Path to Net Zero

Pushing the Limits in the Oregon New Construction Market

Spencer Moersfelder, Business Sector Manager

EnergyTrust of Oregon

Topics

- Pilot development
- Offerings, with examples
  - Early Design Assistance
  - Technical Assistance
  - Installation & Commissioning
  - Monitoring & Reporting

Energy Trust of Oregon New Buildings Program

Projects we serve:

Commercial new construction

Major renovations

Tenant build-outs

Additions to existing buildings

LEED®

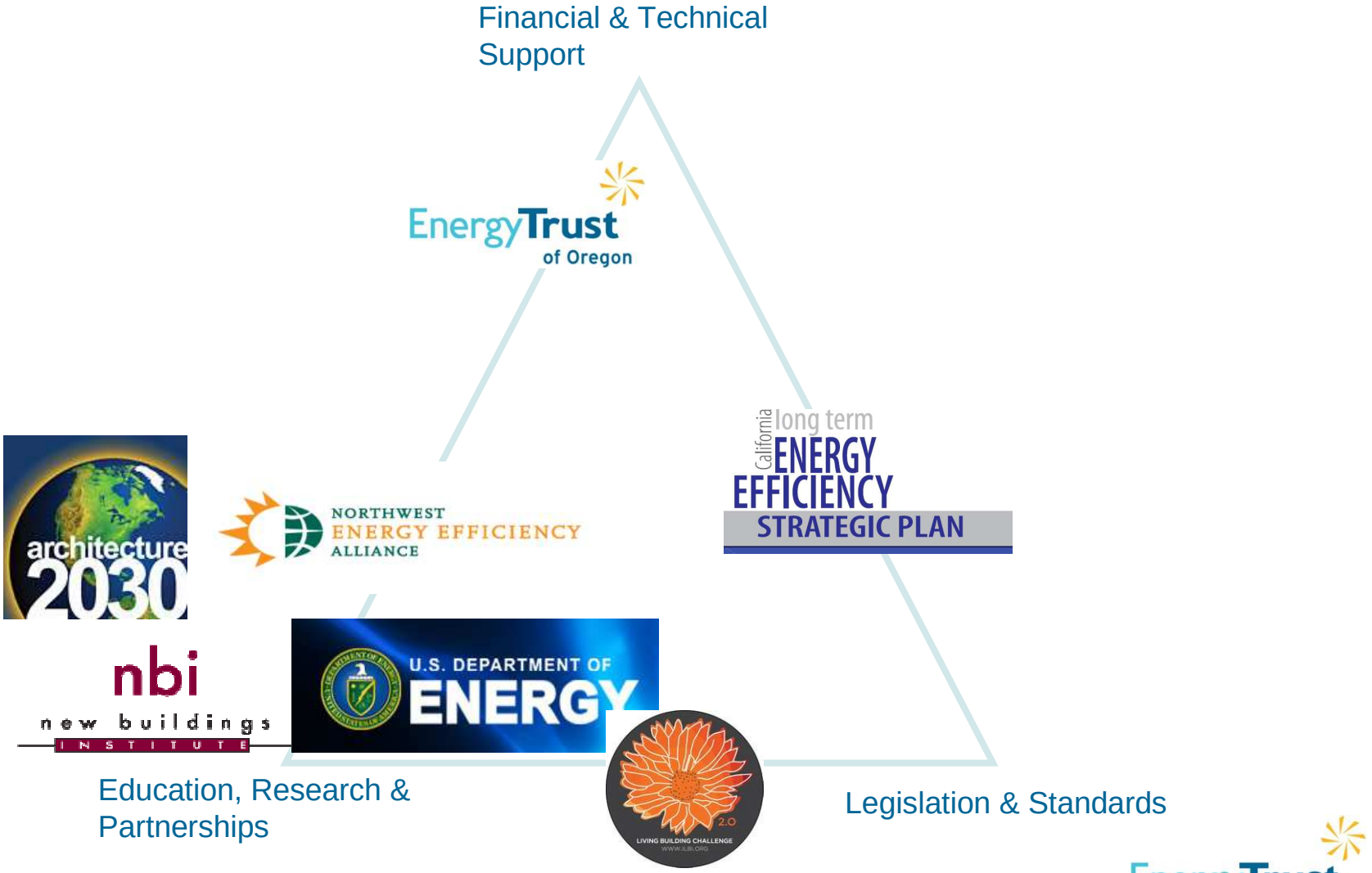
ENERGY STAR®

What we offer:

Financial incentives for energy-efficient equipment and energy studies

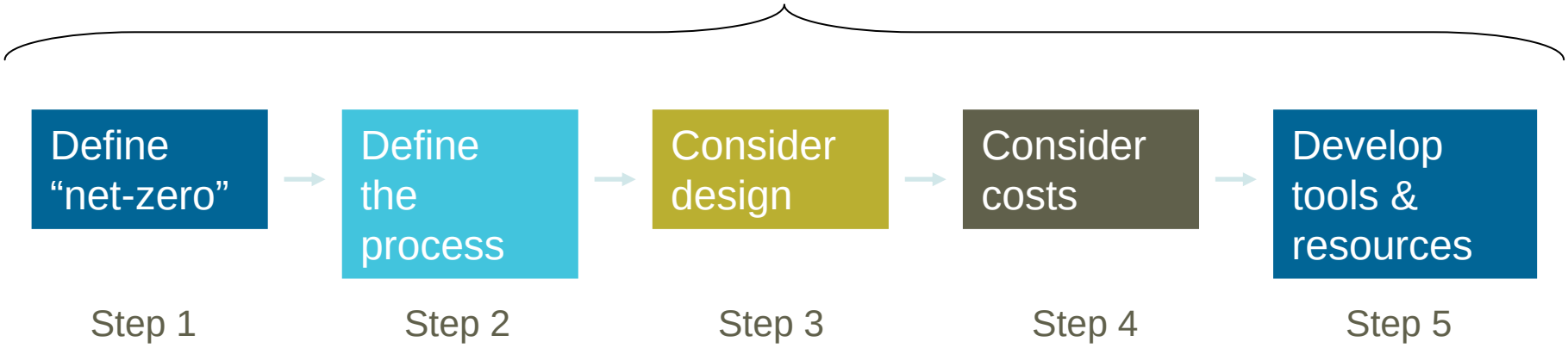
www.energytrust.org/newbuildings

Growing momentum for net zero

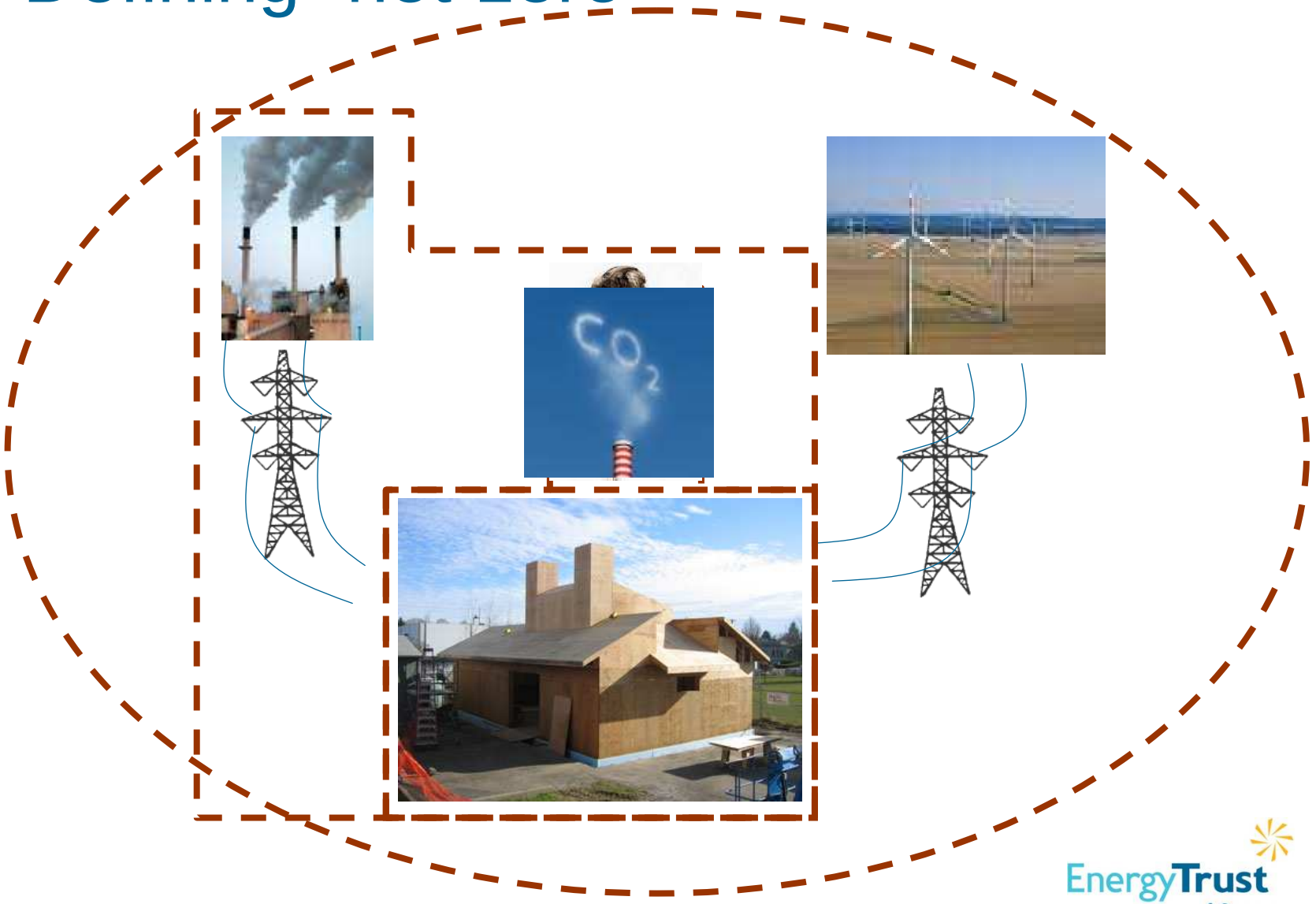


Reaching net zero

Developing the pilot



Defining “net-zero”



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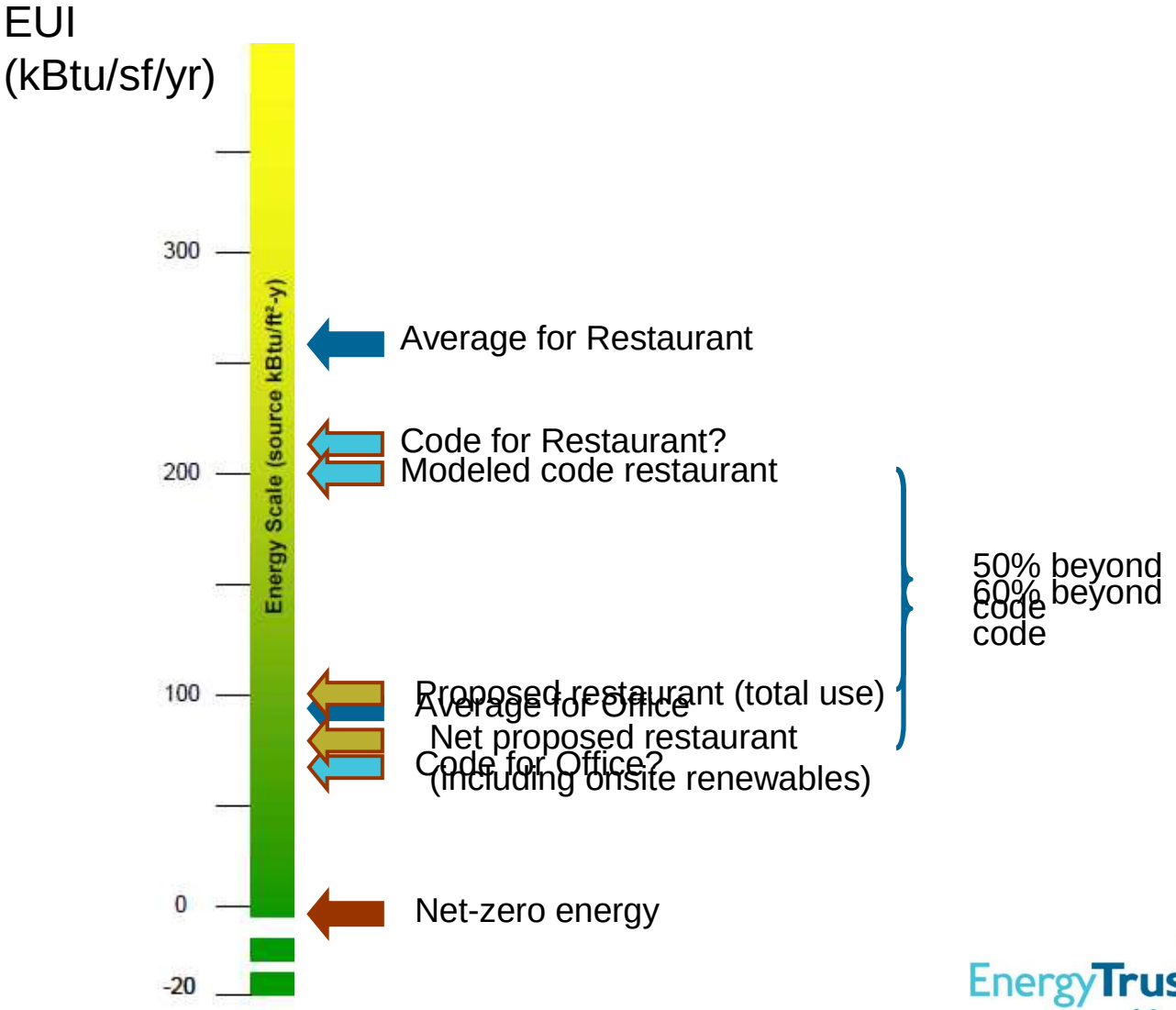
Measuring success



Measuring success

Participants must be committed to achieving:

- at least 60% energy savings beyond Oregon code through energy efficiency and renewable energy *and*
- at least 50% energy savings beyond Oregon code through energy efficiency alone

Where code doesn't apply, projects must use common practice as the baseline

Lessons from Stakeholders

Process for designing a net-zero building

- NZ goal must be identified early and whole team must be committed to the goal
- Whole project team must meet early and often (integrated design)
- Commissioning agents need to be on-board early and involved throughout the process.
  - $10,000 in Early Design Assistance
- Monitoring and reporting needs must be considered early.
  - M&R plan review

Design considerations

- Energy models used as a design tool; must be iterative.
- Other energy-related studies should inform design: climatic studies, CFD analysis and daylighting analysis
- Identifying and optimizing passive and innovative building systems takes time and expertise
- Impact of plug loads and occupant behavior is crucial but difficult to measure.
  - Doubled Technical Assistance

Cost considerations

- Owners and designers perceive that they
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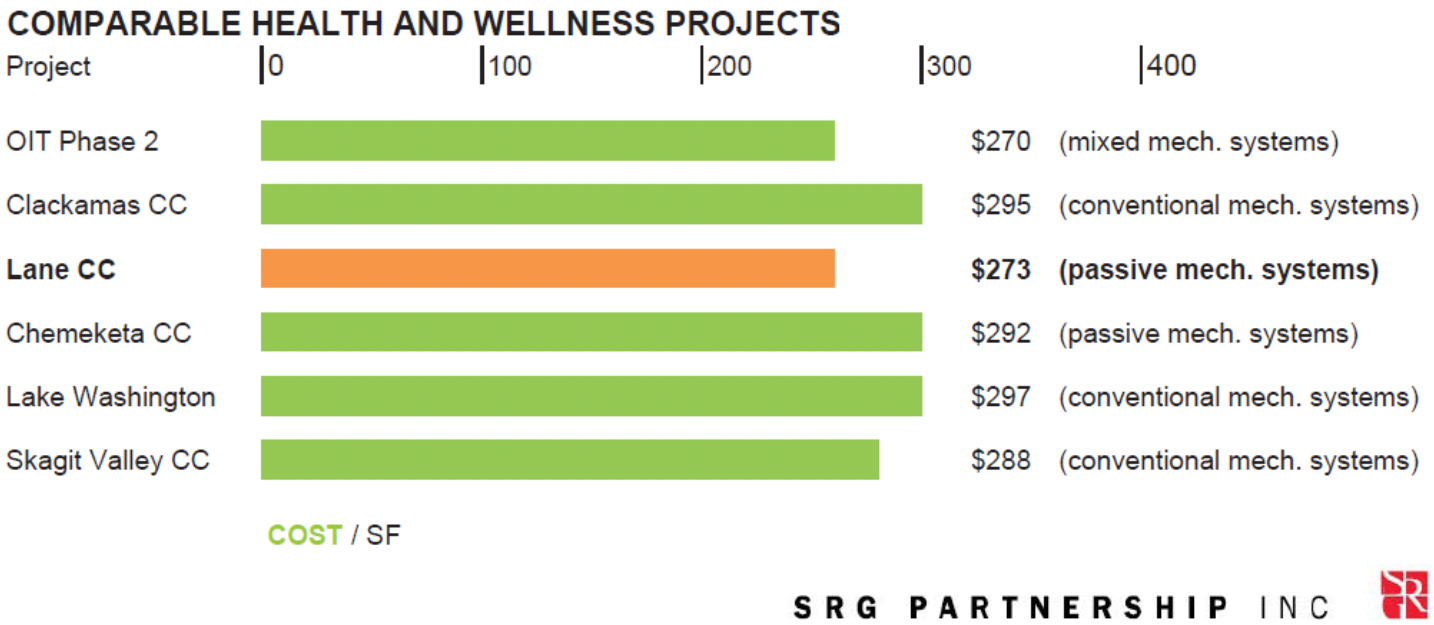


Hawken et. al. *Natural Capitalism,* 1999.

Necessary tools and resources

- Design community needs access to more tools and resources
  - Energy Studies in Buildings Laboratory seminars and project consultations
- Monitoring needed to measure success and ensure savings over time
- Different levels of monitoring and control needed for various building sizes and types
  - Flexible incentives for whole-building and subsystem monitoring (up to $30,000)
  - M&R Applications Guide

Pilot projects

- 15 buildings throughout Oregon
- 2,000 sq. ft. to 500,000 sq. ft.
- New and major renovations
- Office, school, college, multifamily, community spaces

Early Design Assistance

Early Design Assistance Offering

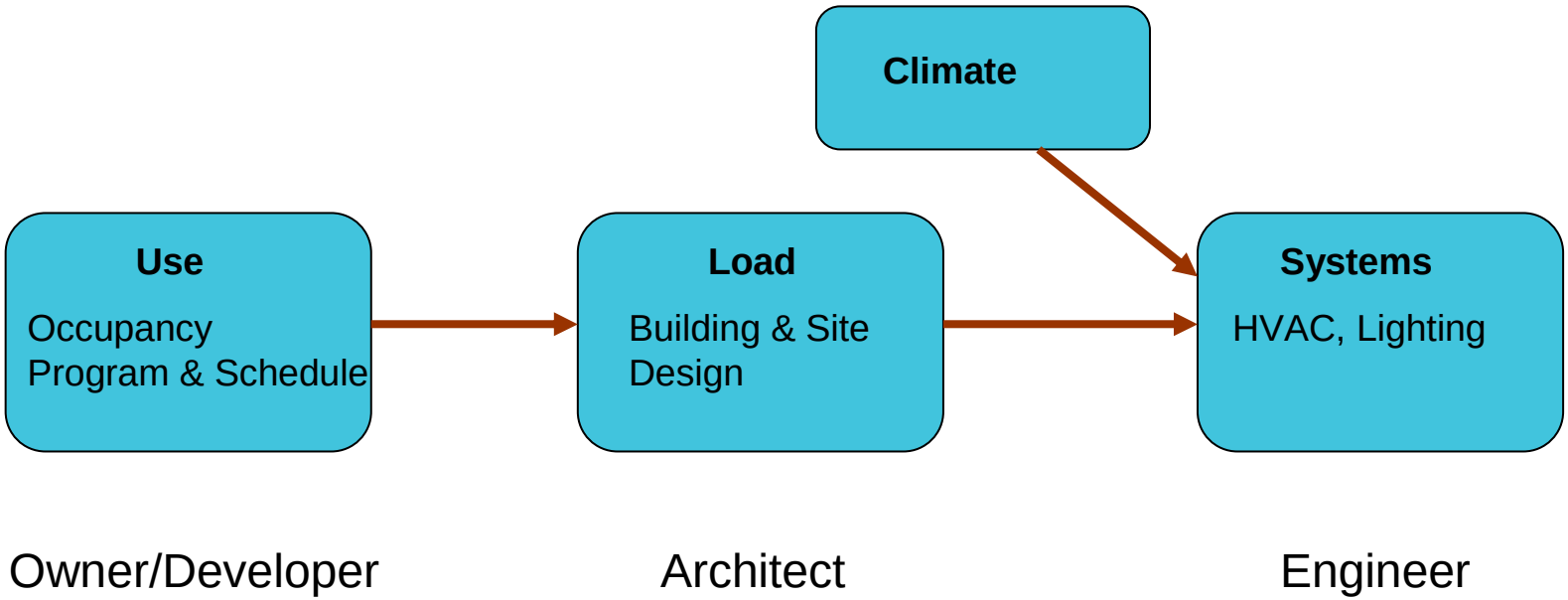
Purpose: Bring all team members to the table early to brainstorm energy-saving concepts

Incentive: $10,000

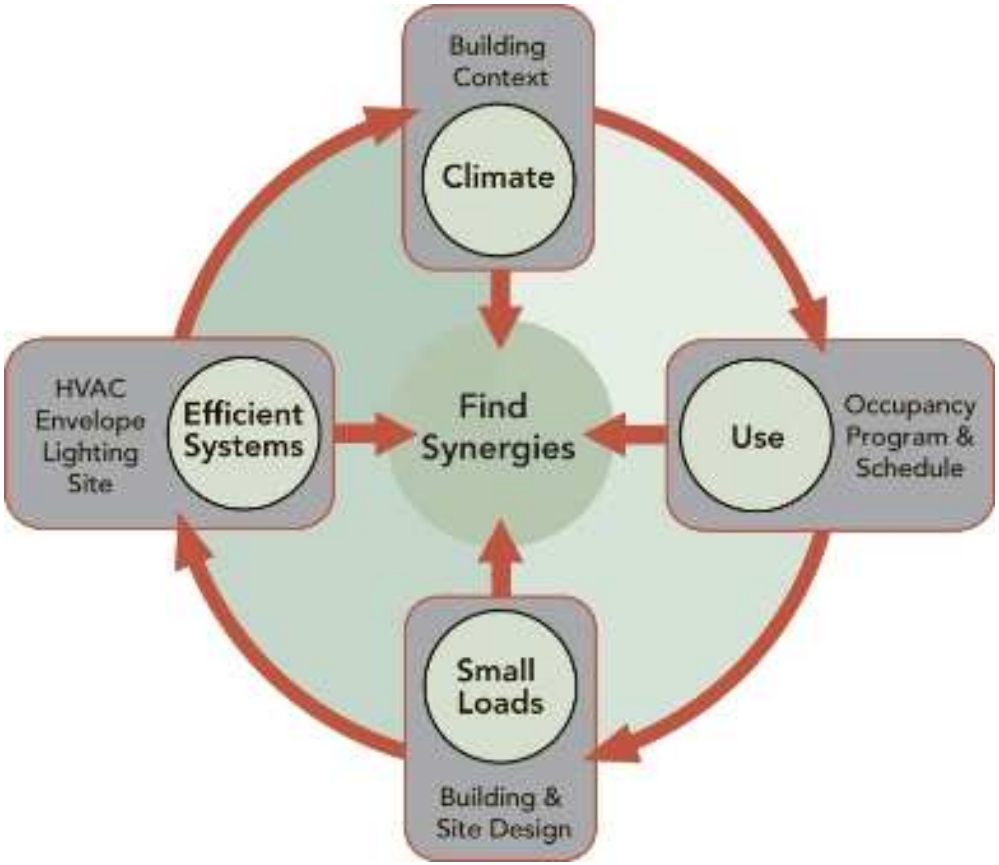
Assistance: Review agenda; attend the charrette; offer guidance as needed

Deliverable: Meeting report from integrated design charrette

Typical Design Process



Integrated Design Process



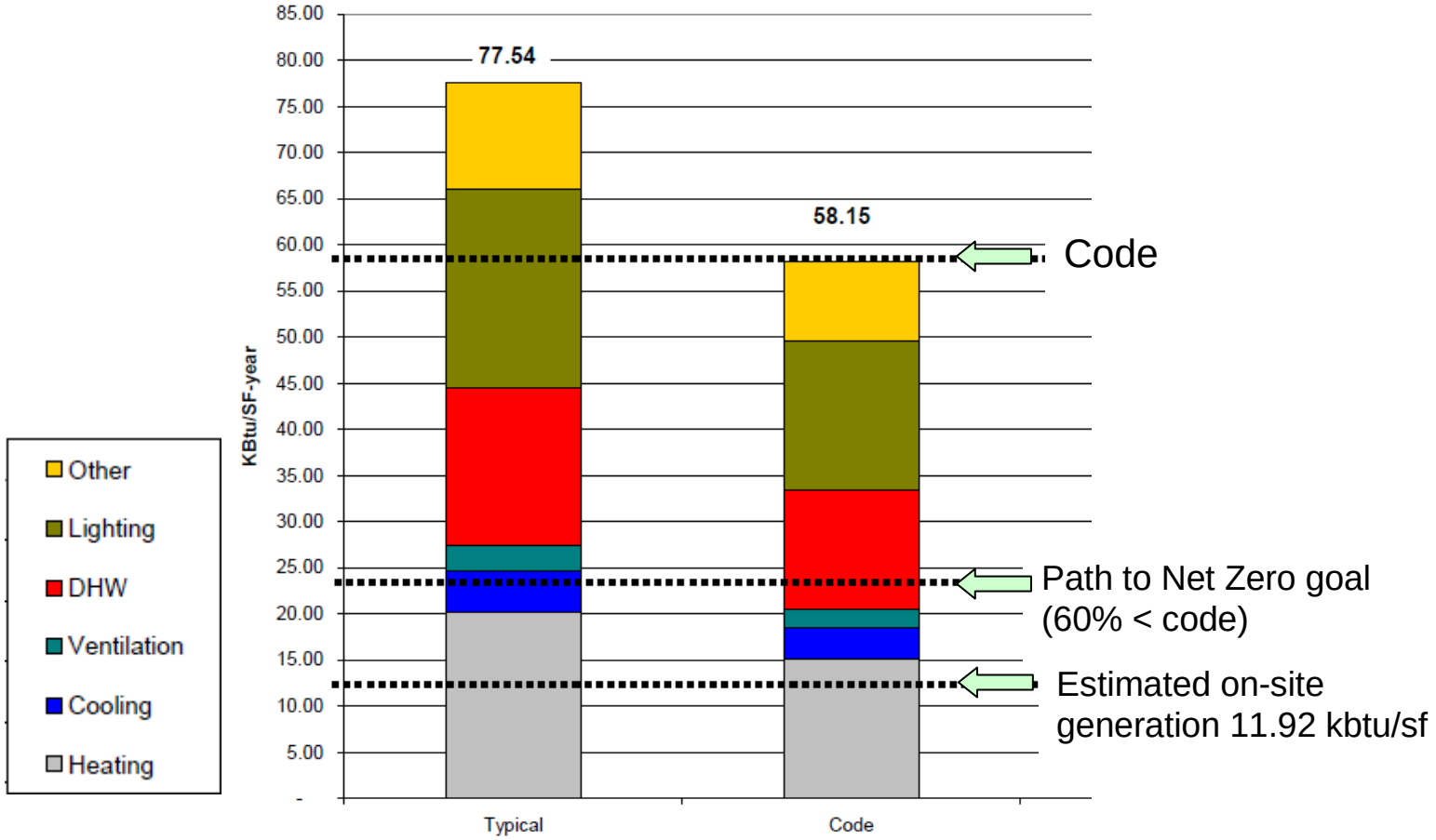
Case Study: XVI Vernon

Type: 5-story mixed use

Size: 50,000 sq. ft.

Project Phase: Schematic Design

How close to net zero?



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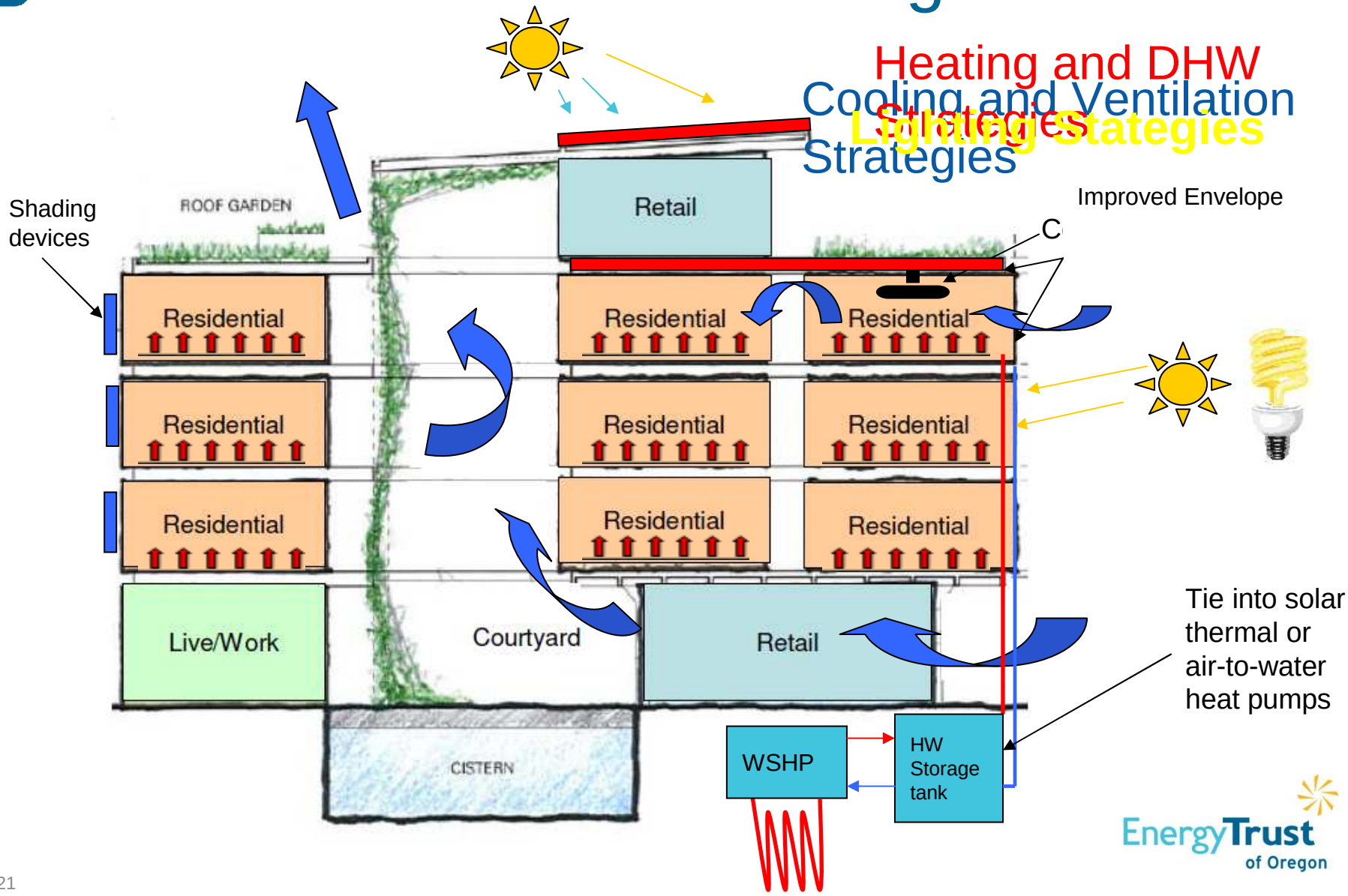
XVI Vernon: Brainstorming Results



XVI Vernon: Brainstorming Results

Tackle Plug Loads and Occupant Behavior

- Create feedback loop to tenants
- Schedule laundry times to utilize solar HW
- CFL ‘trade outs” for tenant task lights
- Occupancy sensors in receptacles
- Discourage window-shakers
  - Misting system in courtyard on hot day

Technical Assistance

Technical Assistance Offering

Purpose: Help to cover the cost of energy modeling fees or other studies (e.g. daylighting study, CFD analysis)

Incentive: Up to $50,000

Assistance: Scoping meeting with analyst; review of proposed analysis

Deliverable: Energy analysis report, energy models, and other studies

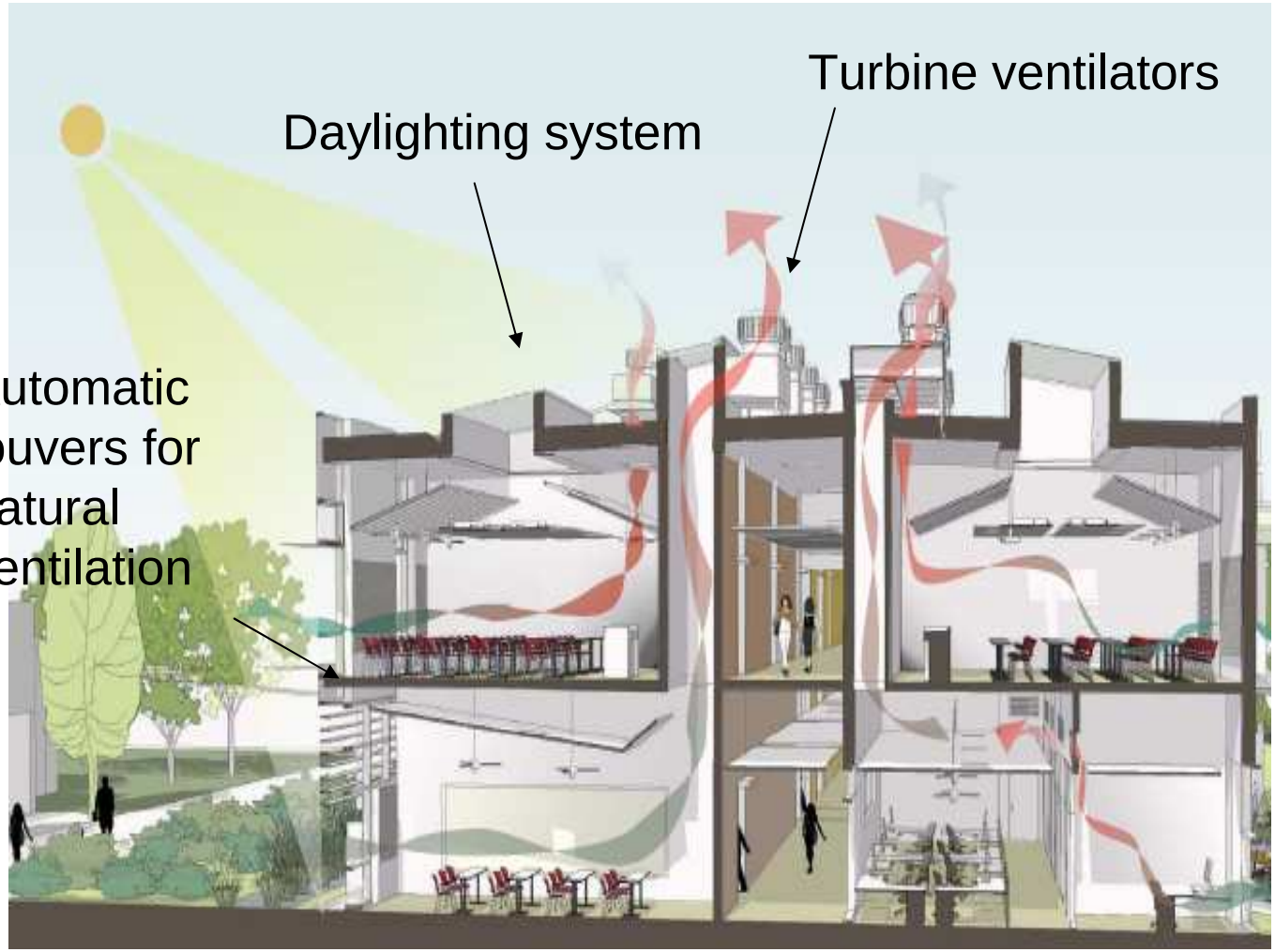
Case Study: Chemeketa Community College Health & Sciences Center

Type: Education

Size: 67,000 sq. ft.

Project Phase: construction documents complete

Chemeketa Design Features



Other features:

- De-coupled HVAC
- Radiant panels
- Night flush
- Advanced lighting controls

50% more efficient than code

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Chemeketa

50.4% more efficient than OR code – how?

- CFD modeling to determine natural ventilation air flow and placement of openings
- Daylighting study
- Energy model in eQuest
  - Had to model details, e.g. low flow fixtures
- 130 kW PV on roof and surrounding grounds

Case Study: Hood River Middle School Science & Music Classroom

Type:
School/Classrooms

Size: 5,600 sq. ft.

Project Phase:
Construction

Hood River Design Features

Solar wall

Other features:

- Plug load occupancy sensors
- Geothermal heat pump loop tied to irrigation water loop
- Night flush

Installing & Commissioning

Installation & Commissioning Offering

Purpose: Cover cost of measures and equipment

Incentive: $0.20/kWh saved, $1.60/therm saved

Assistance: Review commissioning plan

Deliverable: Site verification and invoices, Cx plan and final Cx report

Monitoring & Reporting

Monitoring & Reporting Offering

Purpose: Help to cover costs associated with advanced monitoring and reporting; provide data to inform future designs

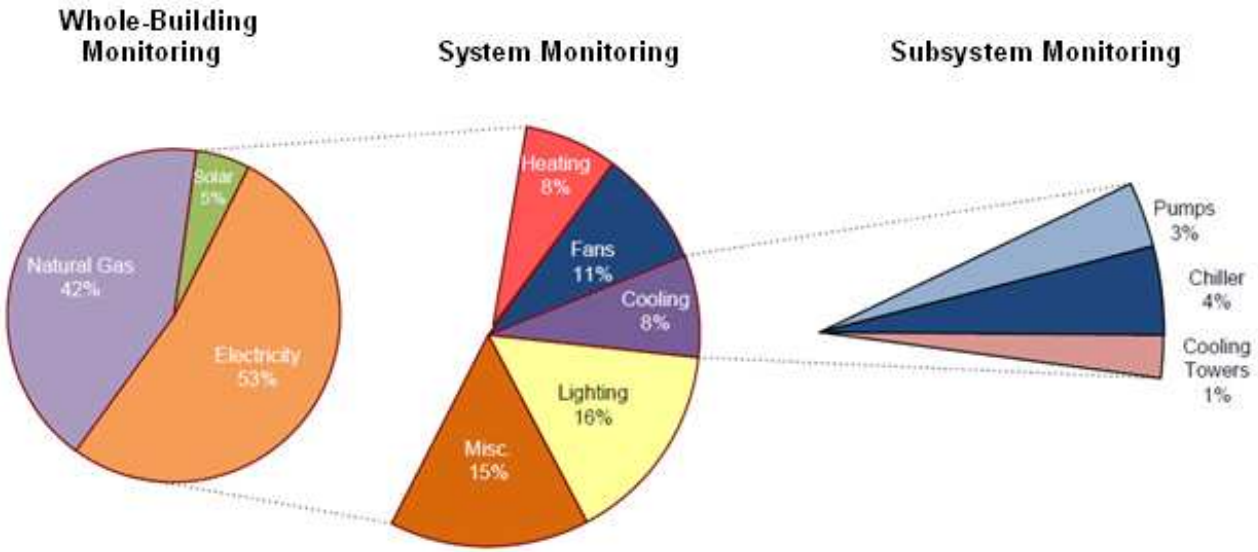
Incentive: Up to $30,000

Assistance: Review plan; *Applications Guide*; quarterly check-ins

Deliverable: M&R plan, equipment cutsheets, monthly utility data for 18-months post-occupancy, quarterly meetings

M&R Requirements

- Whole-building interval meters required
- System and subsystem encouraged
- Defined mechanism for reporting data



Case Study:
Hood River Middle School

- Whole building monitoring:
  - Electric: 15 minute interval meter
  - Solar: 15 minute interval meter
- Sub-metering
  - Geothermal heat pumps
  - Lighting
- Performance tracking
  - Energy management controls system (EMCS) with whole building and sub metering equipment
  - Custom dashboard to track whole building energy use

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Common themes

- Decoupled HVAC
  - More efficient to move water than air
  - Stop reheat
- Synergies with environment
  - Natural ventilation
  - Displacement ventilation
  - Heat recovery or geothermal
- Lighting
  - Daylighting opportunities
- Envelope
  - High performance glazing and envelope; justify cost with lowered HVAC size costs
  - Air barrier
  - Thermal mass for night flush
- Find ways to tackle the plug loads
  - Feedback loops to occupants
  - Occ sensors on plug load equipment

Questions and Contact Info.

Spencer Moersfelder
Business Sector Manager
Energy Trust of Oregon
503-445-7635
spencer.moersfelder@energytrust.org