# An Integrative Business Model for Net Zero Districts

International District Energy Association Annual Conference
June 27, 2017 | Scottsdale, AZ


Transforming global energy use to create a clean, prosperous, and secure low-carbon future.


RMI TRANSFORMS GLOBAL ENERGY USE TO CREATE A CLEAN, PROSPEROUS, AND SECURE LOW-CARBON FUTURE
ROCKY MOUNTAIN INSTITUTE

# THE PROBLEM: CLIMATE CHANGE
# THE SOLUTION: HAS TO INCLUDE BUILDING ENERGY USE

WORLD LEADERS ARE ALIGNING TO ADDRESS THE URGENT CLIMATE CHALLENGE

OUR BUILDINGS CAN MAKE OR BREAK THESE AMBITIOUS GOALS

AND HELP US TRANSITION TO A LOW-CARBON ELECTRICITY SYSTEM

## 2°C

**The ambitious global climate target ratified at COP21**

## 39%

**Buildings are responsible for more than one-third of all U.S. GHG emissions**

## 72%

**U.S. buildings consume nearly three-quarters of all electricity**

Sources: McKinsey & Co, Unlocking Efficiency in the U.S. Economy, 2009; The Rockefeller Foundation, United States Building Energy Efficiency Retrofits: Market Sizing and Financing Models, 2012; RMI, Reinventing Fire, 2011.

# DRIVING CHANGE THROUGH MAJOR INTERVENTIONS

WE CHOOSE PROJECTS THAT DRIVE THE GREATEST IMPACT AND INFLUENCE THE MARKET

WE PLAN TO REDUCE 398 TRILLION BTU OF ENERGY CONSUMPTION OVER 4 BILLION SQ FT OF SPACE

AS AN INDEPDENT, TRUSTED 3rd-PARTY THAT DRIVES RESULTS

## EMPIRE STATE BUIDLING

- **Retrofitted in 2009**
- **38% energy savings**
- **3-year payback**
- **44% cost offset**

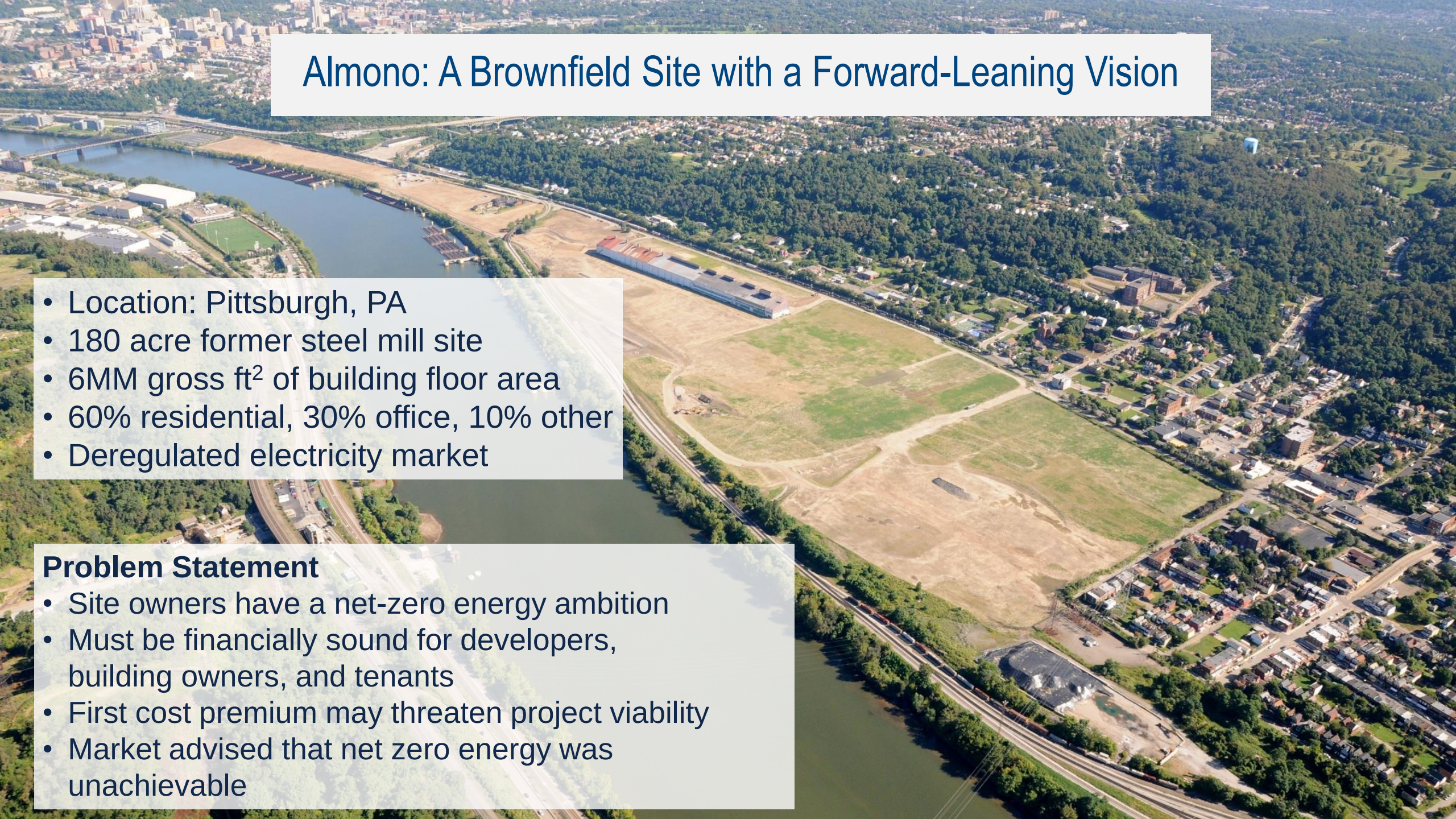
## ALMONO DEVELOPMENT

- **180 acre mixed-use, 6MM gross ft$^2$ of building floor area in Pittsburgh, PA**
- **Largest zero-energy community in U.S.**
- **New, attractive business model**

## ARIZONA STATE UNIVERSITY

- **Partnered to develop master plan to go carbon neutral by 2025 (2035 with transportation)**
- **Costs less than modeled business-as-usual**

# Almono: A Brownfield Site with a Forward-Leaning Vision



- Location: Pittsburgh, PA
- 180 acre former steel mill site
- 6MM gross $ft^2$ of building floor area
- 60% residential, 30% office, 10% other
- Deregulated electricity market

**Problem Statement**

- Site owners have a net-zero energy ambition
- Must be financially sound for developers, building owners, and tenants
- First cost premium may threaten project viability
- Market advised that net zero energy was unachievable

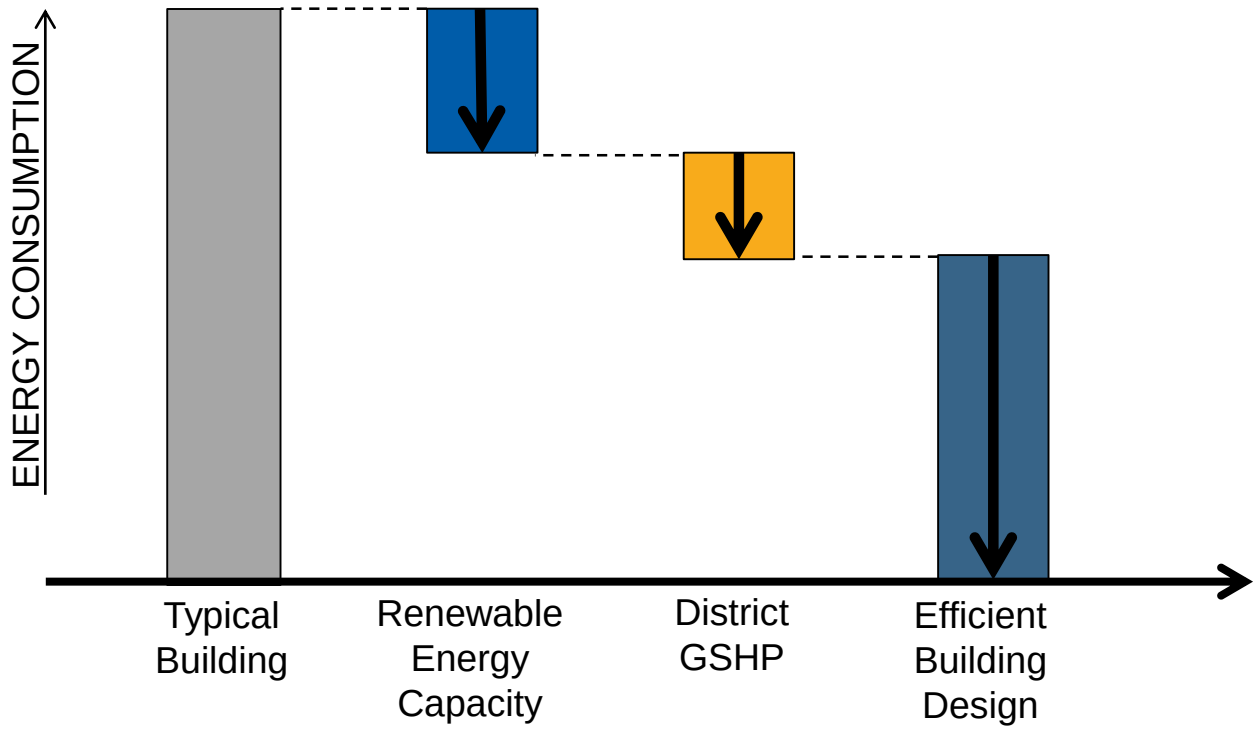
# Developing Site Net-Zero Energy Ambitions

**Zero Energy Vision**

- Best-in-class efficiency standards
- Central geothermal heating/cooling
- Rooftop solar PV
- Integrated financing solution

A whole-systems technical and business approach can result in a **financially attractive** proposition for developers, tenants, and an Integrated Energy Services Provider

# The **pathway to zero** for Almono includes on-site renewables, district scale GSHP, and efficient building design



*“Whenever I run into a problem I can’t solve, I always make it bigger.*

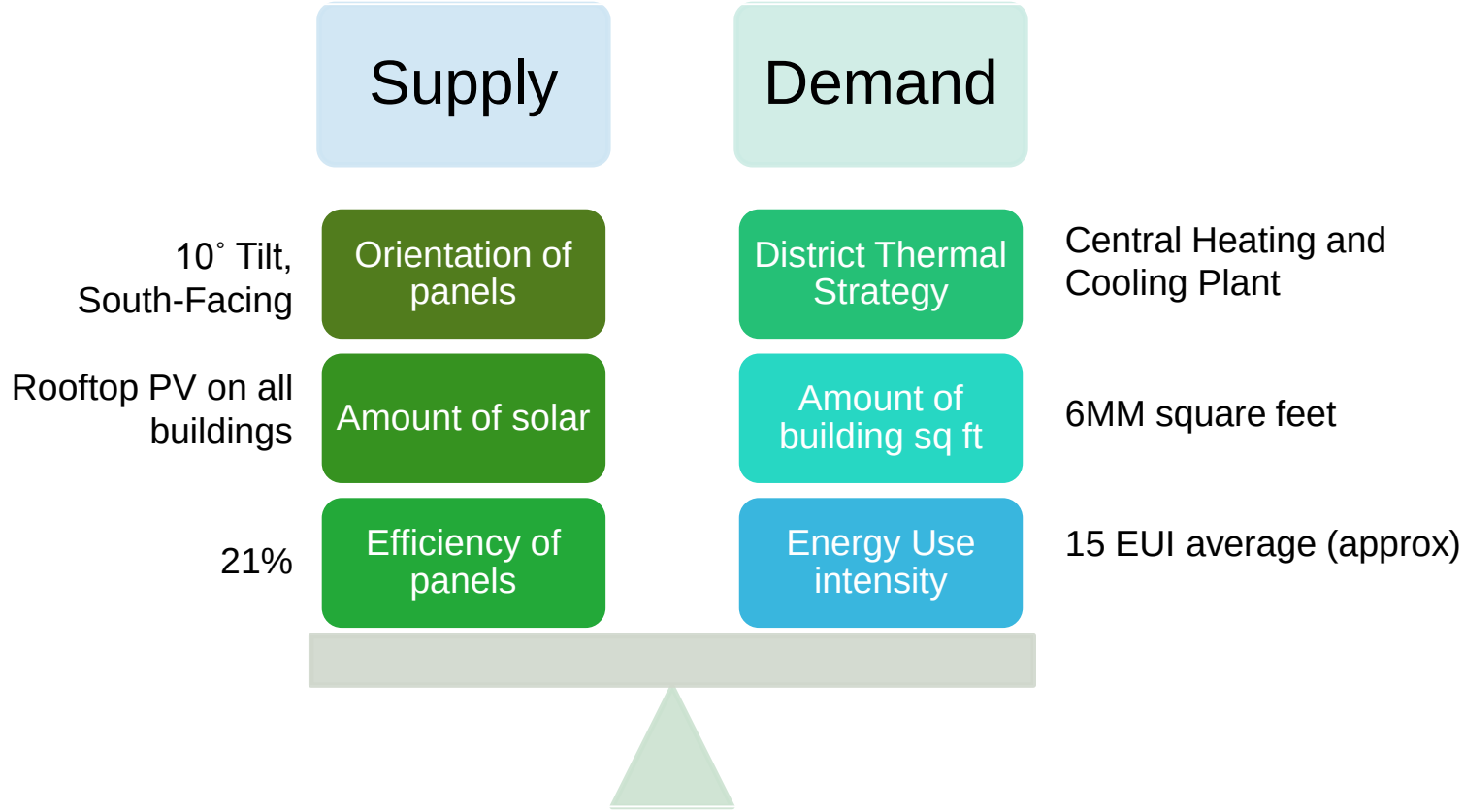
*I can never solve it by trying to make it smaller, but if I make it big enough I can begin to see the outlines of a solution.”*

– Dwight D. Eisenhower

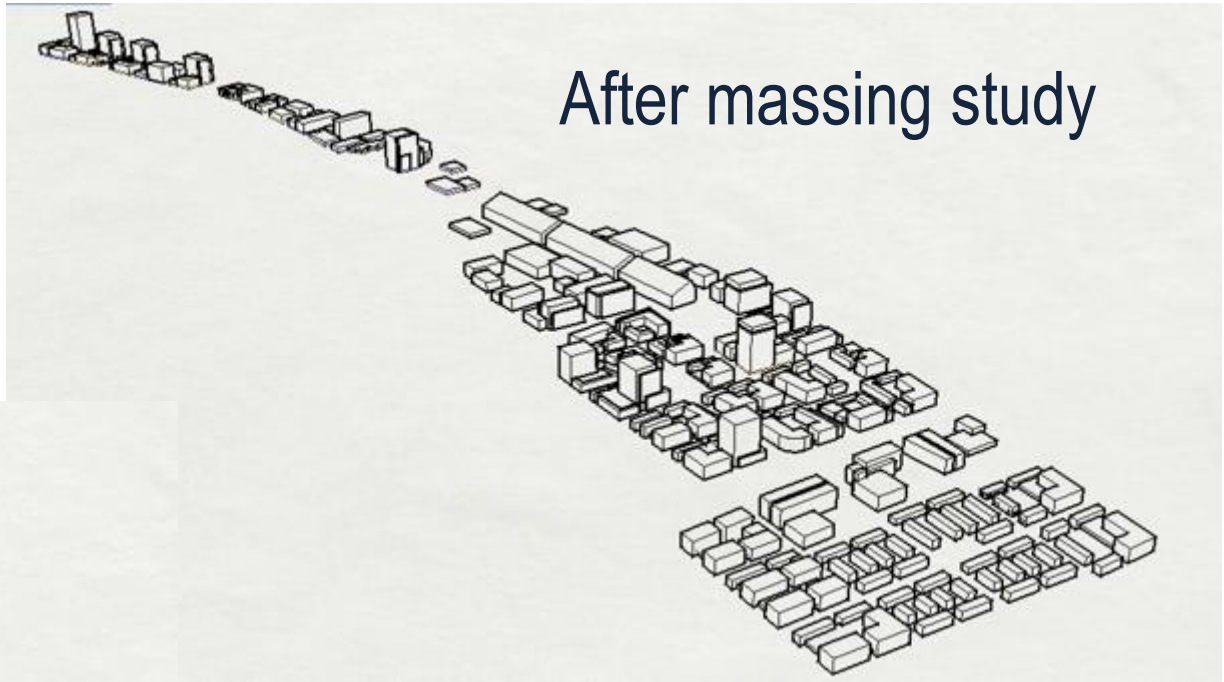
# Achieving net-zero energy requires a holistic approach to balance energy supply & demand

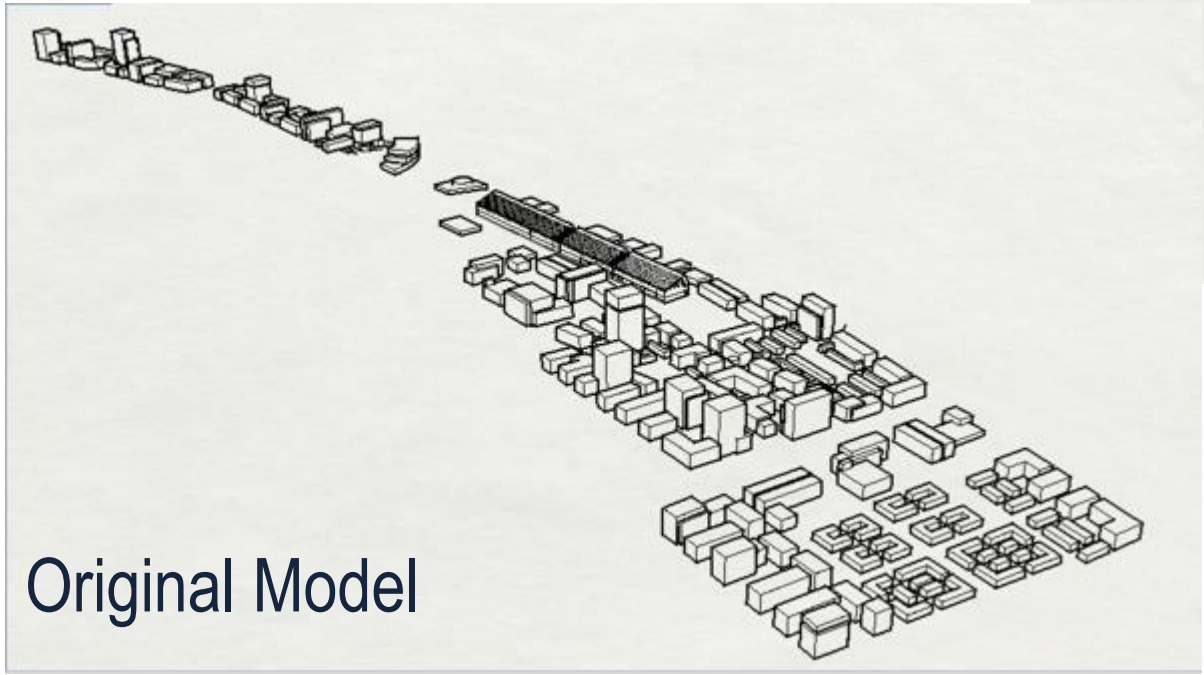
***Key Concept:***

Several factors affect the net-zero energy budget, making on-site net-zero energy easier or more difficult to achieve



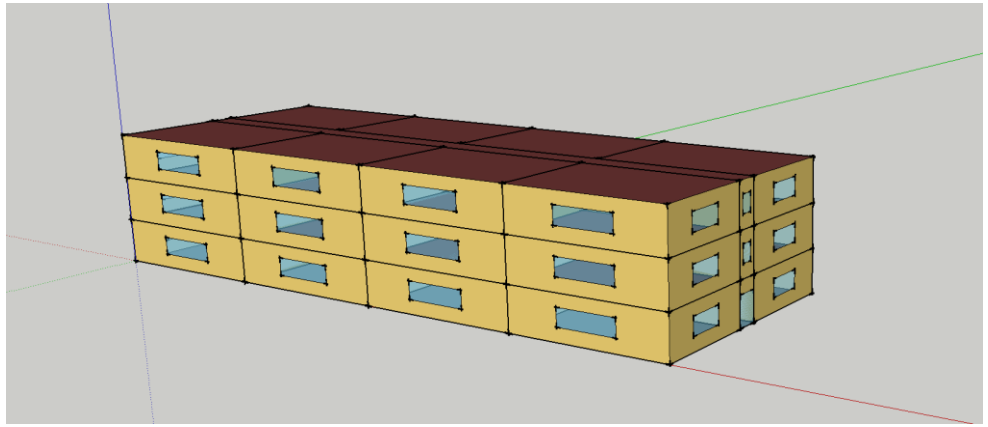
# Site-wide studies allowed us to quantify and maximize available on-site solar resources



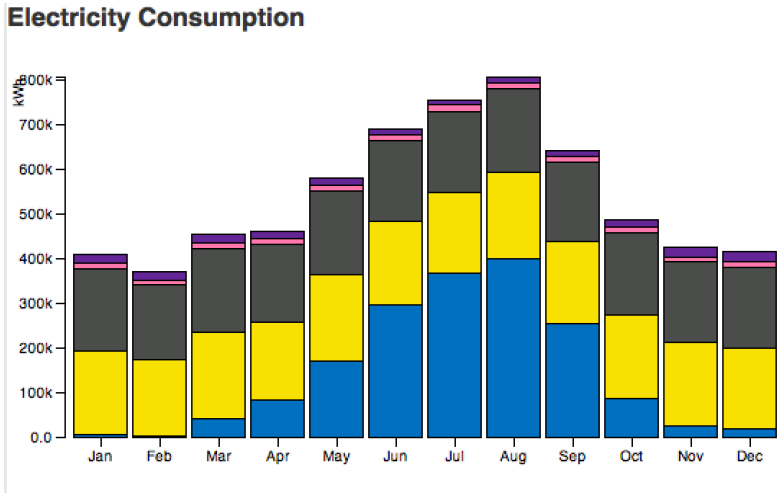



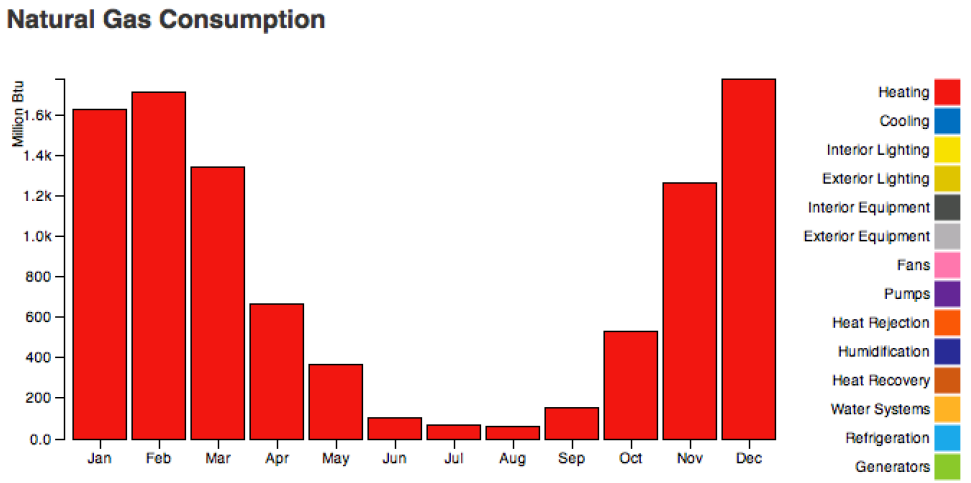

- Maximized roof PV area
- More solar access for south-facing windows
- Passive solar-advantaged building orientation
- 25% increase in site solar insolation, even with a 5% increase in site program (sq ft)

# Whole building energy modeling was used to develop and justify performance targets

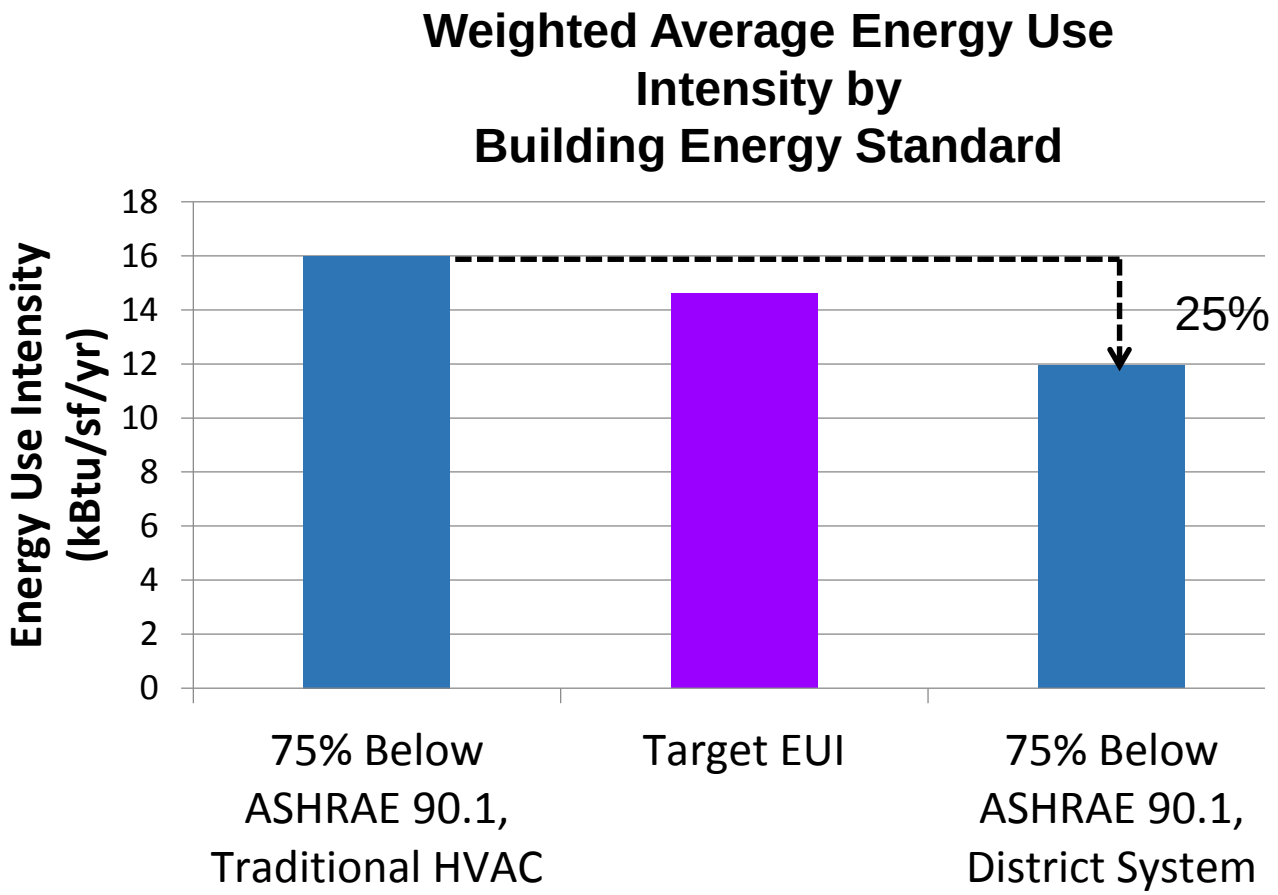


- Maximize value by using energy modeling for design, not just verification
- Start energy modeling early on, and use throughout design process
- Energy modeling is an iterative process with an increasing level of detail

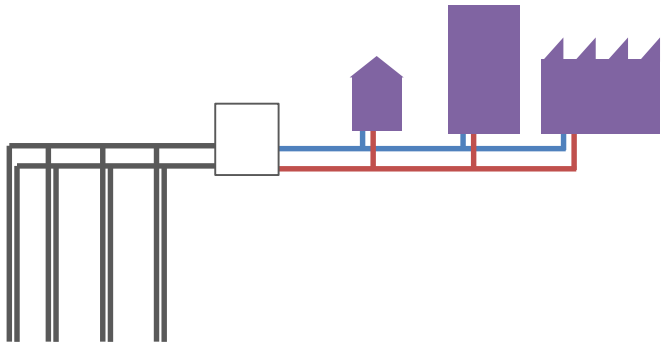


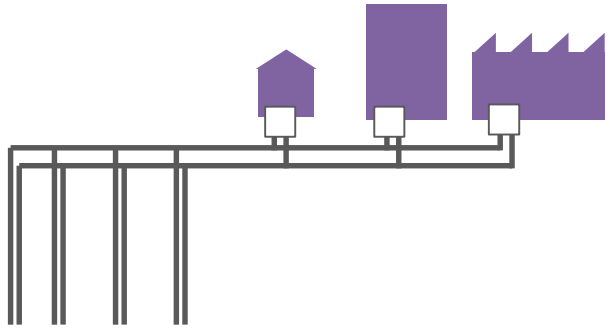
# A district system would enable forward-leaning energy requirements



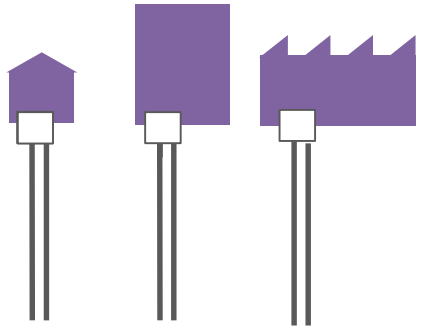
# RMI compared several ground source heat pump configurations



CENTRAL HEATING AND COOLING PLANT(S)

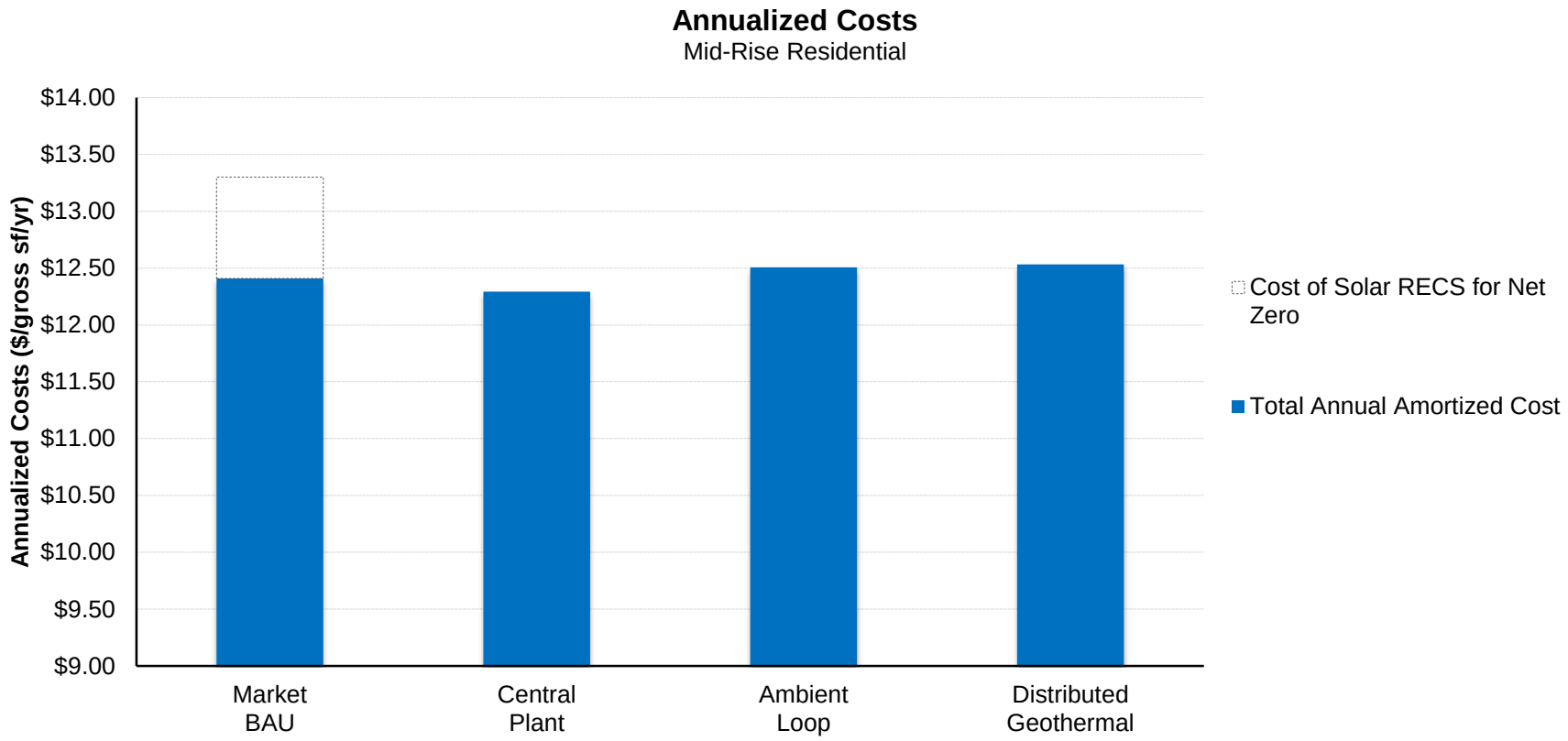


GROUND SOURCE LOOP with DISTRIBUTED HEAT PUMPS



STAND ALONE GROUND SOURCE HEAT PUMPS

# Multiple district energy options had comparable site-wide energy efficiency at similar cost




All geothermal scenarios were **very similar to BAU** in terms of site-wide energy efficiency and annualized costs.
**However, the centralized scenario offered distinct advantages that look beyond the pure technical and financial analysis.**

*“Whenever I run into a problem I can’t solve, I always make it bigger**er.**”*

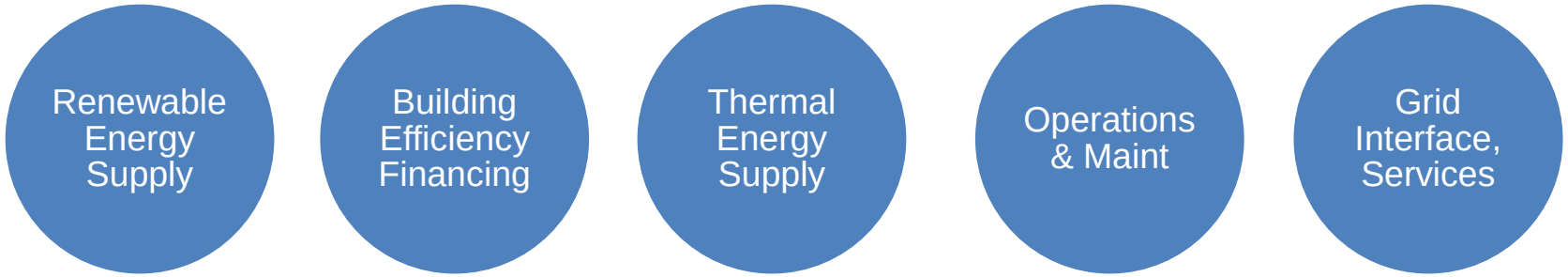
– Unattributed Quote

# Looking beyond pure economics and energy efficiency: An *even more* holistic approach uncovered additional benefits of a centralized system

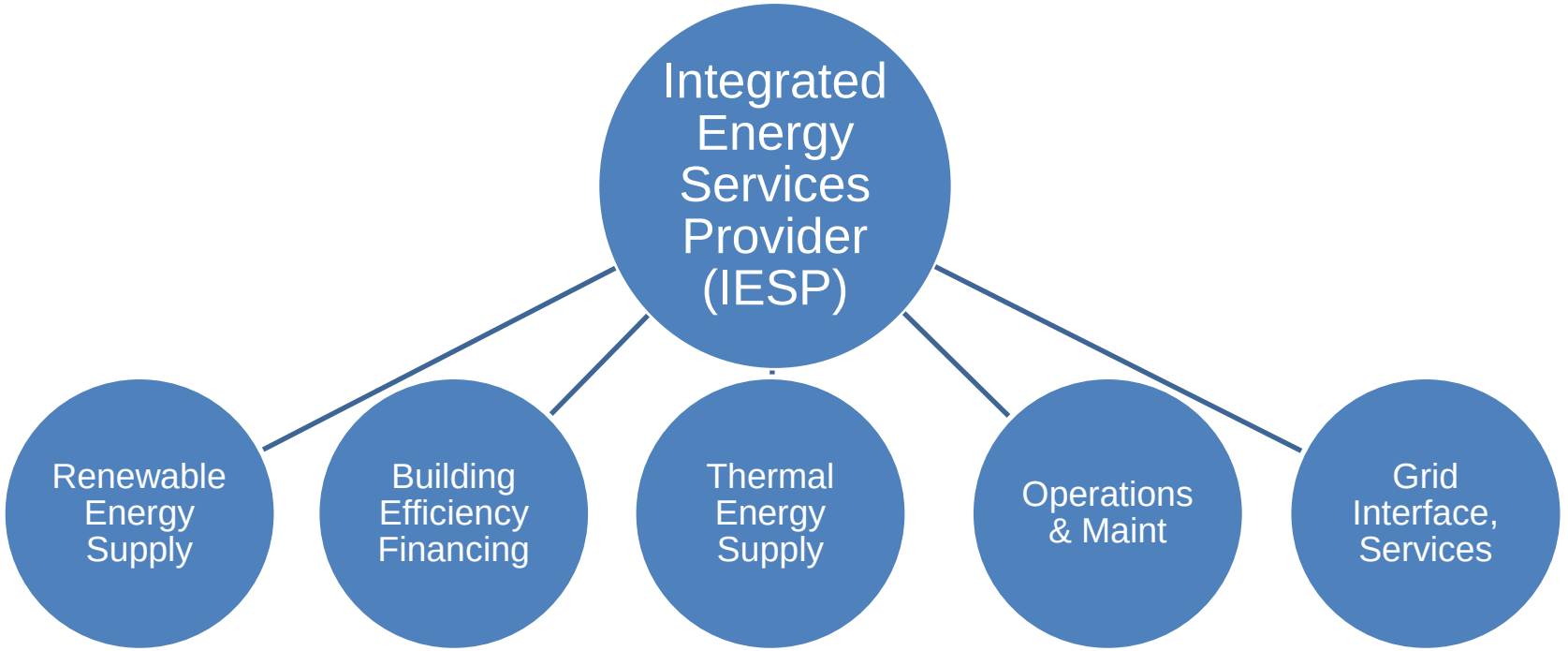
A centralized system could:

1. **Shift upfront capital costs for heating and cooling equipment** from individual buildings (vertical developers) to a district energy developer.
2. **Provide basis for on-bill efficiency financing** based on local market circumstances.
3. **Facilitate electricity market revenue opportunities** like demand response, frequency regulation, or investment deferral for utility infrastructure.
4. **Centralize control** of the site heating and cooling system, including operations and maintenance.
   This provides more opportunity for control and optimization, aligns incentives for an energy developer to maintain the system and operate it efficiently, and significantly reduces the amount of refrigerant required onsite.

# This integrated technical and business approach could enable a number of new energy savings and revenue opportunities across the site

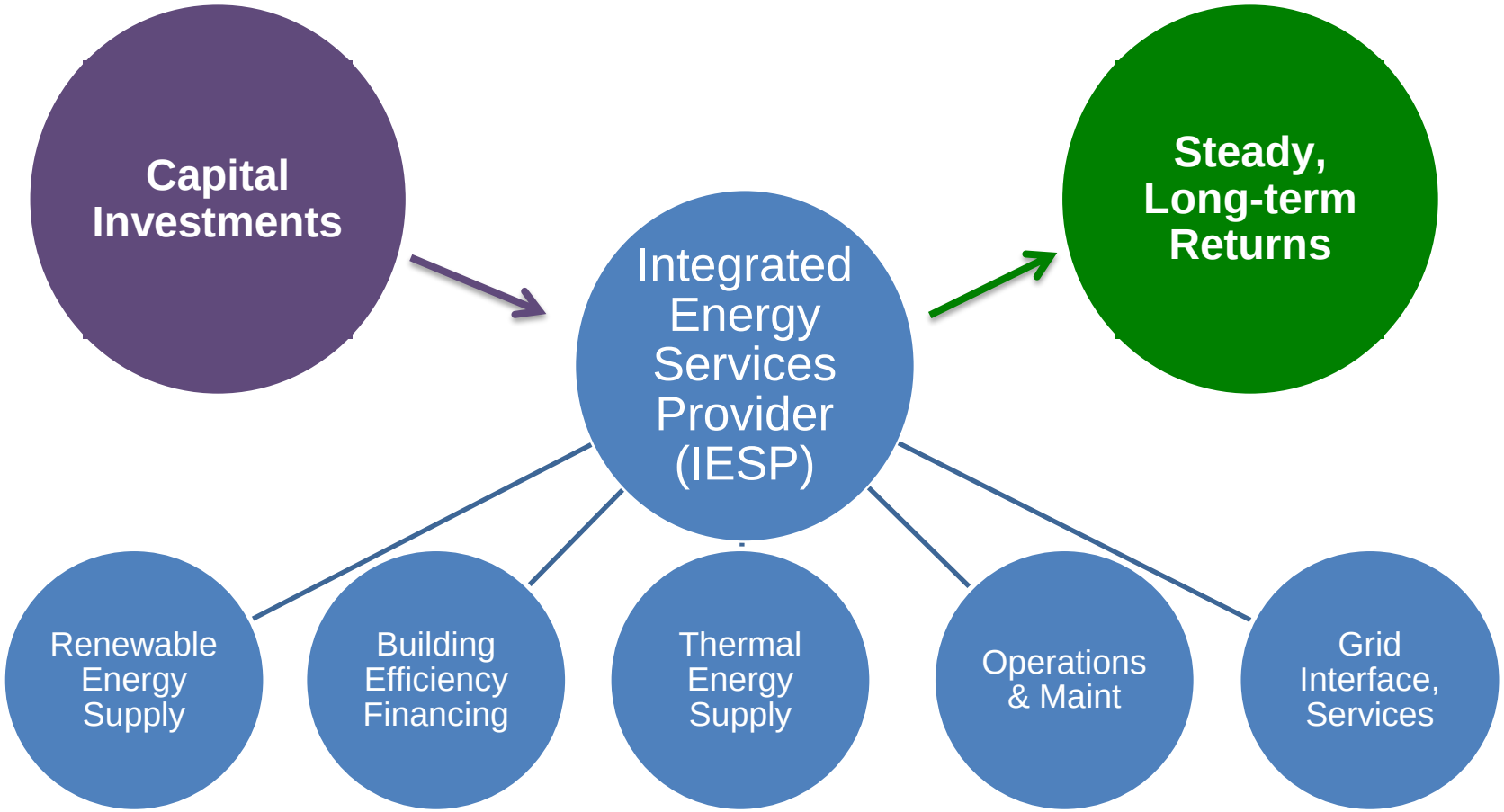


# These functions could all be performed by a single entity



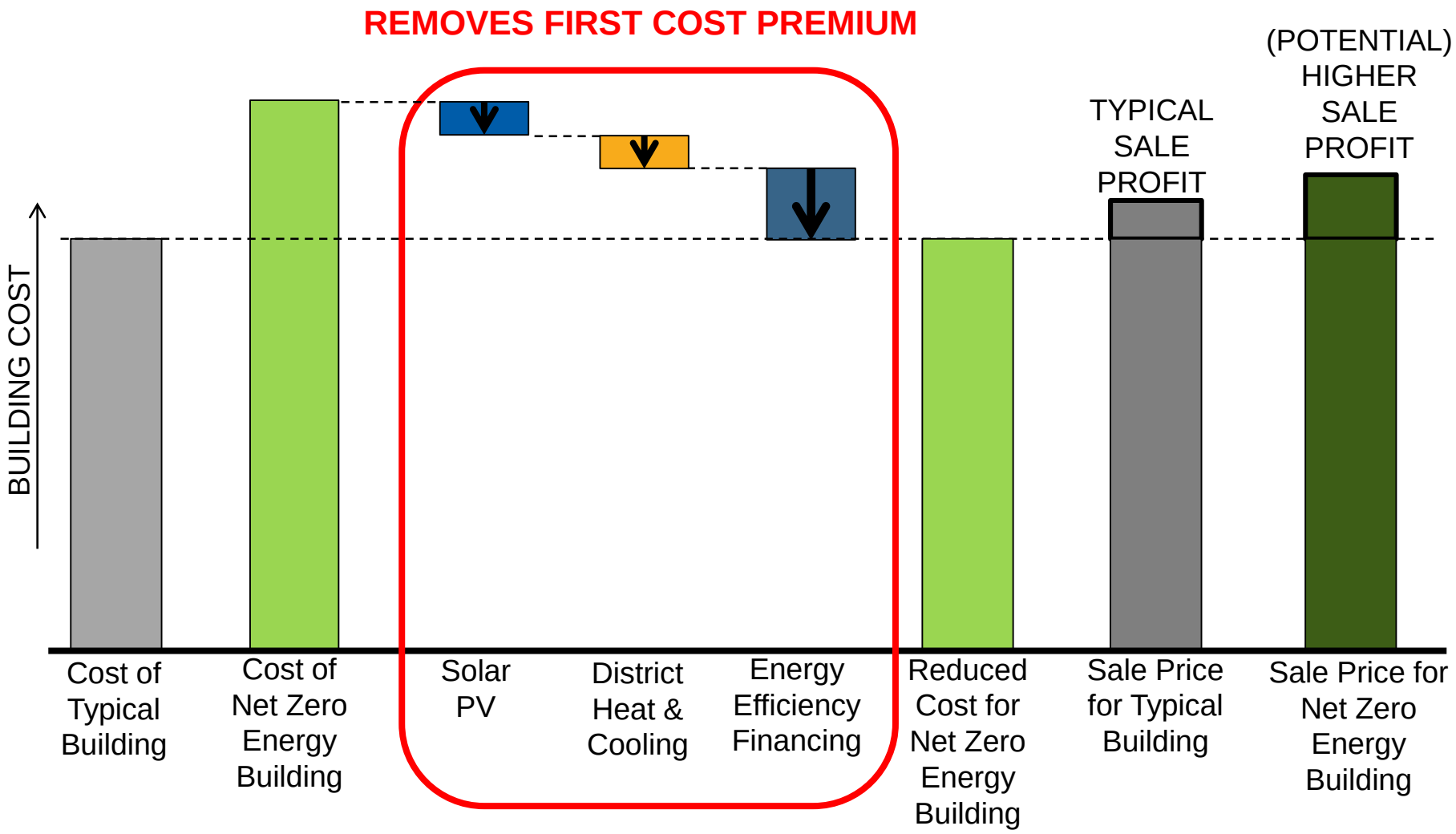

The **integrated energy services provider (IESP)** aggregates site energy services while ensuring that **net-zero energy is financially attractive** to **vertical developers and tenants**

# The IESP would have aligned incentives while driving a greater investment opportunity

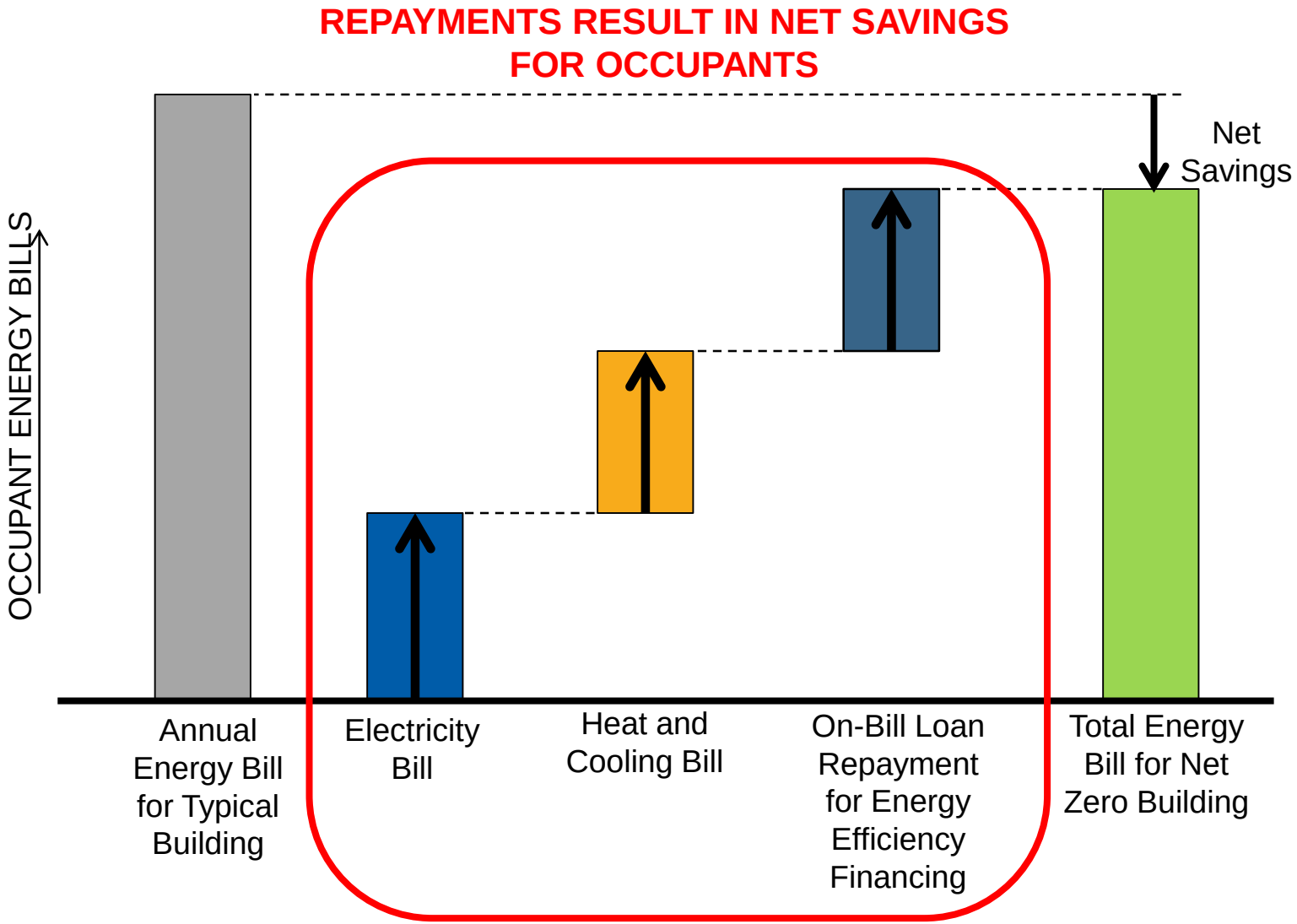



The **integrated energy services provider (IESP)** aggregates site energy services while ensuring that **net-zero energy is financially attractive** to **vertical developers and tenants** while collecting a **steady, long-term return** (comparable to infrastructure investment).

# IESP shifts up front costs from individual building to central entity



# IESP revenues are delivered through the occupant energy bills



# Key Conclusions

**An integrated energy service provider model paves a pathway to achieving net-zero energy without compromising real estate market economics**

1. **Enables a technical path to net zero energy:** District heating and cooling technologies are coupled with efficiency and renewable energy for overall greater carbon reductions impact than business-as-usual

2. **Enables capital markets to invest:** The investment has sufficient scale and repayment security because the IESP has a captive market for decades to come.

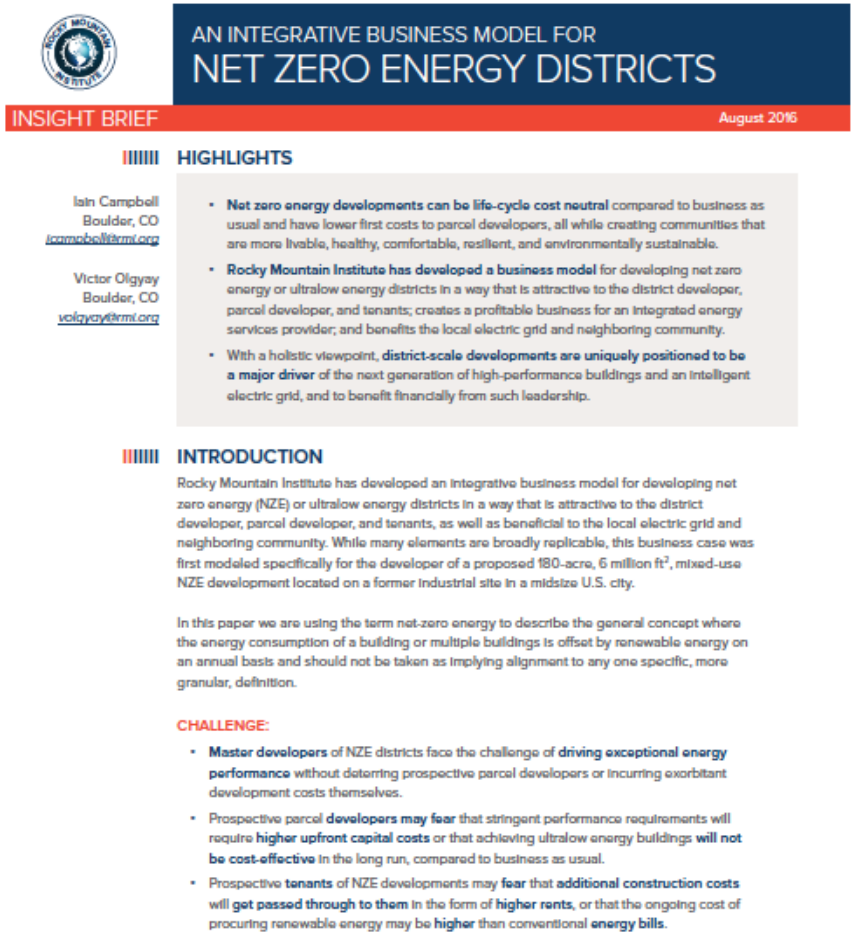
3. **Reduces or eliminates first cost premium:** Shifts the first cost for heating/cooling equipment, efficiency, and on-site renewable generation to a central entity

4. **Results in net savings for occupants** by reducing the total cost of energy for tenants

# Download the Insight Brief: "An Integrative Business Model for Net Zero Energy Districts"

- This presentation closely follows the approach that is detailed in an insight brief (short report) featured on our website: http://info.rmi.org/NZE_Districts

- RMI strives to develop business models that represent a diversity of regulatory environments, ownership structures, and other criteria for zero energy districts.



AN INTEGRATIVE BUSINESS MODEL FOR
NET ZERO ENERGY DISTRICTS

INSIGHT BRIEF August 2016

Iain Campbell
Boulder, CO
icampbell@rmi.org

Victor Olgyay
Boulder, CO
volgyay@rmi.org

## HIGHLIGHTS

- **Net zero energy developments can be life-cycle cost neutral** compared to business as usual and have lower first costs to parcel developers, all while creating communities that are more livable, healthy, comfortable, resilient, and environmentally sustainable.
- **Rocky Mountain Institute has developed a business model** for developing net zero energy or ultralow energy districts in a way that is attractive to the district developer, parcel developer, and tenants; creates a profitable business for an integrated energy services provider; and benefits the local electric grid and neighboring community.
- With a holistic viewpoint, **district-scale developments are uniquely positioned to be a major driver** of the next generation of high-performance buildings and an intelligent electric grid, and to benefit financially from such leadership.

## INTRODUCTION

Rocky Mountain Institute has developed an integrative business model for developing net zero energy (NZE) or ultralow energy districts in a way that is attractive to the district developer, parcel developer, and tenants, as well as beneficial to the local electric grid and neighboring community. While many elements are broadly replicable, this business case was first modeled specifically for the developer of a proposed 180-acre, 6 million ft², mixed-use NZE development located on a former industrial site in a midsize U.S. city.

In this paper we are using the term net-zero energy to describe the general concept where the energy consumption of a building or multiple buildings is offset by renewable energy on an annual basis and should not be taken as implying alignment to any one specific, more granular, definition.

CHALLENGE:

- **Master developers** of NZE districts face the challenge of **driving exceptional energy performance** without deterring prospective parcel developers or incurring exorbitant development costs themselves.
- Prospective parcel **developers may fear** that stringent performance requirements will require **higher upfront capital costs** or that achieving ultralow energy buildings **will not be cost-effective** in the long run, compared to business as usual.
- Prospective **tenants** of NZE developments may **fear** that **additional construction costs** will **get passed through to them** in the form of **higher rents**, or that the ongoing cost of procuring renewable energy may be **higher** than conventional **energy bills**.

# THANK YOU

Matt Jungclaus | mjungclaus@rmi.org | Twitter @MAJungclaus

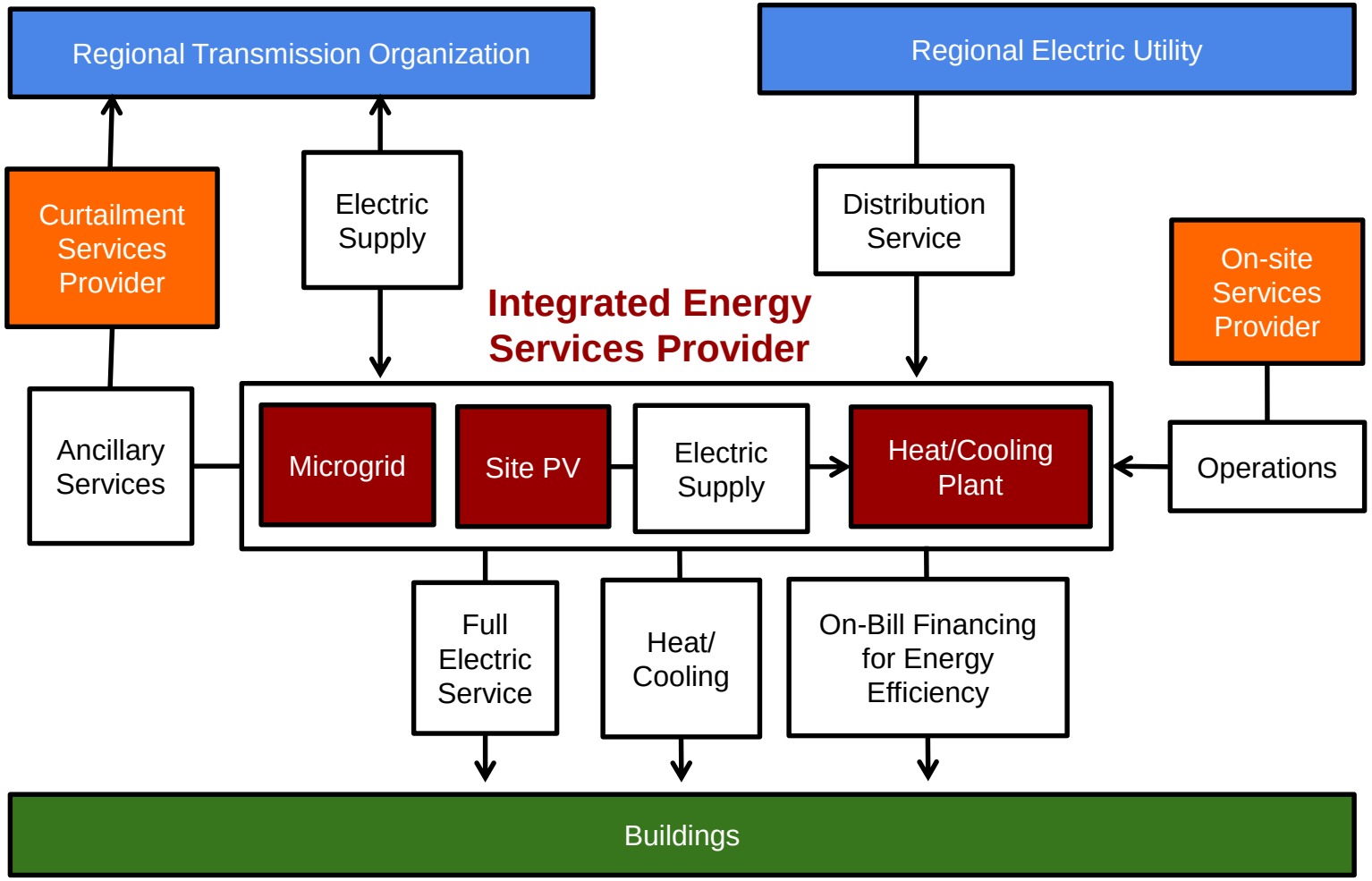
International District Energy Association Annual Conference | June 27, 2017

Engage with RMI

Transforming global energy use to create a clean, prosperous, and secure low-carbon future.

www.rmi.org | Twitter @RockyMtnInst | Facebook.com/RockyMtnInst/

# The IESP can also interface with the regional transmission authority, the regional electric utility, and the customer to maintain day-to-day operations



# Appendix Slide:
# The IESP would see substantial returns after a steady, long-term payback