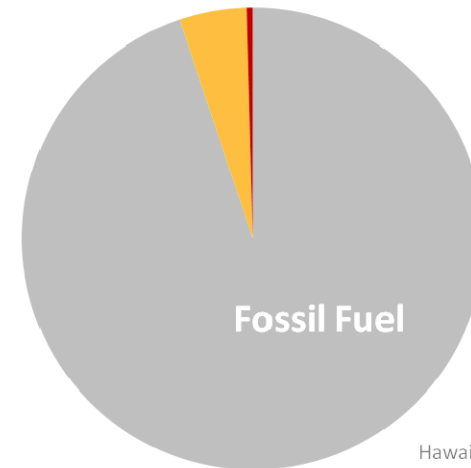
Renewable
Energy



Hawaii Electricity Sector
2007 Net Generation
Source: EIA

Transportation

■ Oil ■ Ethanol ■ Biodiesel



Hawaii Transportation Sector
2008 Fuel Use
Source: State of Hawaii Data Book

Hawaii's transformation to 70% clean energy will present a significant market opportunity



Avg. Crude Oil Price (2008-2030) per Barrel	Investment Cost	PV of Investment Cost	Savings from Oil Displaced	PV of Savings from Oil Displaced
\$100	\$ 18.1	\$ 9.1	\$ 49.3	\$ 20.0



What companies & technologies will deliver the \$18 billion of capital investment needed to achieve the Hawaii Clean Energy Initiative?



Source: DOE analysis for Hawaii Clean Energy Initiative

A successful clean technology sector in Hawaii would provide wide and lasting benefits



- Local, high-quality, high-paying jobs
- Opportunities for Hawaii's youth
- Industry leadership, and opportunities to export innovative technology
- Import substitution & energy security
- Diversified income streams for agricultural land
- Reduced greenhouse gas emissions

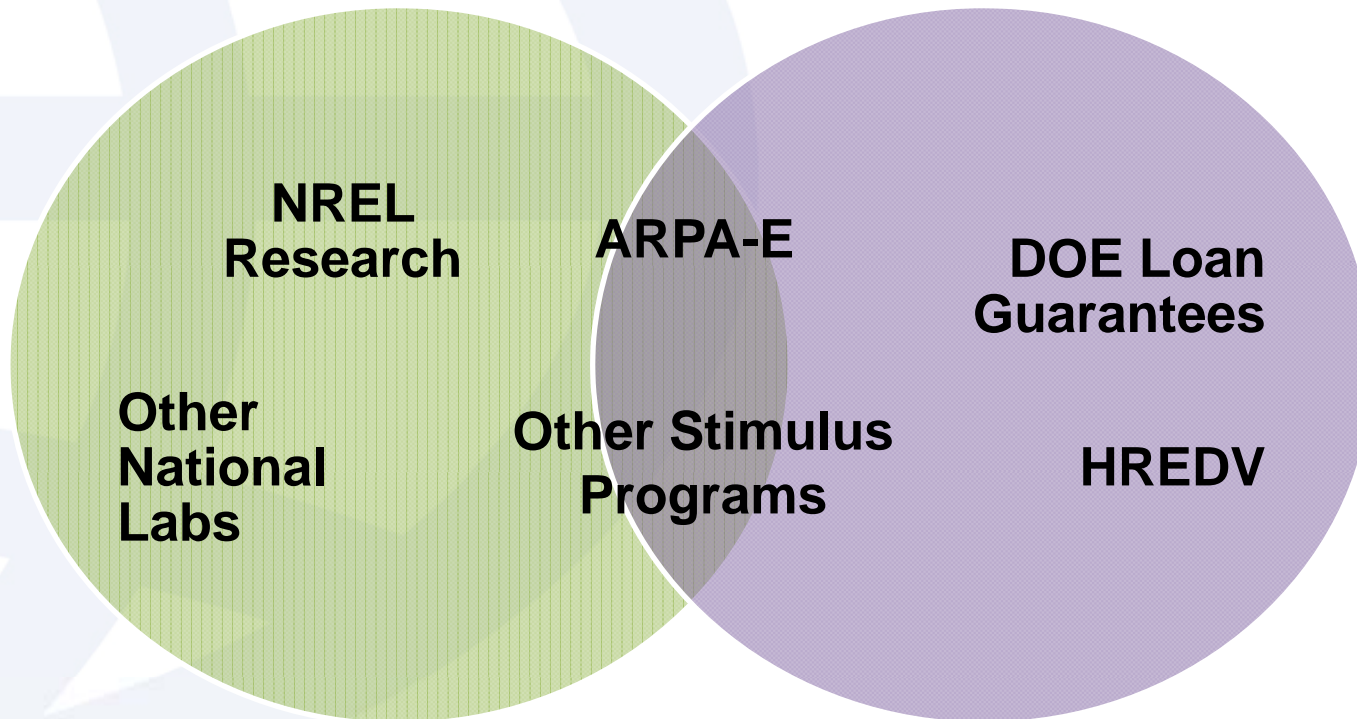
DOE recognizes that this transformation will require new technologies



U.S. Department of Energy is investing in...

...public sector innovation

...private sector innovation



New technologies will be needed to reach high levels of clean energy



Challenge	Possible Technology Solution
Wind intermittence	Energy storage, demand response technologies
Integrating PV	Advanced inverters & controls, visualization tools
Deploying efficiency at scale	Controls for buildings, demand response
Limited transportation options	Electric vehicles integrated with the grid, enhanced fleet efficiency
Cost of new technologies	Advanced materials, increased efficiency
Feedstock limitations	Next-generation biofuels
Oil-based energy costs on farms	Clean energy to power equipment, irrigation, etc.

Hawaii companies are innovating to meet these needs, but the road to commercialization can be long



Honolulu Seawater Air Conditioning, LLC

To succeed, Hawaii's policy & regulatory framework must support clean tech investment



- **Reduced uncertainty** through consistent, stable rules
- Predictable & timely environmental **permitting**
- **Level playing field** for technologies
- **Access to the grid** for renewable energy
- **Utility business model** aligned with clean energy

HREDV was created in 2008 to be a catalyst for the local clean energy industry through...



1. Competitively Awarded Funding

- Accelerate commercialization for local companies
- Support mainland companies investing in commercialization activities in Hawaii

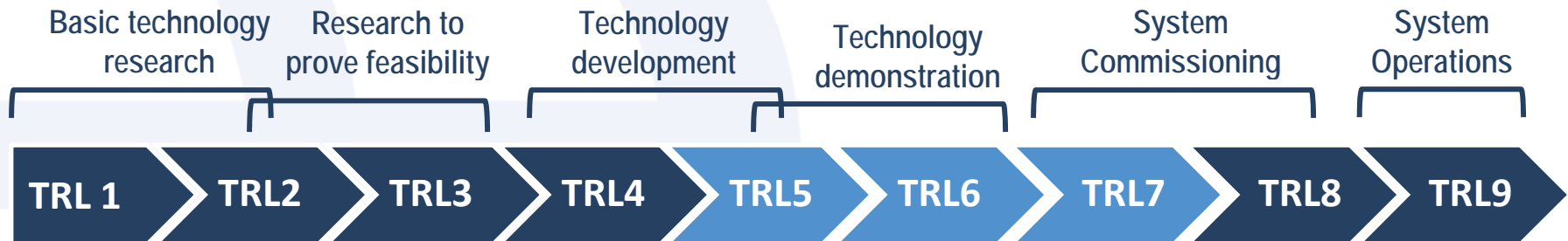
2. Training & Capacity Building

- Enhance the competitiveness of local companies

3. Strategic Partnerships

- Facilitate partnerships among industry players
- Coordinate with multiple levels of government

HREDV focuses on technologies that are nearly ready for the commercial marketplace



HREDV targets businesses with pre-commercial technology

U.S. DOE commercialization pathway based on Technology Readiness Levels

Needs of the community and the utility drive HREDV prioritization



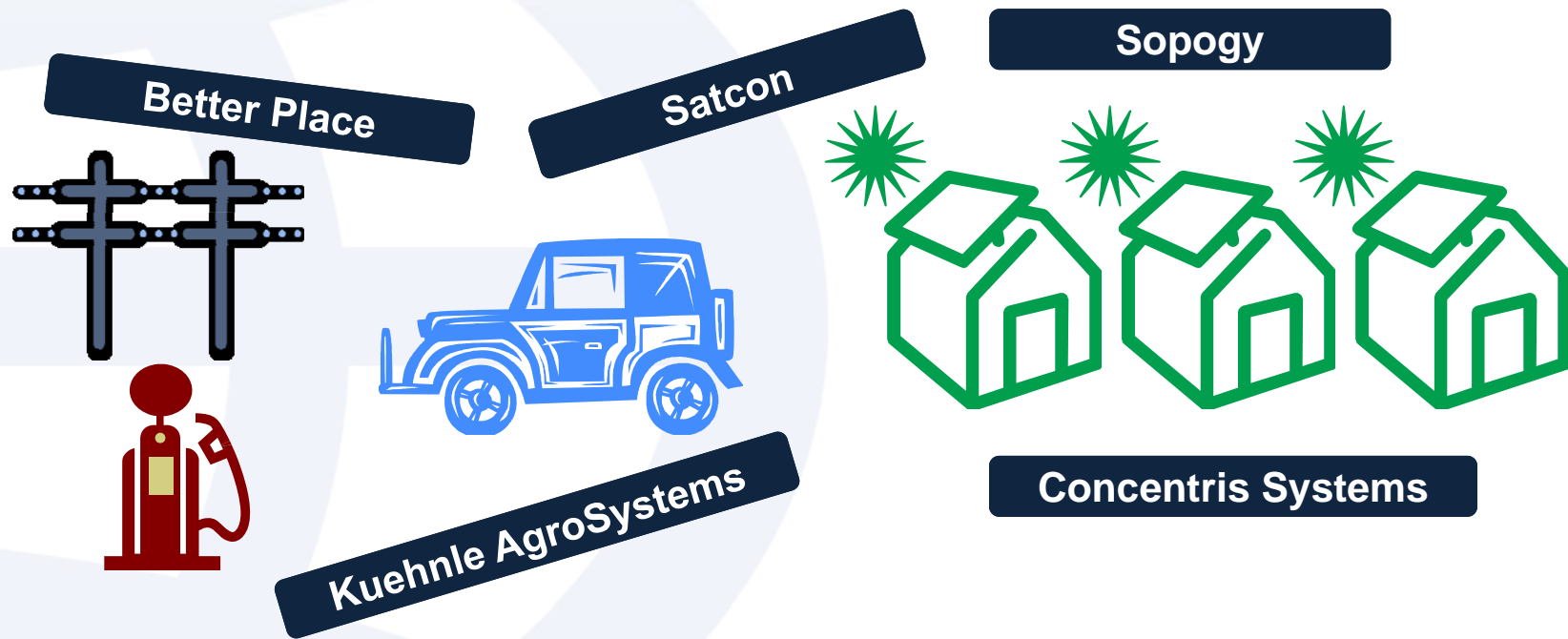
Challenge	HREDV Topic Area for 2010 funding
Wind intermittence	} Grid integration
Integrating PV	
Limited transportation options	} Transportation
Feedstock limitations	
Oil-based energy costs on farms	} Energy in Agriculture



HREDV selected five projects for Round 1 co-investment funding

Company	Project	Benefit
Concentris	Meshed Intelligent System for Energy-use Reduction (MISER)	Centralized energy management & conservation for military communities (Oahu)
Better Place	Hawaii Electric Vehicle Network Initiative	Demonstration of grid-smart electric vehicles and charging network (<i>Oahu</i>)
Satcon	Grid-Interactive DC-Link PV Charging Station	Improved integration of PV and vehicles on microgrids (<i>Lanai</i>)
Kuehnle AgroSystems	Algae Biomass for Biofuel Production	Serve biofuel needs with a next-generation feedstock (Oahu)
Sopogy	Micro Concentrated Solar Power Absorption Air Conditioning	Solar powered air conditioning to reduce electricity usage (Maui)

The projects will demonstrate technologies that integrate into Hawaii's whole energy system



How well do these technologies integrate into island grids?
This is where lab results meet the real world

As other regions bring on more renewable energy, they will need these products that have been proven in Hawaii

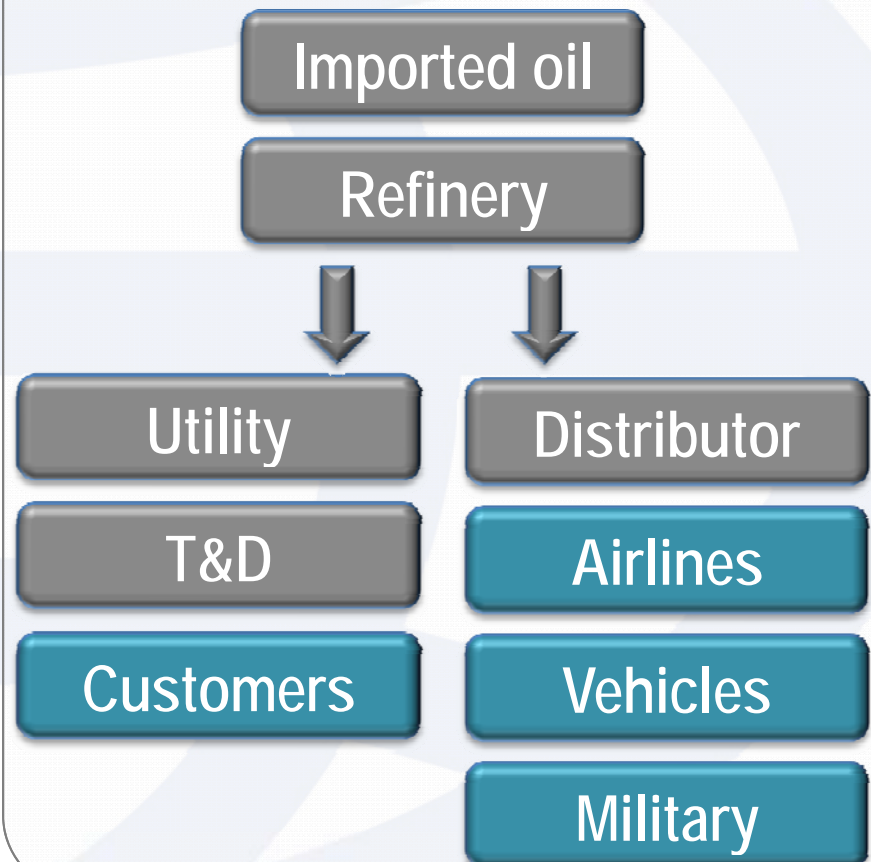


Hawaii, with its already high levels of solar and wind, is an early proving ground for innovative grid technologies

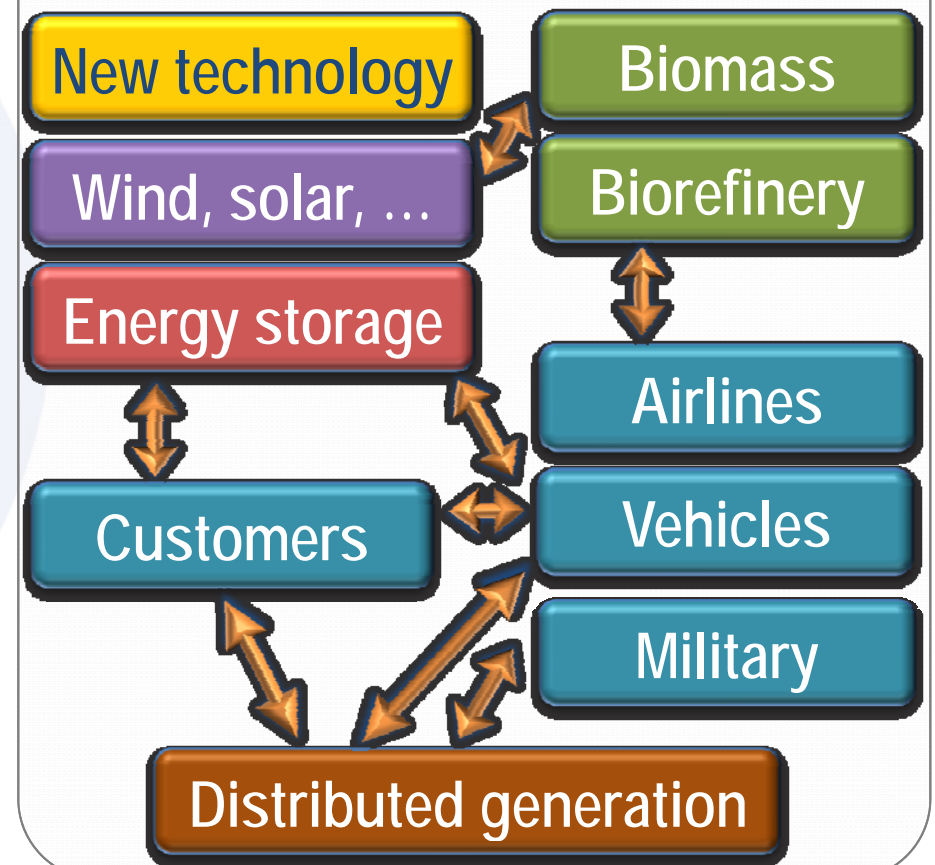
The energy system of the future may look very different from the one we have today



2010: dominant energy system



2020: new energy system?



Why is innovation a critical part of today's discussion on utility infrastructure?

The success of innovators depends on access to market...

- ▶ State policy can only do so much; tech companies need **customers**
- ▶ The **utility** is the major customer for energy production and grid-related technologies
- ▶ R&D is valuable to prove initial concepts, but full commercialization requires **demonstration on real energy systems**

... and the success of the utility depends on innovation

- ▶ Technical challenges require new **solutions**
- ▶ Solutions will be most effective if **needs/requirements** are communicated from utility to tech sector
- ▶ Collaboration and some degree of **risk sharing** can accelerates the deployment of new technology



Mahalo

Hawaii Renewable Energy Development Venture
(808) 237-5050
hredv@pichtr.org

www.hawaiirenewable.com