Webinar: The Economics of Grid Defection

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Webinar: The Economics of Grid Defection

Panelists:

Jon Creyts, Ph.D.
Managing Director
Rocky Mountain Institute

Peter Lilienthal, Ph.D.
Chief Executive Officer
HOMER Energy

John Glassmire
Senior Energy Analyst
HOMER Energy

Webinar: The Economics of Grid Defection

Administrative Notes:

1) Type questions for the panelists in the Q&A box at far right. We will cue them up for discussion after the final presenter.

2) For tech support at any time, call the WebEx help desk at: +1-866-229-3239

3) A recording of this Webinar will be available on-demand after today's session

THE ECONOMICS OF GRID DEFECTION

HOMER WEBINAR

23 APRIL 2014

ROCKY MOUNTAIN INSTITUTE®

STUDY BACKGROUND

"…one can imagine a day when battery storage technology or micro turbines could allow customers to be electric grid independent."

- Edison Electric Institute (EEI) Disruptive Challenges report, 2013

Study Goal: Establish a fact-base for where and when solar plus battery storage hybrid power systems compete with traditional utility service

Study Partners:

HOMER ENERGY

COHN REZNICK THINK ENERGY

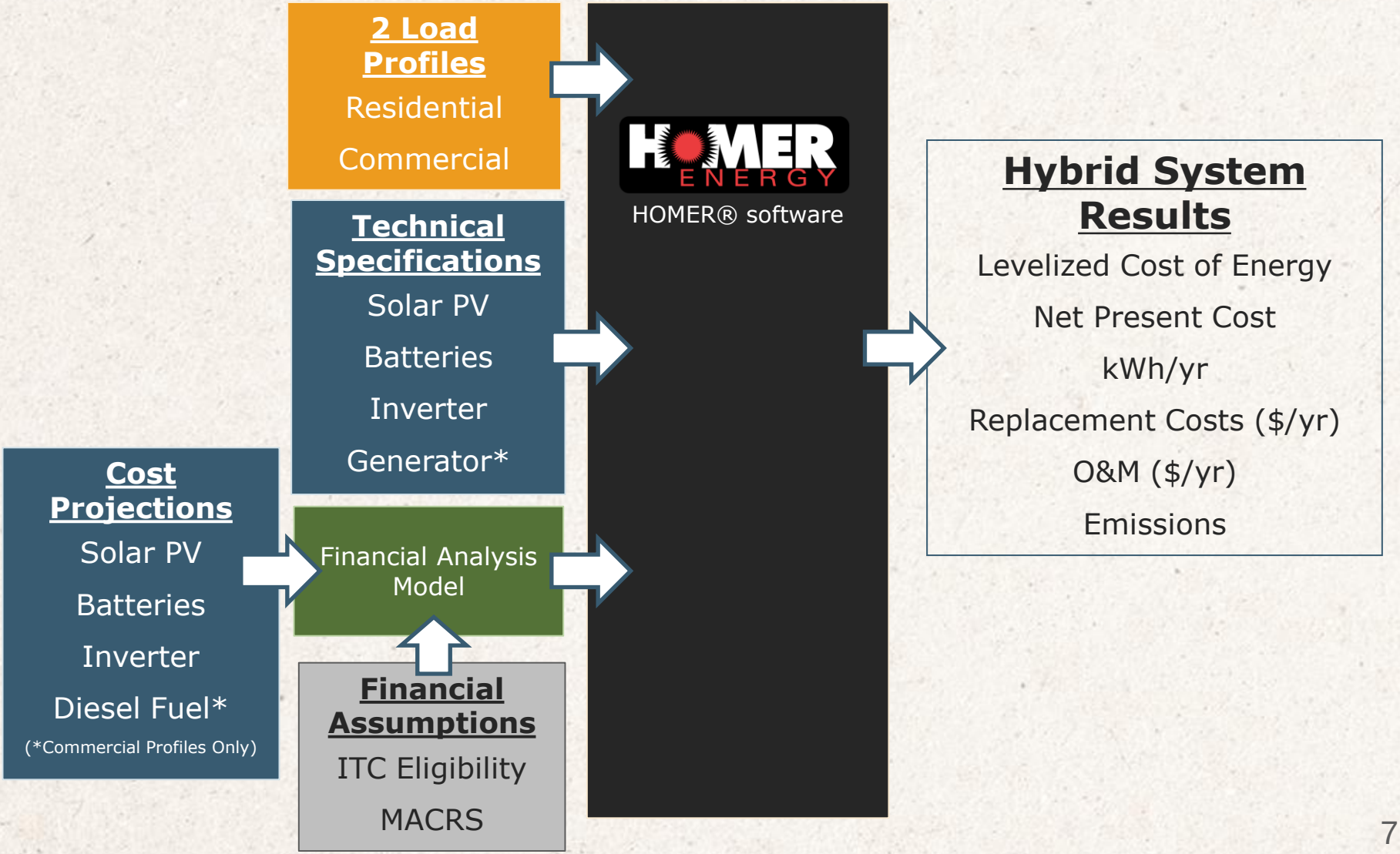
ROCKY MOUNTAIN INSTITUTE®

REPORT KEY MESSAGES

- Favorable defection economics exist for a small minority of customers today, but will expand to **millions of customers by 2024** under conservative assumptions
- Optimizing demand and/or achieving DoE levels of technology advance **brings forward parity economics by 5-10 years** versus conservative assumptions
- **Defection is suboptimal**

- The “traditional” utility business model is broken today since utilities are making investments now for customers *that may not exist* in the future
- Hybrid systems can create value for customers, utilities, and developers alike
- Migrating to a market structure that enables two-way exchange of value is critical to unlock hybrid system benefits

ANALYTICAL APPROACH



GEOGRAPHIES EXAMINED

	WESTCHESTER, NY	LOUISVILLE, KY	SAN ANTONIO, TX	LOS ANGELES, CA	HONOLULU, HI
INSOLATION ($kWh/m^2/day$)	4.5 kWh	4.5 kWh	6 kWh	6 kWh	5.5 kWh
2012 AVG RETAIL PRICE ($/kWh)	$0.15–$0.20	$0.06–$0.08	$0.05–$0.09	$0.09–$0.17	$0.34–$0.41
Installed PV (MW)	122.02 MW	2.92 MW	131.16 MW	2074.53 MW	27.33 MW
MARKET STRUCTURE	Deregulated	Regulated	Deregulated	Deregulated	Regulated

CASES MODELED

PV Sunshot
Residential - $1.50/W
Commercial - $1.25/W

DOE Battery Goal
Both - $125/kWh

Accelerated Technology Improvement

Base Case

Combined Improvement

Efficiency Measures
Residential – 30% Reduction
Commercial – 34% Reduction

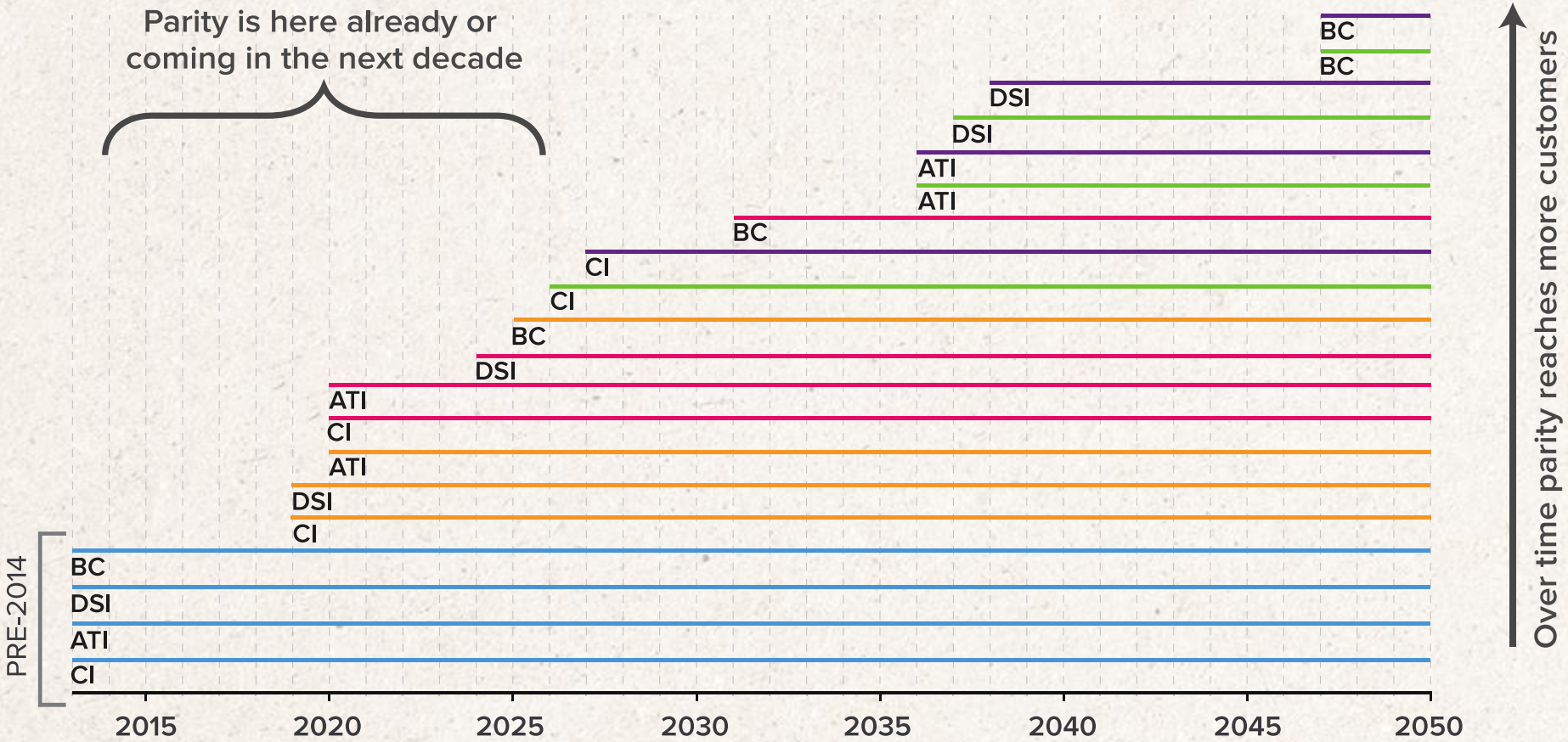
Demand Management
Residential – 2%
Commercial – None

Demand-Side Improvement

COMMERCIAL PARITY TIMELINE

BC - Base Case
ATI - Accelerated Technology Improvement
DSI - Demand-Side Improvement
CI - Combined Improvement

Louisville, KY
Westchester, NY
San Antonio, TX
Los Angeles, CA
Honolulu, HI



RESIDENTIAL PARITY TIMELINE

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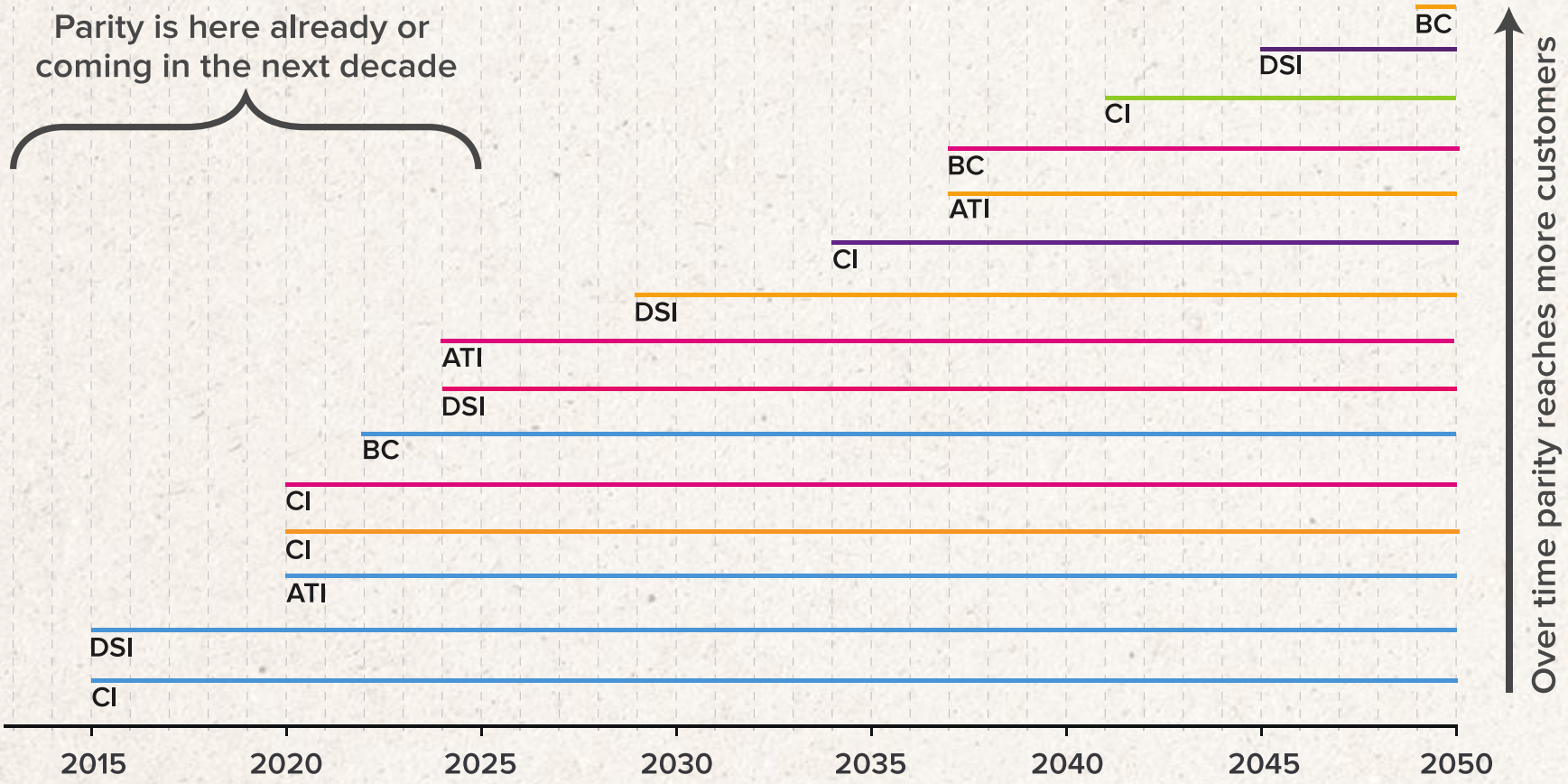
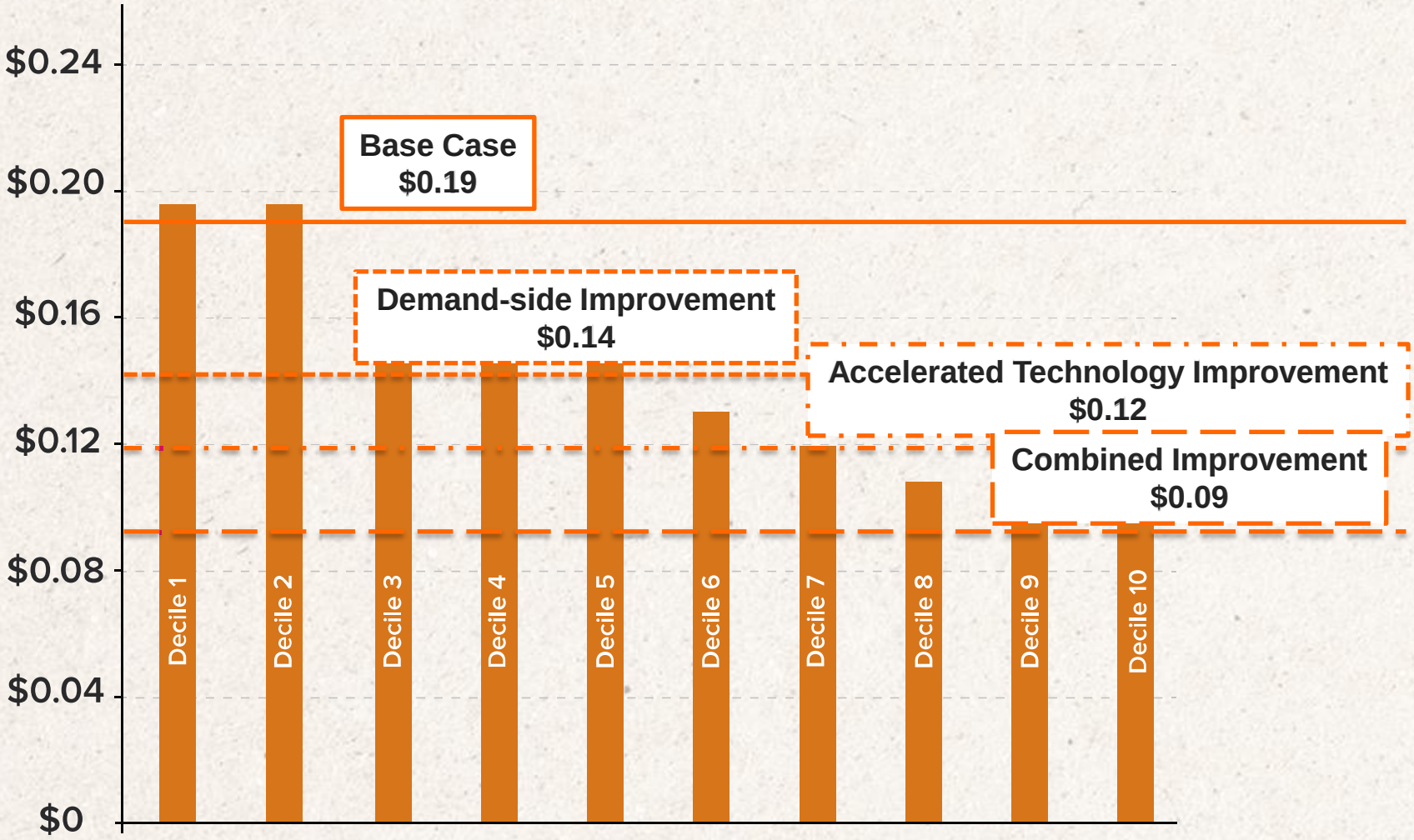
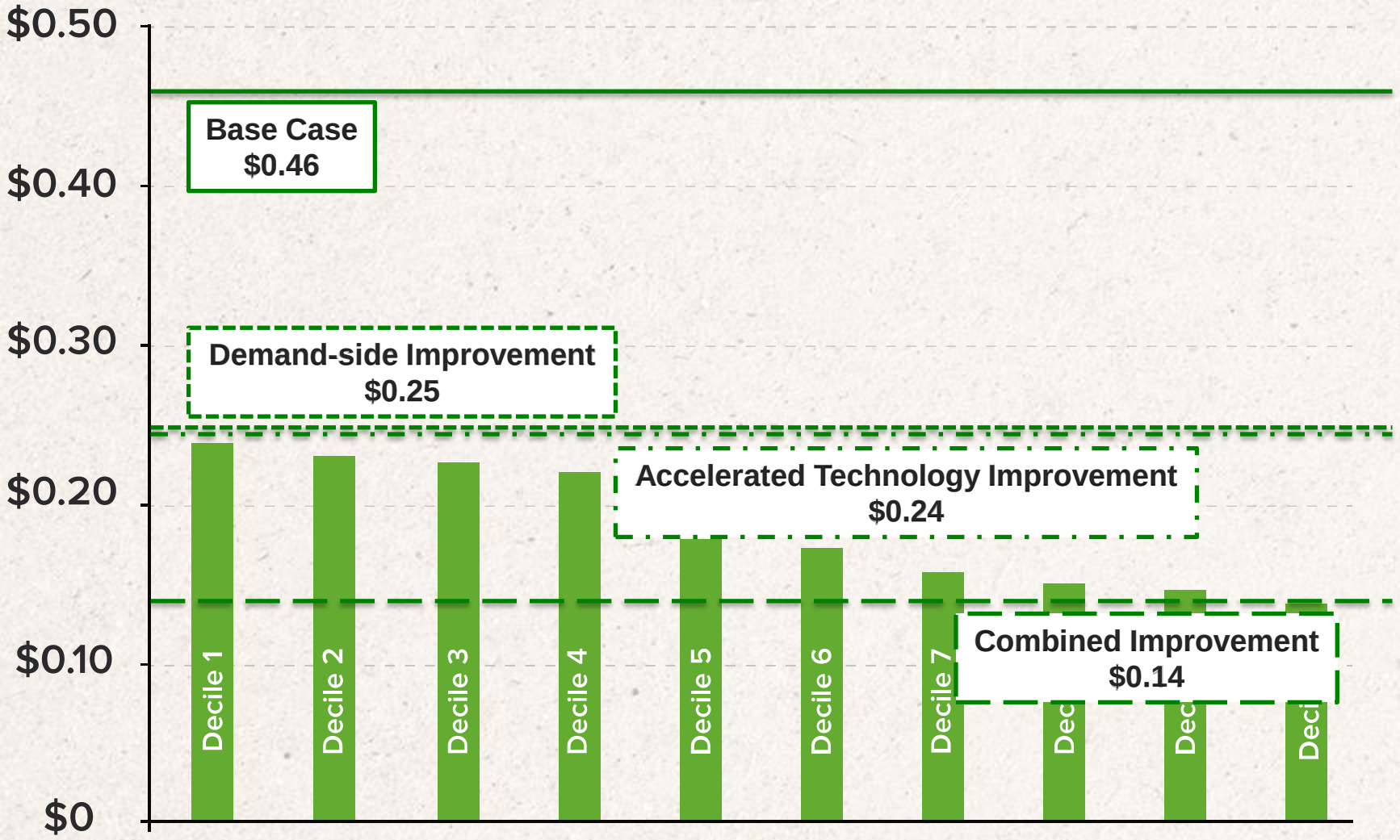


EFFECTS ON CUSTOMERS AND REVENUE IN THE SOUTHWEST BY 2024 (COMMERCIAL)



States included in the Southwest region for this graph: AZ, CA, CO, NM, NV, UT

EFFECTS ON CUSTOMERS AND REVENUE IN THE SOUTHWEST BY 2024 (RESIDENTIAL)



States included in the Southwest region for this graph: AZ, CA, CO, NM, NV, UT

REPORT KEY MESSAGES - REPRISE

1. **Favorable defection economics will exist for millions within a decade under conservative assumptions; potentially a lot more sooner with either technology or business model innovation**

2. **Defection is suboptimal**

3. **The “traditional” utility business model is broken today and urgently needs repair**

4. **There is value in hybrid systems; unlocking it requires new approaches to encourage a two-way transactive grid**

Optimizing Clean Power Everywhere

Generating Insight into Distributed Generation and Microgrids with the HOMER® software

Peter Lilienthal, Ph.D, CEO
John Glassmire, Senior Engineer

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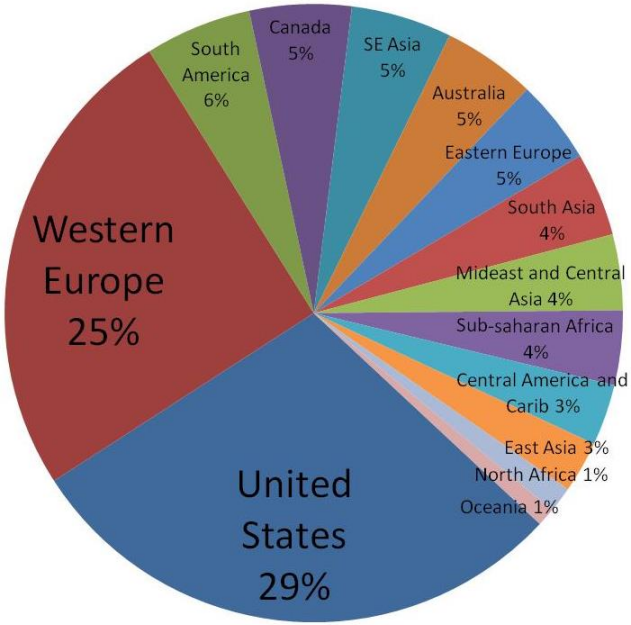
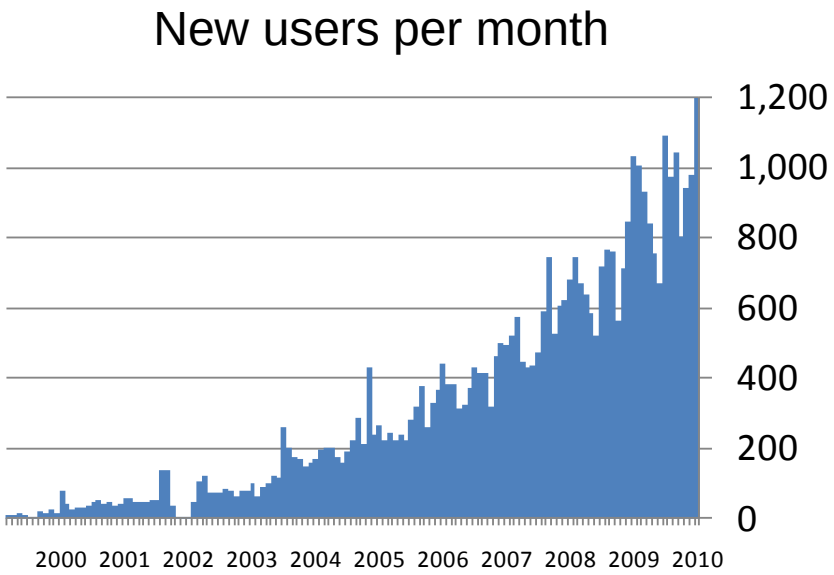
HOMER

- NREL: 1992-2009
- Original developers now at HOMER Energy
- 107,000 users in 193 countries

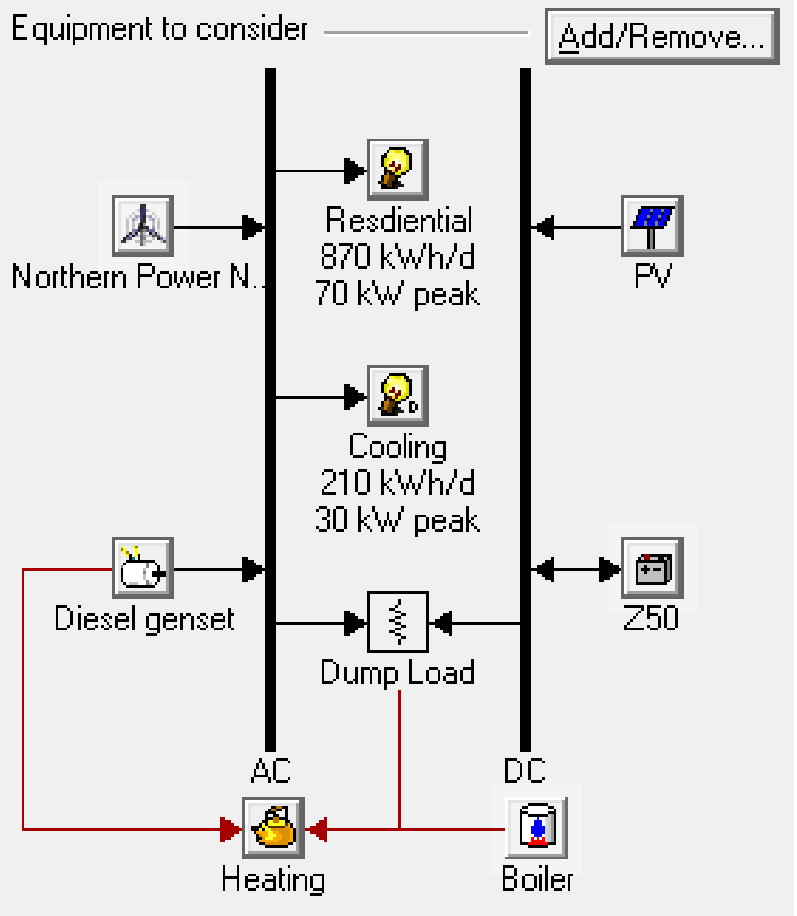




HOMER

- Industry standard for:
  - Micro-grids
    - On & off grid
  - Isolated grids
  - Island grids

- Using hybrids with:
  - Conventional resources
  - Renewable resources
  - Storage
  - Load Management



Too Many Choices

Solar

Wind

Hydro

Geothermal

Biomass

New Storage Techs.

Electric Vehicles

Smart grids

Fuel Cells

Micro-turbines

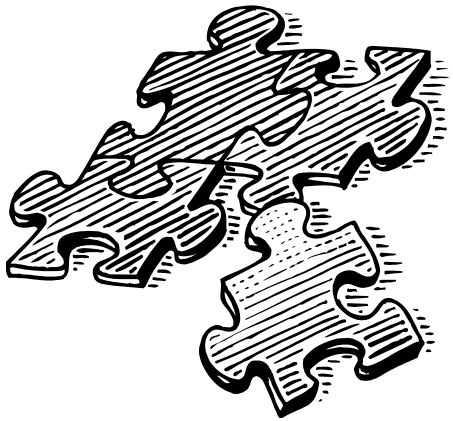
Micro-grids

Demand Response

Load Management

What is best?

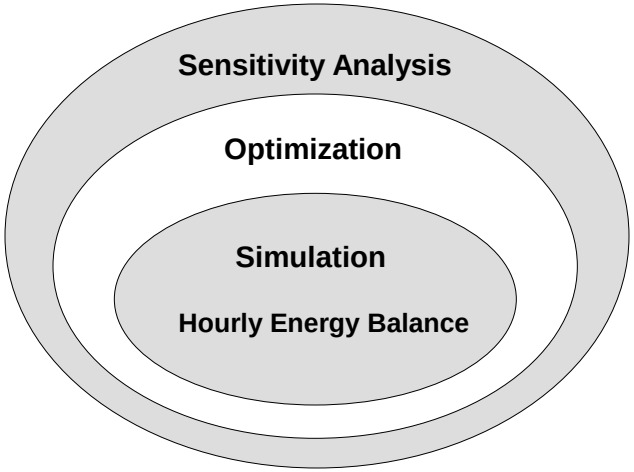
- Depends on the site & application
  - Resources
  - Loads
  - Equipment prices
  - Equipment performance



- A confused mind says “No!”
- **HOMER fits the pieces together**

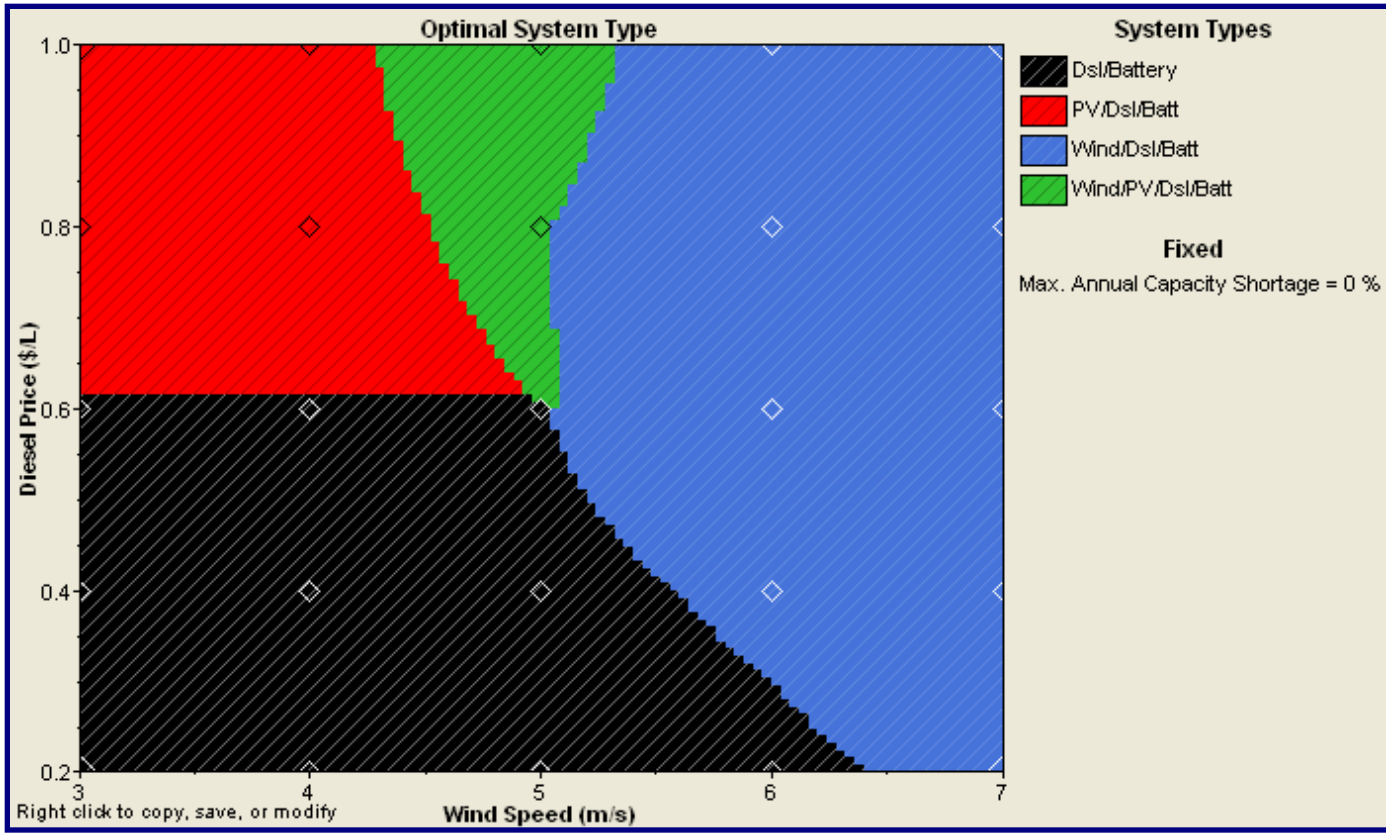
HOMER Analysis Layers

- Simulation
  - Time varying loads and resources
  - Hour-by-hour analysis for entire year
- Optimization
  - Find the least cost solution
- Sensitivity Analysis
  - The data is never “good enough”.
  - What if….?

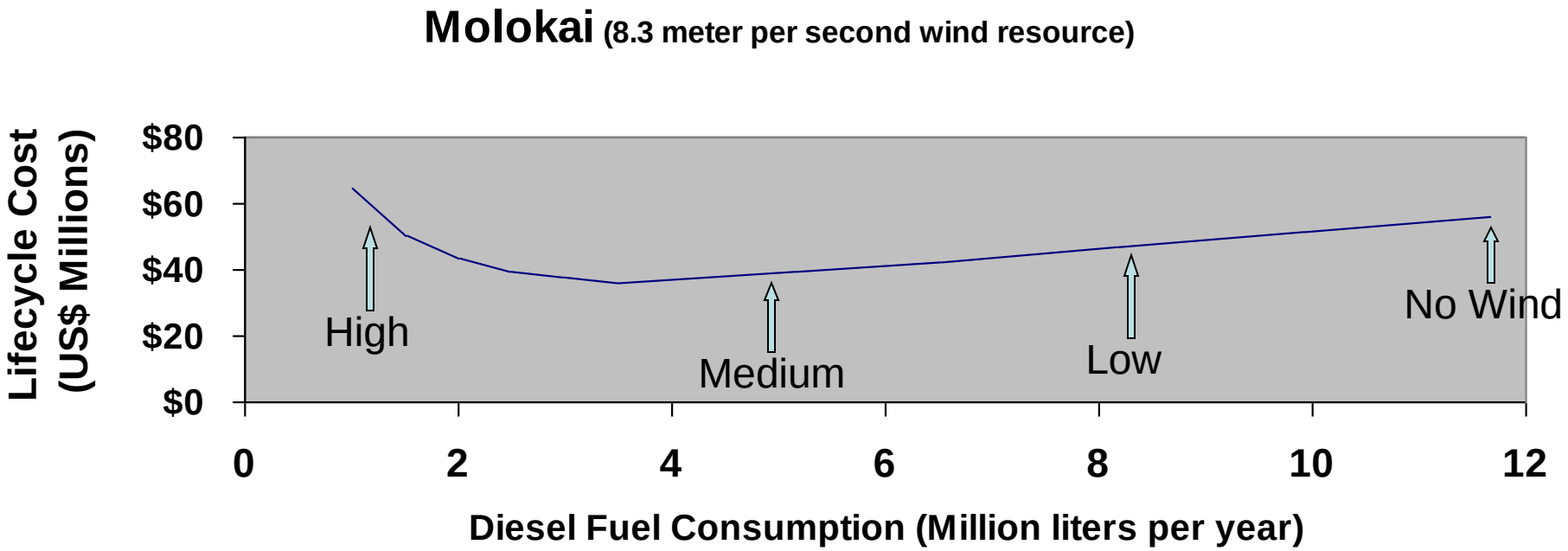


Sensitivity Analysis

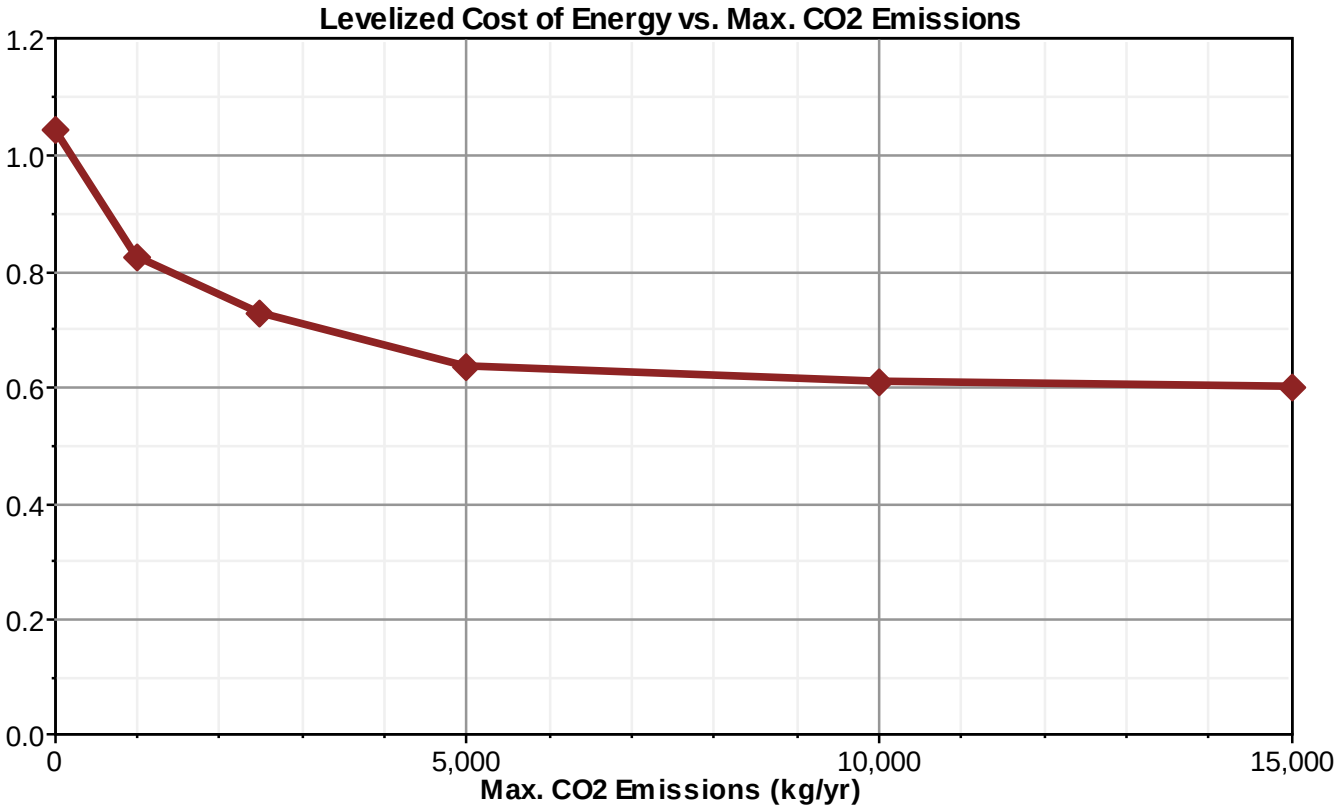
- What kind of system is best under which conditions?



Penetration Analysis from HOMER

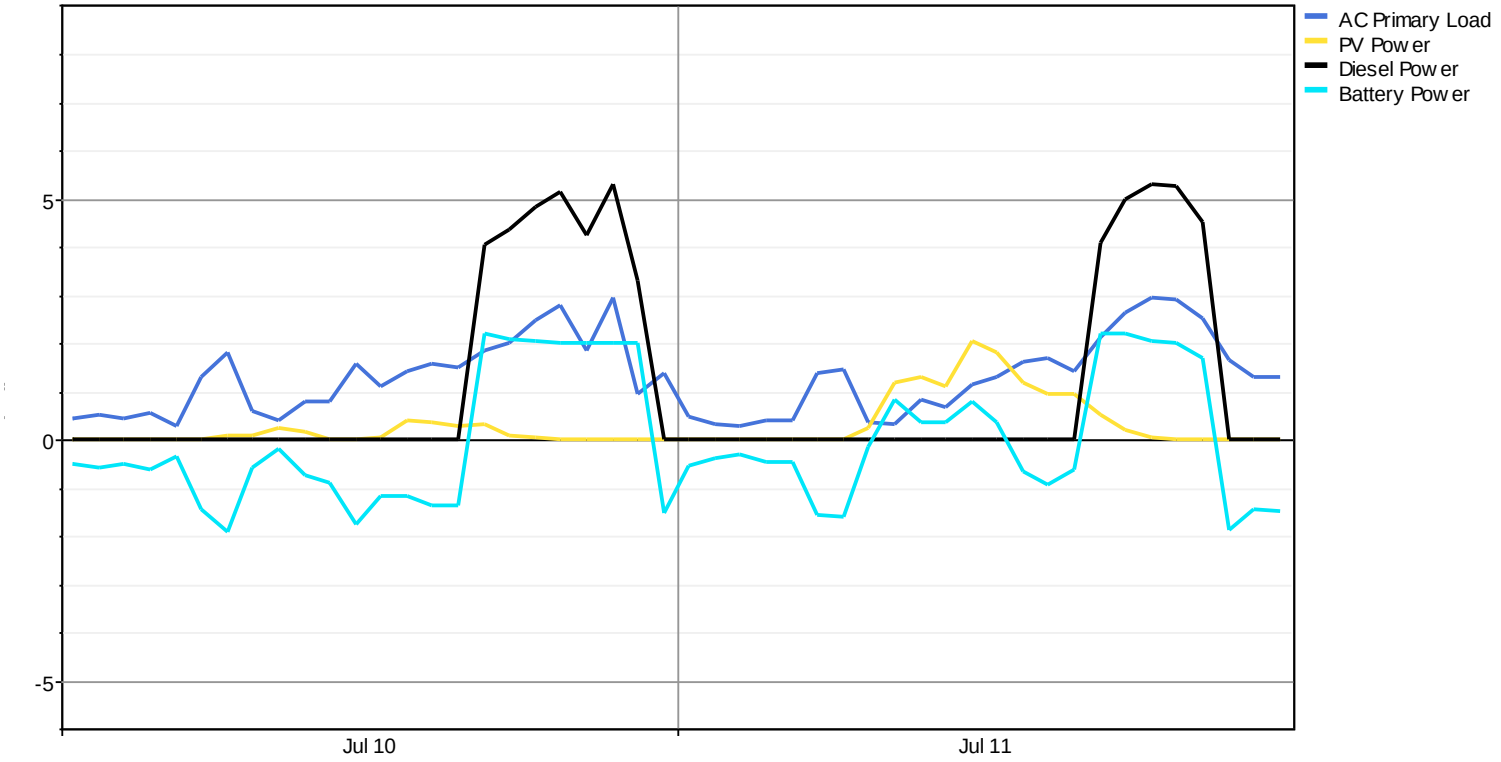


Policy Analysis



- Cost of emission constraints

Operational Analysis



- When is backup power needed?

What Have We Learned?

- Favorable grid defection economics requires:
  1. Substantial improvement in storage technology
  2. Backup generation
     - Our commercial case
  3. Aggressive load management
     - Our residential case
  4. Solar access or CHP opportunity
  5. Support industry

- **Part-time "defection" could be win-win**
  - Customer gets higher reliability
  - Customer's assets can provide flexibility to the utility

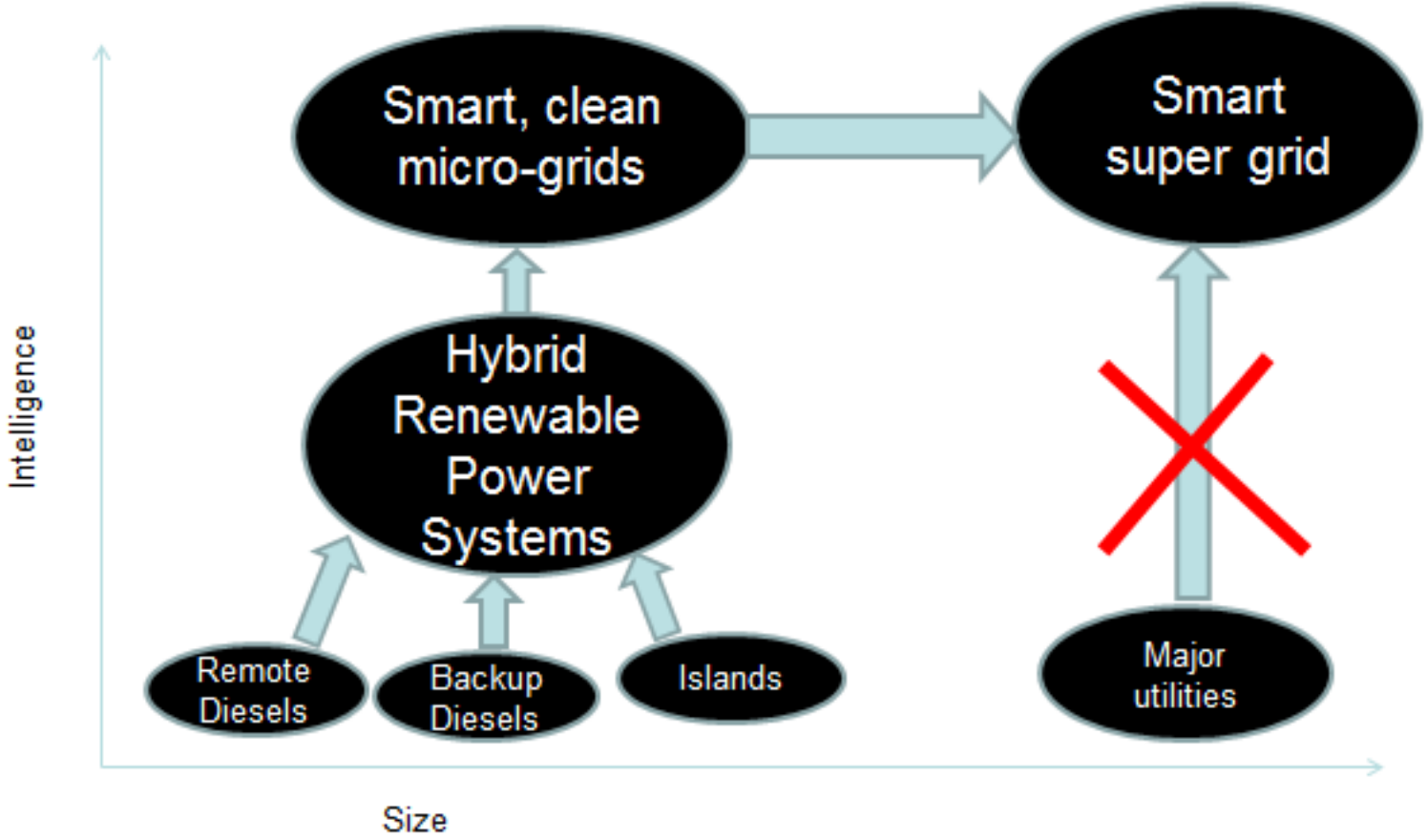
Renewables Evolution

- Entering a new era
- Where are the real economics?
- How do you manage high penetrations?

Smart, clean micro-grids

- Capable of operating on their own
- Empowered consumers manage own variability
- Customized levels of:
  - Reliability
  - Renewables
  - Storage and load management
- Requires regulatory reform
- $40 billion market by 2020

Clean Power Evolution



- Smaller systems
  - Liquid fuels from oil
  - High renewable penetrations
- Large utilities
  - Security obstacles
  - Regulatory obstacles

Build off our analysis

- Join in the conversation at the HOMER Community Forum:
  - http://homerusersgroup.ning.com/group/economics-of-grid-defection
  - From HOMER webpage, Support > Community Forum > Groups > Economics of Grid Defection
- You can download the 40 HOMER models we used for our report
- There is a primer with guidance on how to use the models

Build off our analysis

- We encourage you to modify these models and engage in an active discussion surrounding the results.
- Areas of interesting further study might be:
  - Replacing the diesel generator with a natural gas fuel cell
  - Modifying levels of grid independence (i.e., 90% versus 98% as we used in the report)
  - Adding other geographies
  - Trying other battery technology technical specifications
  - Anything else you might like to explore

Build off our analysis

- Demonstration of how to access the files

(Open in separate window)

RETAIL PRICE PROJECTIONS USED IN OUR STUDY

Utility	Load Profile	Load Size (kWh/yr)	Rate Projection (low)	Rate Projection (high)
Hawaiian Electric Co.	Honolulu Residential	14,479	0.62%	3%
	Honolulu Commercial	722,700	0.34%	
Southern California Edison	Los Angeles County Residential	7,914	0.10%	
	Los Angeles County Commercial	586,557	0.10%	
CPS Energy	San Antonio Residential	15,247	0.90%	
	San Antonio Commercial	670,504	0.70%	
Louisville Gas & Electric	Louisville Residential	12,837	-0.50%	
	Louisville Commercial	604,809	-0.40%	
ConEdison (NY)	Westchester County Residential	11,927	0.30%	
	Westchester County Commercial	577,431	0.10%	

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Q&A Session (type your questions in box at far right)

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Thanks for attending!

Further questions can be sent to info@homerenergy.com. We will forward them to the speakers.

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Looking forward to your participation in future Webinars hosted by HOMER Energy!