

Large Scale Offsite Renewable Energy Projects – MWCOCG Opportunities

Panel Presentation



Key Takeaways for Today's Discussion

- > Renewable Energy (RE) costs are down dramatically in recent years, which has led to an explosion of direct customer purchases of RE
- > Large scale renewable energy (LSRE) options are possible throughout the larger Washington Metropolitan Area despite differences in state regulation
- > Customer aggregation can help local governments take advantage of large scale renewable energy at extremely competitive pricing
- > Regulated (VA) and deregulated (MD/DC) jurisdictions have different options available but all have the same wholesale options (that do not conflict with state retail regs)

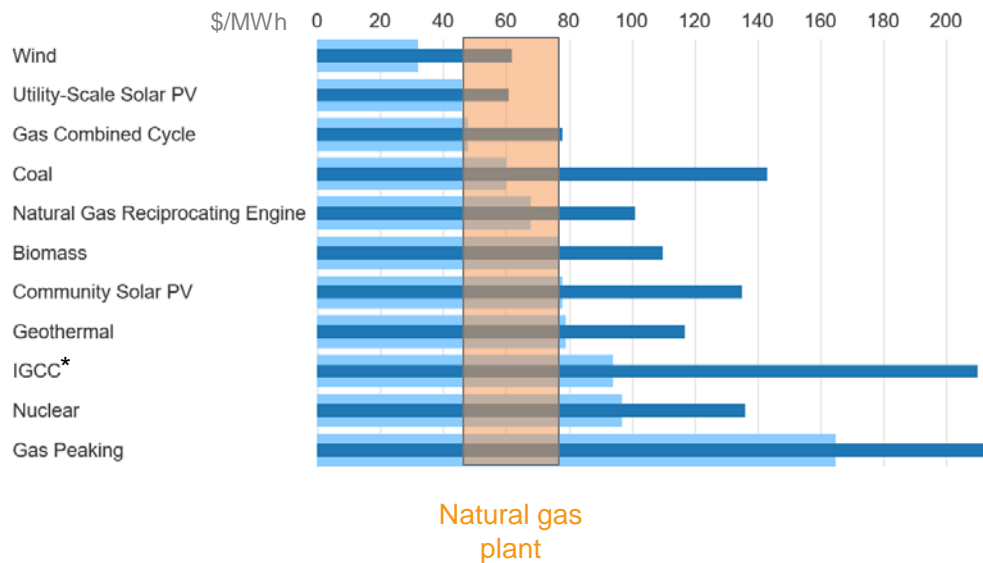
Cost Reductions Have Made Renewable Energy Competitive

Steep reduction in renewable energy costs between 2009 and 2016

- 66% reduction in wind energy
- 85% reduction in solar energy

US Unsubsidized Levelized Cost of Energy (Figures by Lazard)

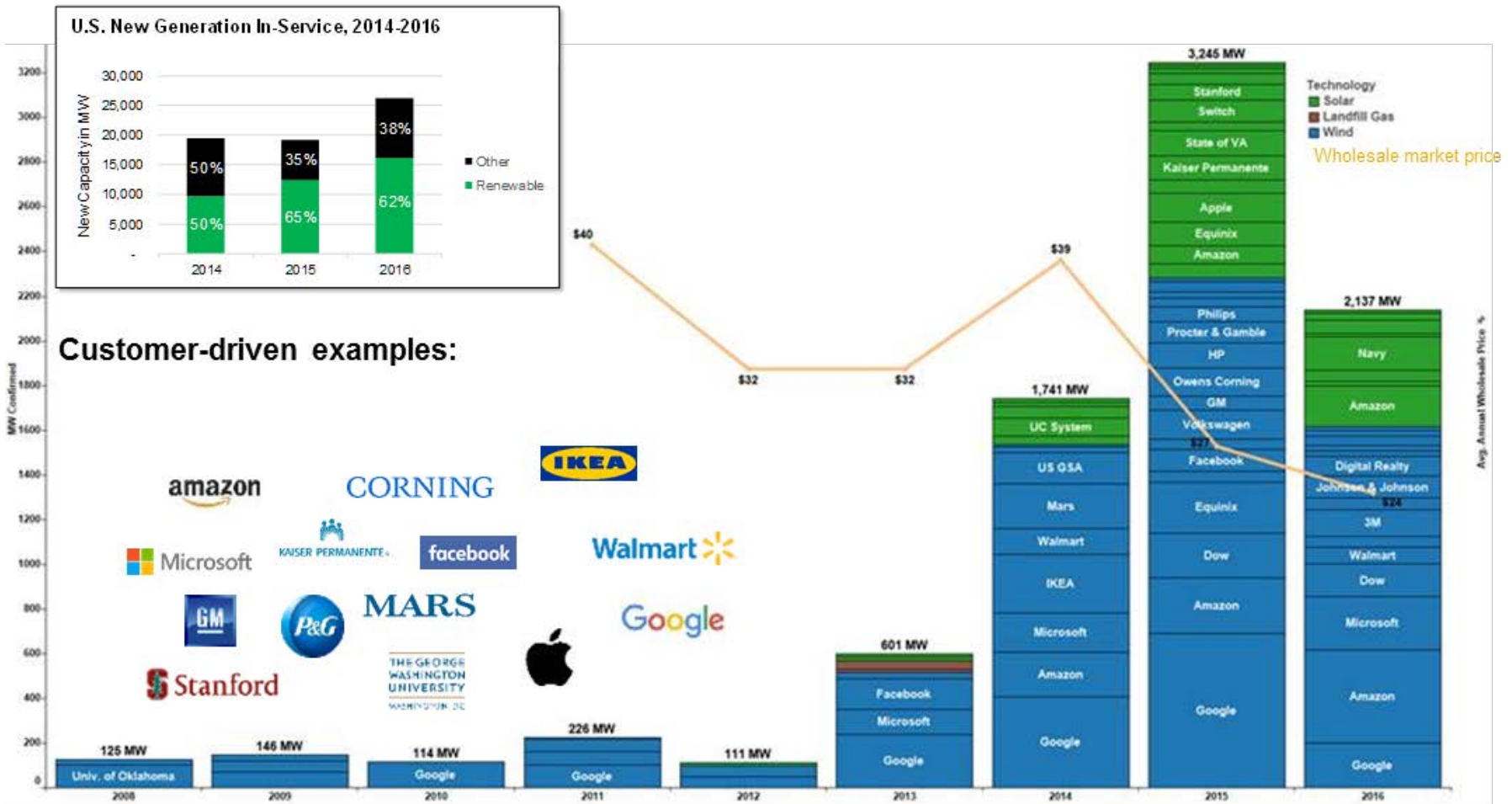
Light blue = low estimate. Dark blue = high estimate.



* Integrated Gasification Combined Cycle

Source: Clean Technica, March 2017, Data: Lazard's Levelized Cost of Energy – v10.0, Dec. 2016.

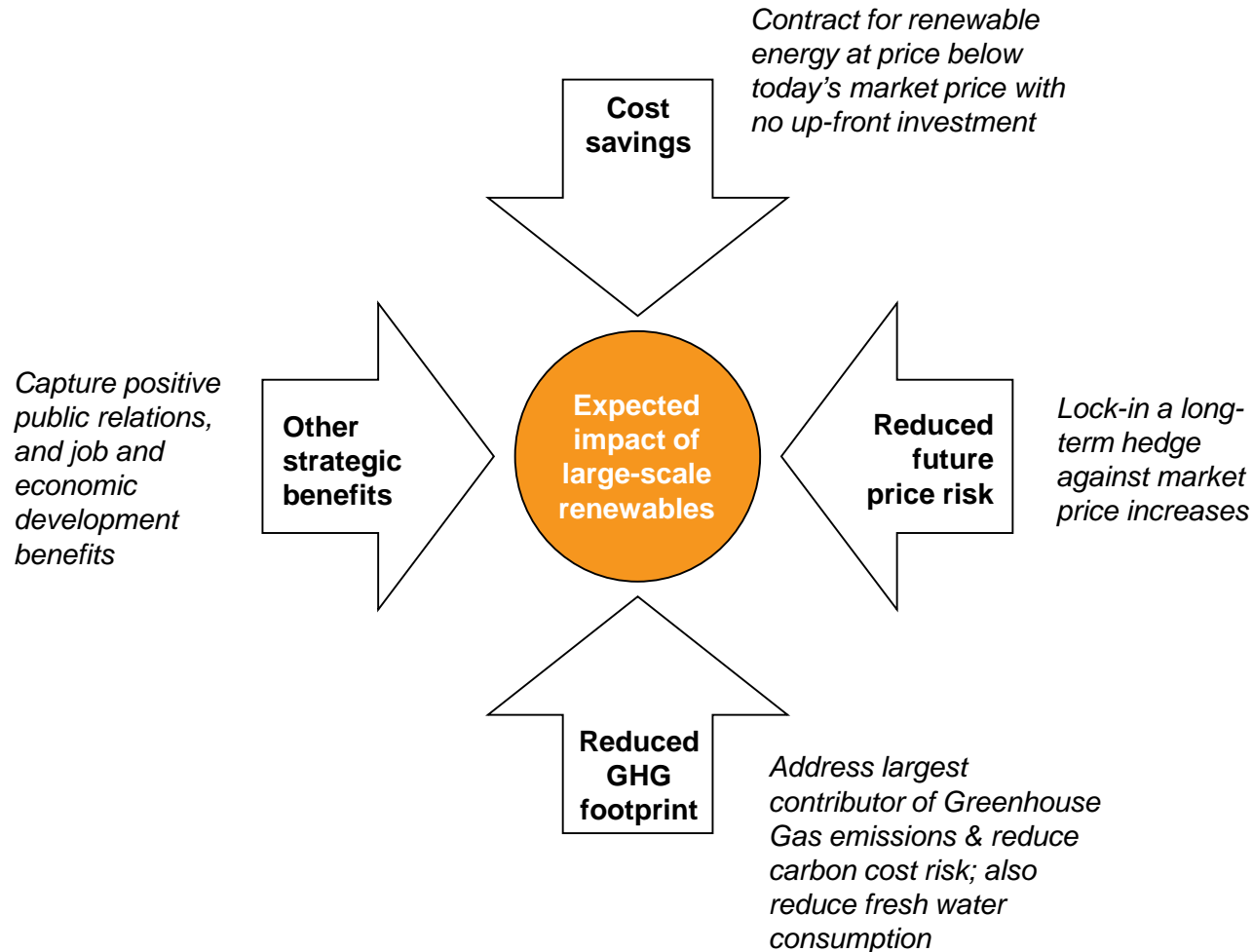
Large US End-Users are Harnessing LSRE Value



* Projects over 10MW

Source: FERC Office of Energy Projects Energy Infrastructure Update Dec 2016; Publicly available press announcements, CFR analysis

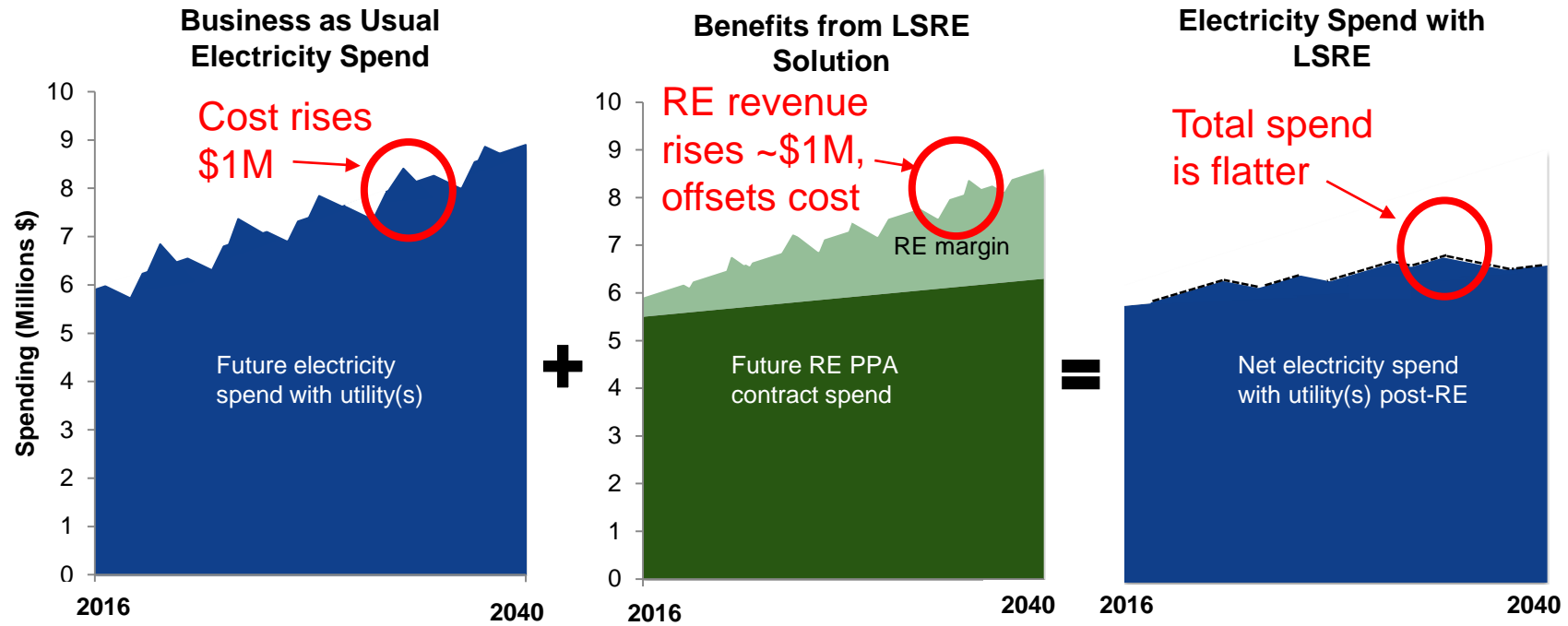
Large Scale Renewable Energy Delivers Significant Value



Wholesale Solution Mitigates Price Volatility Risks

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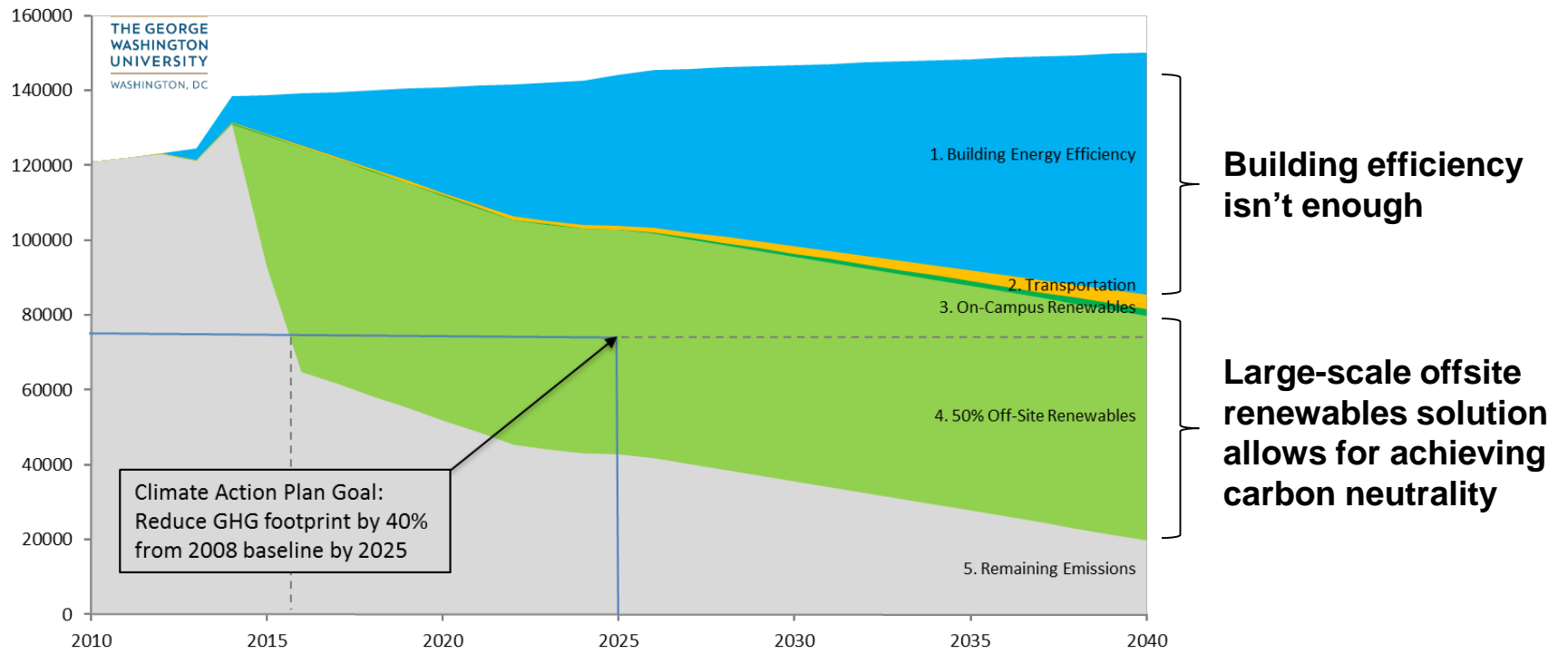
How do Indirect Wholesale Renewable Energy Solutions Reduce Risks?



* Includes electricity price as well as other revenue streams such as capacity charges.
Source: EIA; CFR analysis

Significant Reduction in Greenhouse Gas (GHG) Footprint Achievable

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Source: The George Washington University

The MWCOG Has Developed Strong GHG Reduction Goals

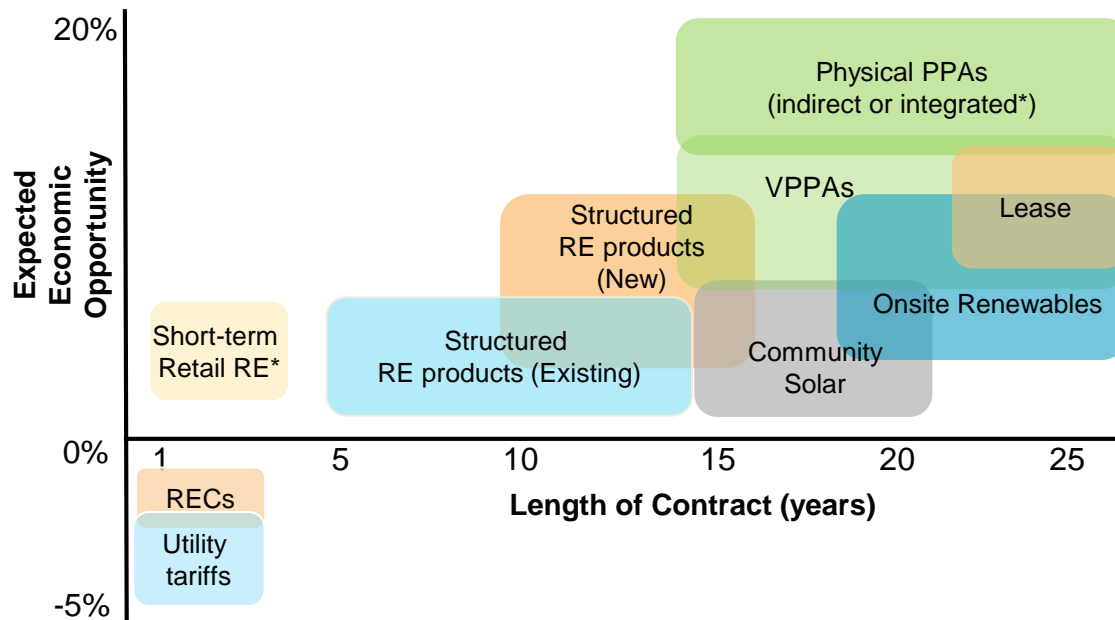


> Regional Greenhouse Gas (GHG) Reduction Commitments

- By 2012 reduce greenhouse gas emissions down to 2005 levels (Done)
- By 2020 further reduce greenhouse gas emissions by 20% compared to 2005
- By 2050 further reduce greenhouse gas emissions by 80% compared to 2005

Market Rapidly Evolving with New LSRE Options

A multitude of renewable energy options with significant value at stake



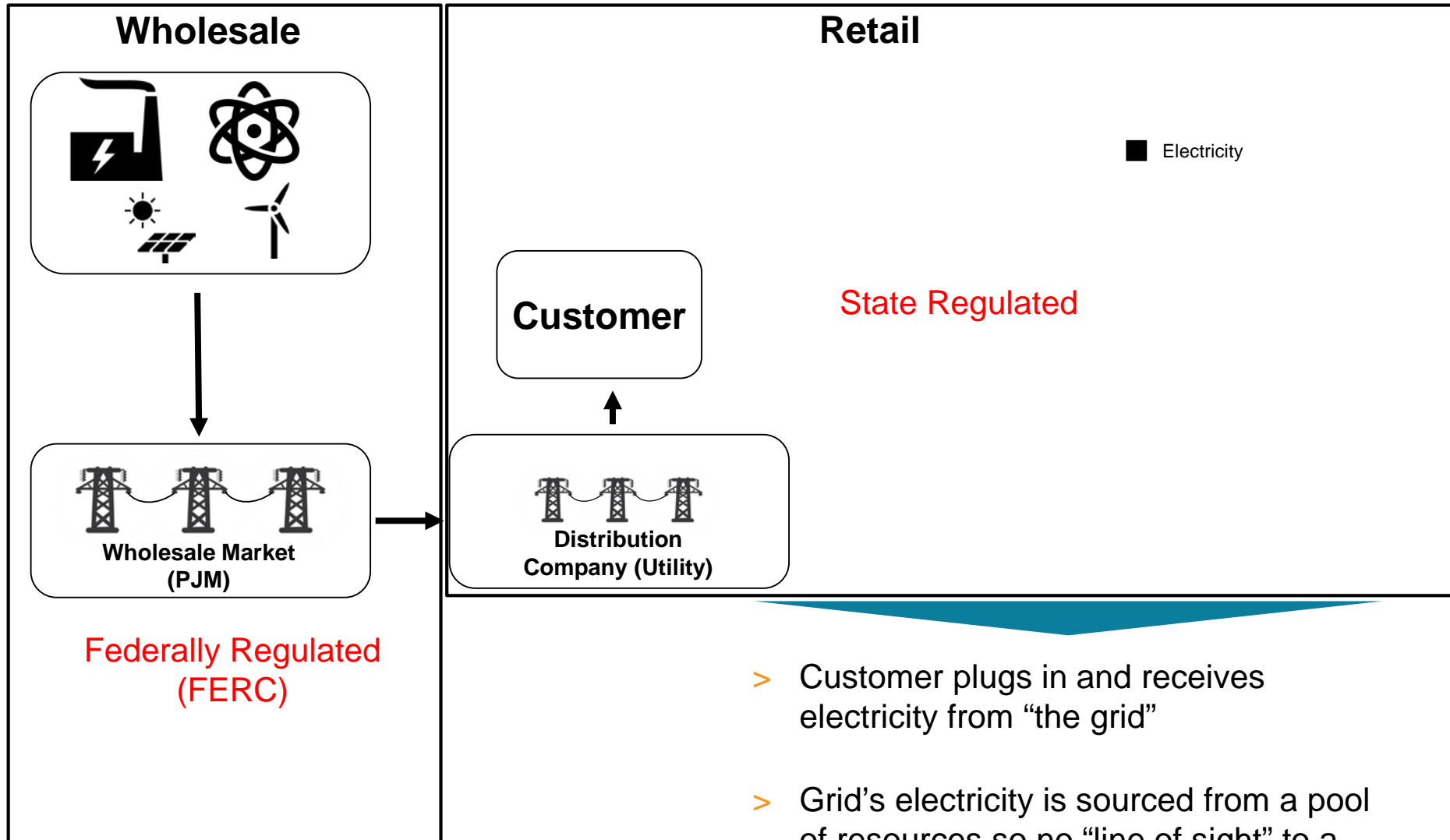
**Today's Focus:
Large Scale Offsite
Renewable Energy
Solutions - PPAs**

* Only available in states with deregulated energy markets
Other structures available: bilateral utility agreements, etc.

Source: CFR analysis

Electricity Market Actors

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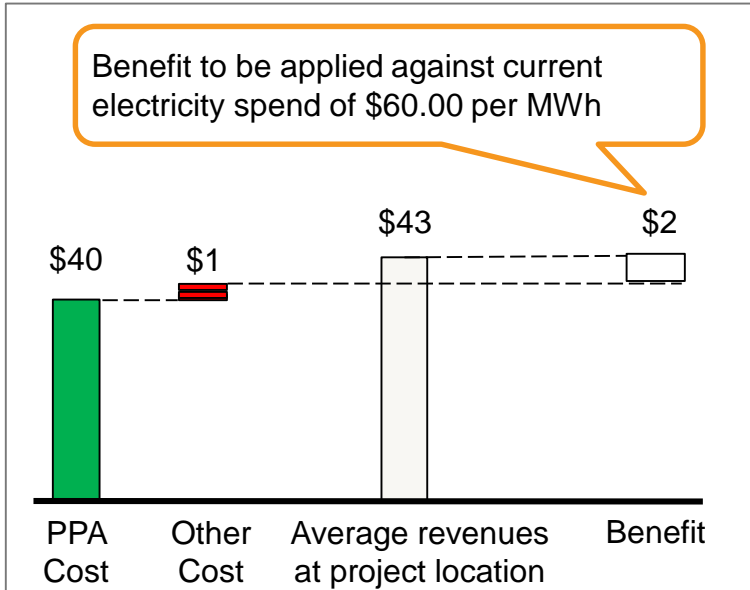
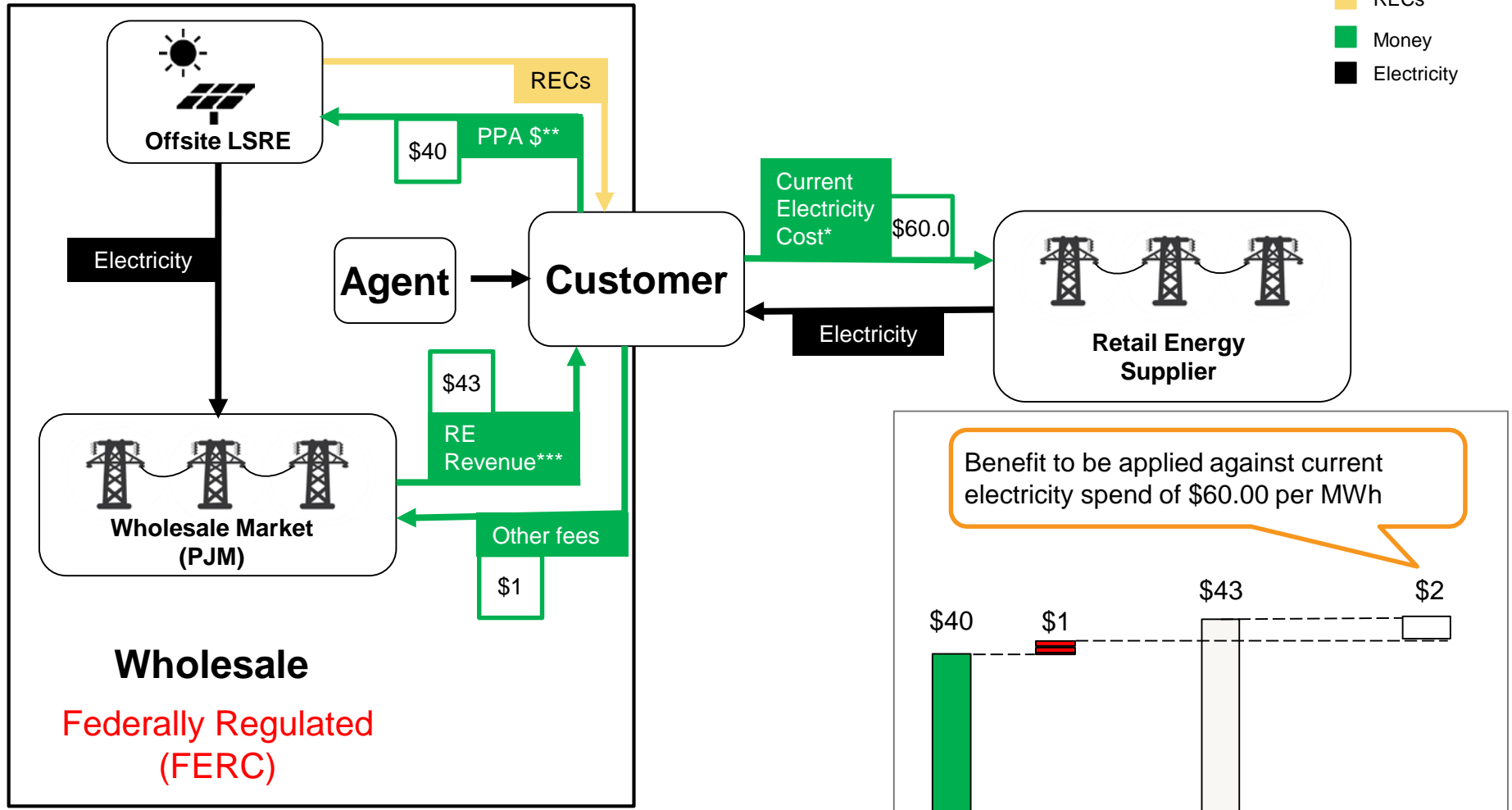
- > Customer plugs in and receives electricity from “the grid”
- > Grid’s electricity is sourced from a pool of resources so no “line of sight” to a particular project for most buyers

* Physical PPA Structure; Virtual PPA also available
Source: Recent CFR-led procurements; CFR analysis

LSRE Solution With a Physical PPA Contract - Economics

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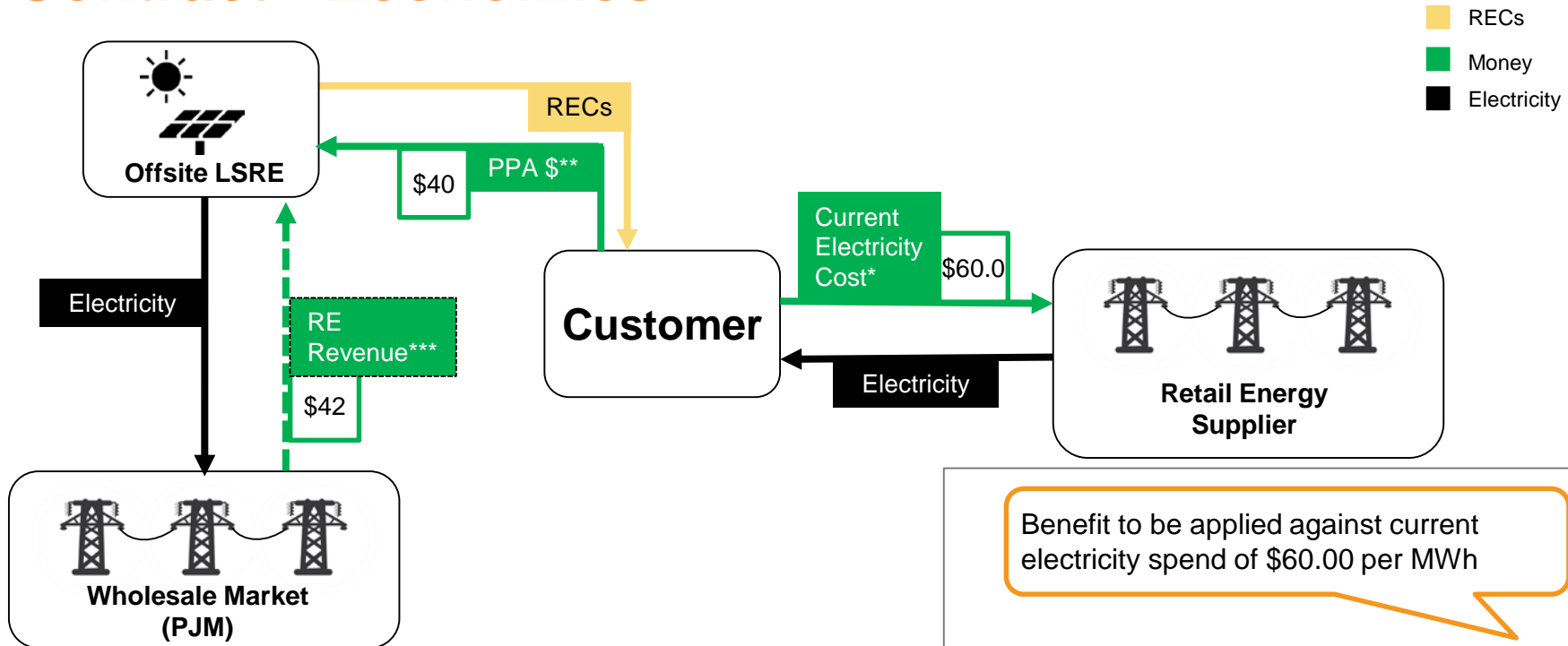
- RECs
- Money
- Electricity



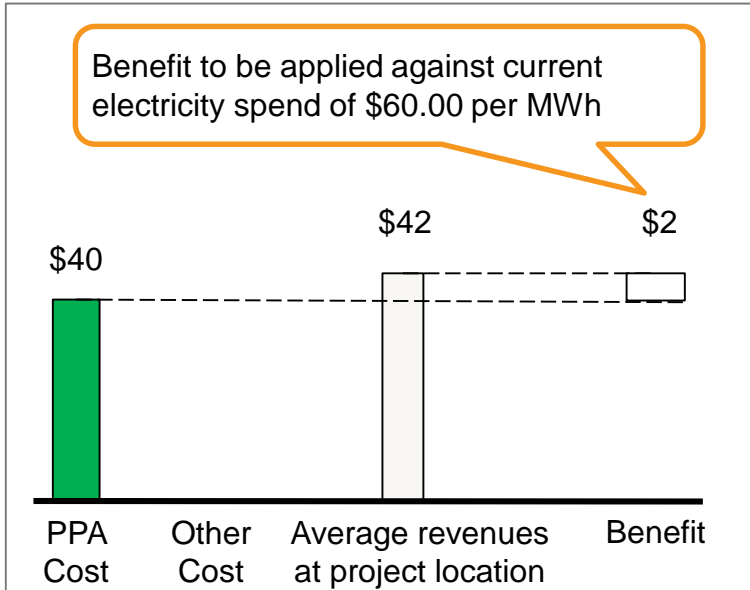
* Current all-in electricity cost based on Commercial Rates for brown power.
 ** PPA price based on a recent solar proposal in North Carolina.
 *** RE revenue based on energy and capacity revenues.
 Source: Recent CFR-led procurements; CFR analysis

LSRE Solution With a Virtual PPA Contract - Economics

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- RECs
- Money
- Electricity

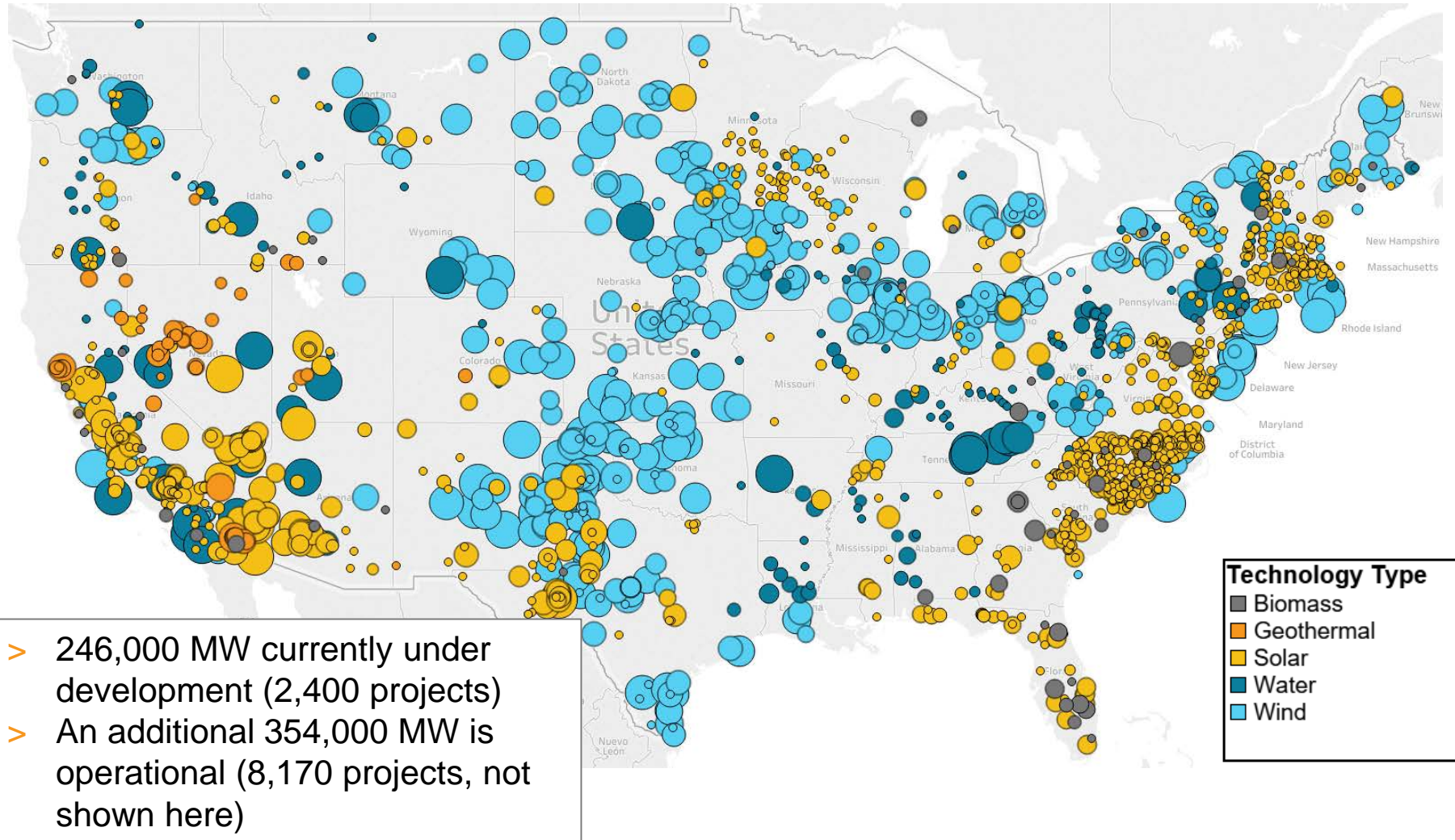


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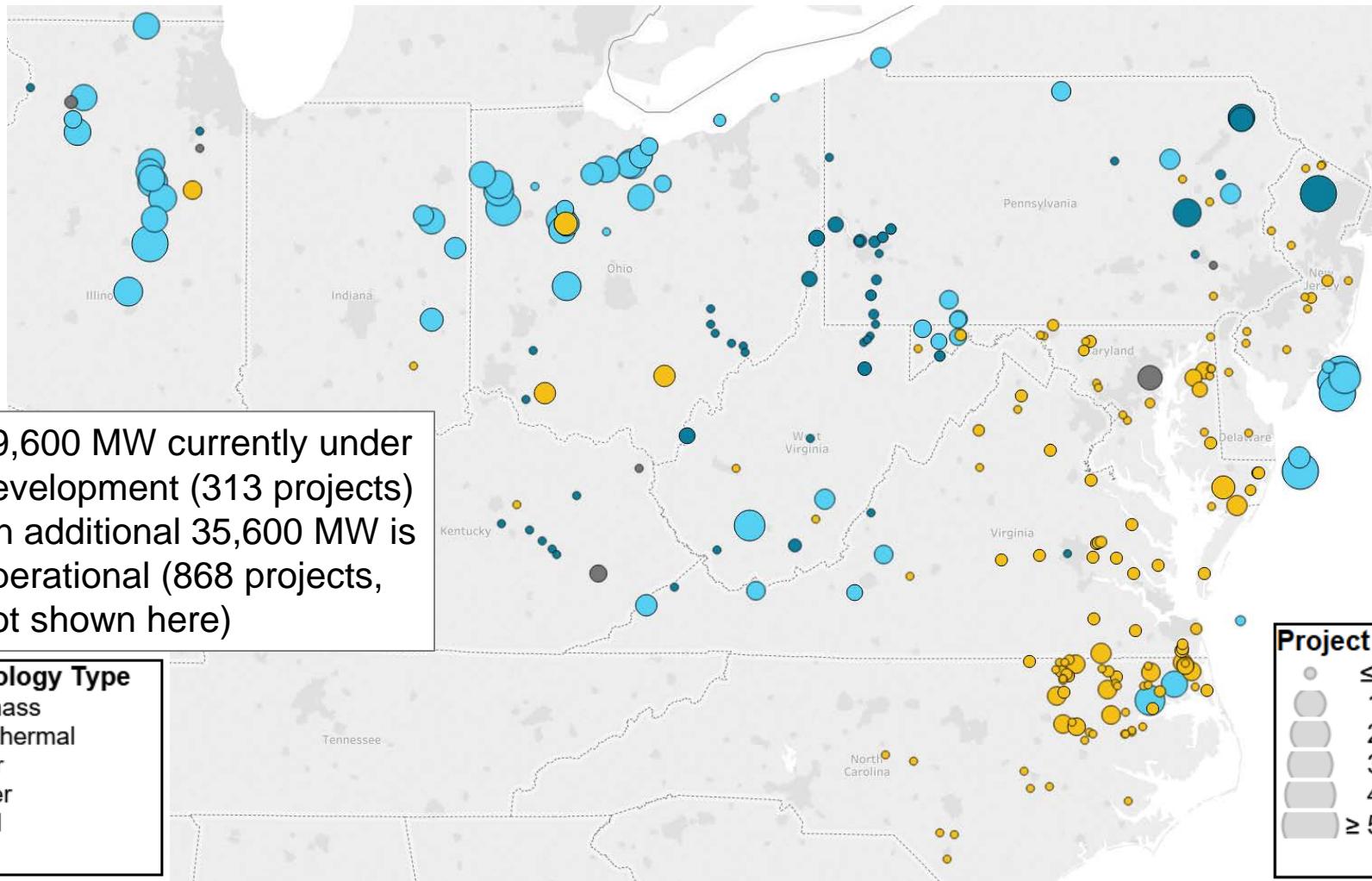
PPA Success Factors

- > Alignment
 - It's never too early to get your organization(s) on the same page; this is an ongoing activity, not a one-time event
- > Change management
 - Don't underestimate the challenge inherent in making the switch from 1-3 year contracts to longer-term purchases – needs to be a cross-organizational, cross-functional effort
- > Competition
 - Highly competitive and properly structured solicitations will ferret out the best values
- > Due diligence
 - Great due diligence on developers and projects helps avoid problems further down the line
- > Value vs price
 - Different places on the grid have different values based on supply, demand and congestion (think of the latter as traffic congestion that you want to avoid)
- > Analysis
 - Don't be fooled by PPA price alone since many low-priced projects have low prices because they're in poor locations and need to offer bargain prices
 - Correlation of wholesale solution to your electricity cost is an important factor
 - Consider your "Business as Usual" risk – retail rates (whether regulated or unregulated) are exposed to price risk – even tariff based rates in regulated states often have fuel surcharge pass-throughs and will always adjust to what is happening in the wholesale markets, although perhaps on a slightly longer time scale

Many Large Scale Renewable Energy Projects Under Development Nationwide



LSRE Projects Under Development in PJM



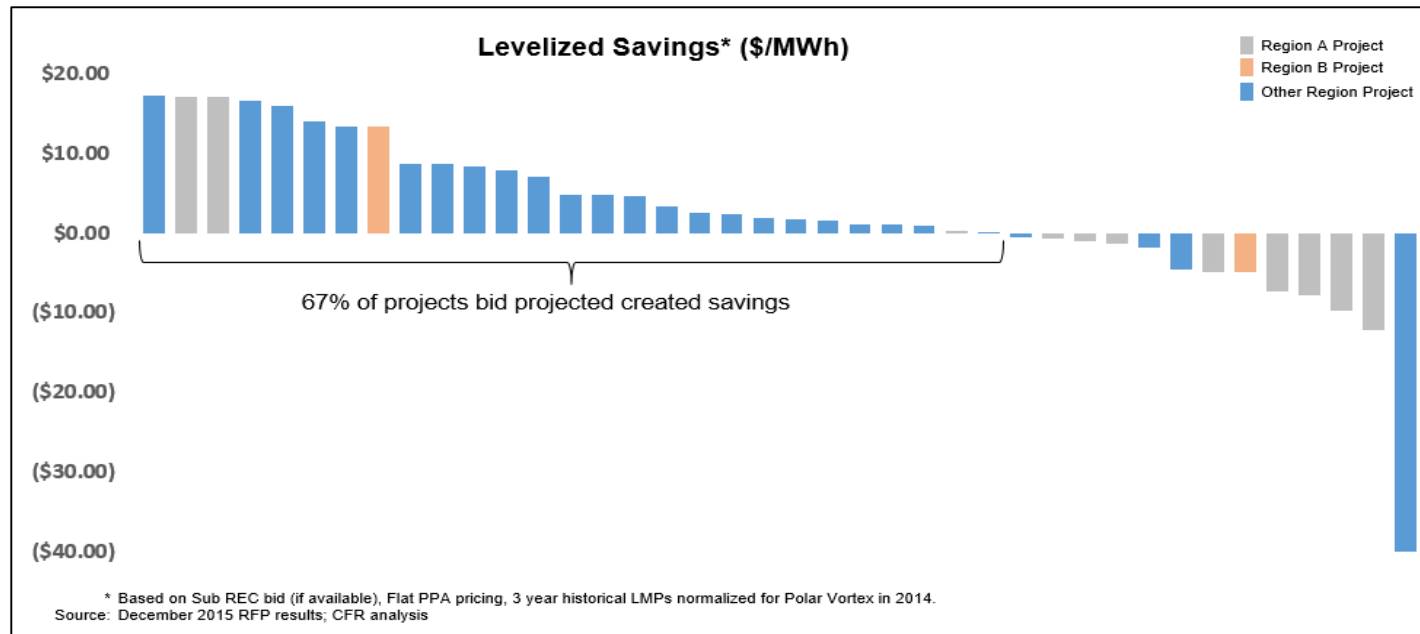
- > 29,600 MW currently under development (313 projects)
- > An additional 35,600 MW is operational (868 projects, not shown here)

Technology Type	
■	Biomass
■	Geothermal
■	Solar
■	Water
■	Wind

Project Size	
●	≤ 10.0
●	100.0
●	200.0
●	300.0
●	400.0
●	≥ 500.0

Positive Benefits when Best Projects are Identified in an Inefficient Market

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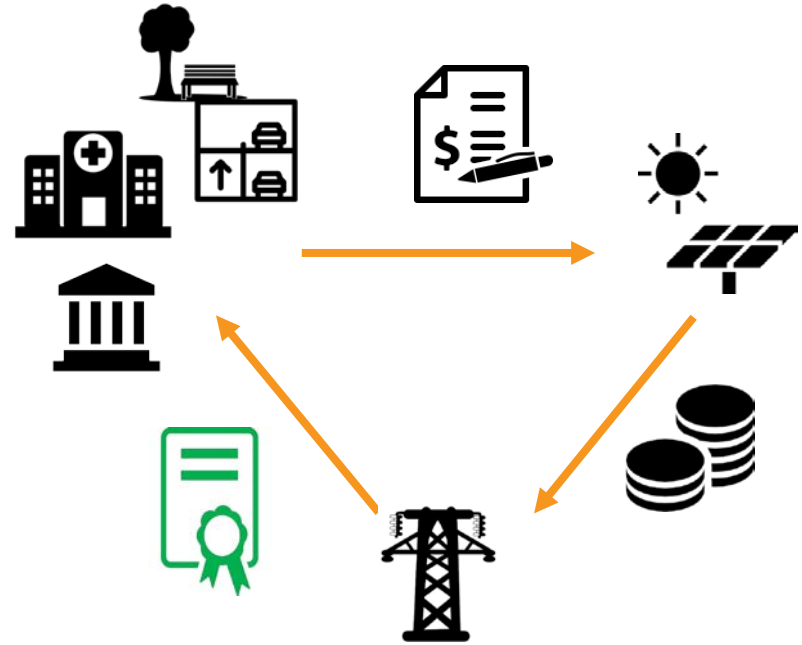


- > Initial economics for bids evaluated for a recent CFR customer; PPA prices ranged from \$15 to \$90
- > The top 5 projects by Levelized Savings (Benefits) had PPA prices in the \$16 - \$47 range
- > High market prices, capacity values and other factors make some seemingly expensive projects profitable





Source: CFR analysis

Customer Aggregation Can be Tailored to Success

Successful Aggregations



<p>Multiple Organizations Single business unit/location</p>	
<p>Single Organization Multiple business units/locations</p>	
<p>Multiple Organizations Multiple business units/locations</p>	

-  255,000 solar panels
-  650 acres
-  146,000 MWh
-  Power for ~9,700 homes



60MW Summit Farms

Convened by A Better City

CFR – Who We Are

Renewable Energy Advisory Firm

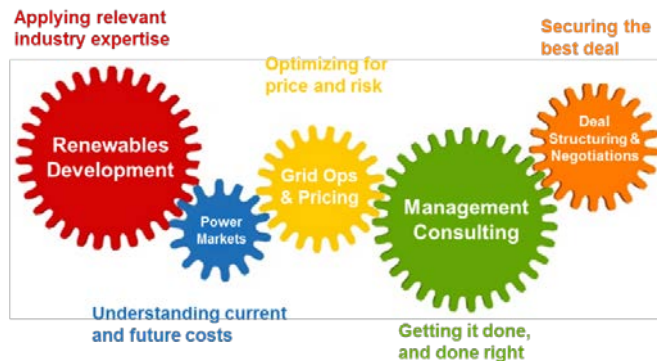
- Founded in 2010 by two former McKinsey & Company energy practice partners
- Focus 100% on bringing tailored large-scale renewable energy (LSRE) solutions to large end-users
- Technology, developer and project agnostic
- Customer-first approach underpins everything we do to maximize economic value for our customers

Team Experience

- 150+ years combined energy experience:
~2,900 MW of renewables
~6,000 MW traditional generation
- Deep expertise in corporate strategy, innovation, organizational and operational issues
- Advanced capabilities in risk management, financial analysis, and transaction execution



Core Capabilities



Client Examples



Accelerate your organization's switch
to renewable energy with a trusted
advisor and tailored solution

Customer  First
Renewables