SEATTLE

BUILDING TUNE-UP ACCELERATOR

Tune-Up Provider Training

June 15 & 16, 2017

SMART BUILDINGS CENTER

Training Agenda

Day 2

- Site Visit Debrief
- Tool Lending Library
- Utility Incentives
- Building Renewal
- Wrap up and next steps

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BUILDING TUNE-UP ACCELERATOR

SITE VISIT DEBRIEF

Site B: El Centro De La Raza

2016 Site EUI (Non-Norm):

50.1 kBtu/sf

Seattle EUI Rank:

Medium Low

ENERGY STAR: 83

2016 Total Site Use:

2.78 million kBtus

Electric 54% / Gas 46%

Property Types:

Office, Other-Education

Site A: KC Metro Transit Power Distribution

2016 Site EUI (Non-Norm):

61.6 kBtu/sf

Seattle EUI Rank:

Medium High

ENERGY STAR: NA

2016 Total Site Use:

1.55 million kBtus

Electric 62% / Gas 38%

Property Types:

Office, Warehouse, Other, Parking

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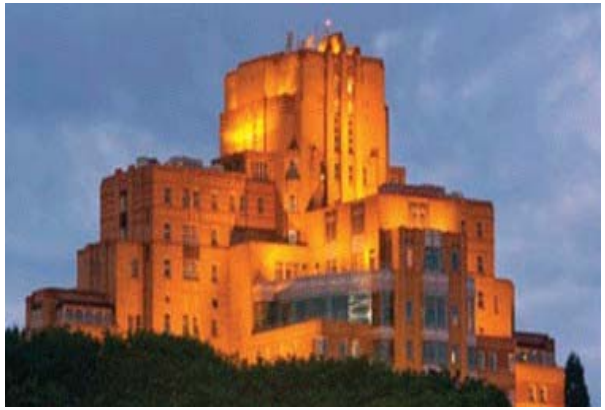
BUILDING TUNE-UP ACCELERATOR

Diagnostic Tool Lending Library



Duane Lewellen

Tool Lending Library Director

Smart Buildings Center

SMART BUILDINGS CENTER A project of NEEC

Agenda

1. Introduction to the Tool Lending Library
2. Loan procedures and policies
3. Tune up diagnostic tool packages
4. Data analytics & resources
5. Q&A

Tool Lending Library at SBC

- 85 tool types
- Online reservation system
- Loan period up to 4 weeks
- Local pickup or shipped
- Open 9am to 4pm Tue., Wed., Thur.

FREE !!!

Tool List & Application Notes

Tool Inventory

Available tools include loggers, logger sensors, power and light meters, air flow tools and more. Review our **Tool List (PDF)**. If you don't see a specific tool you need, please contact us.

Tool Resources – Notes, Guides, & Information

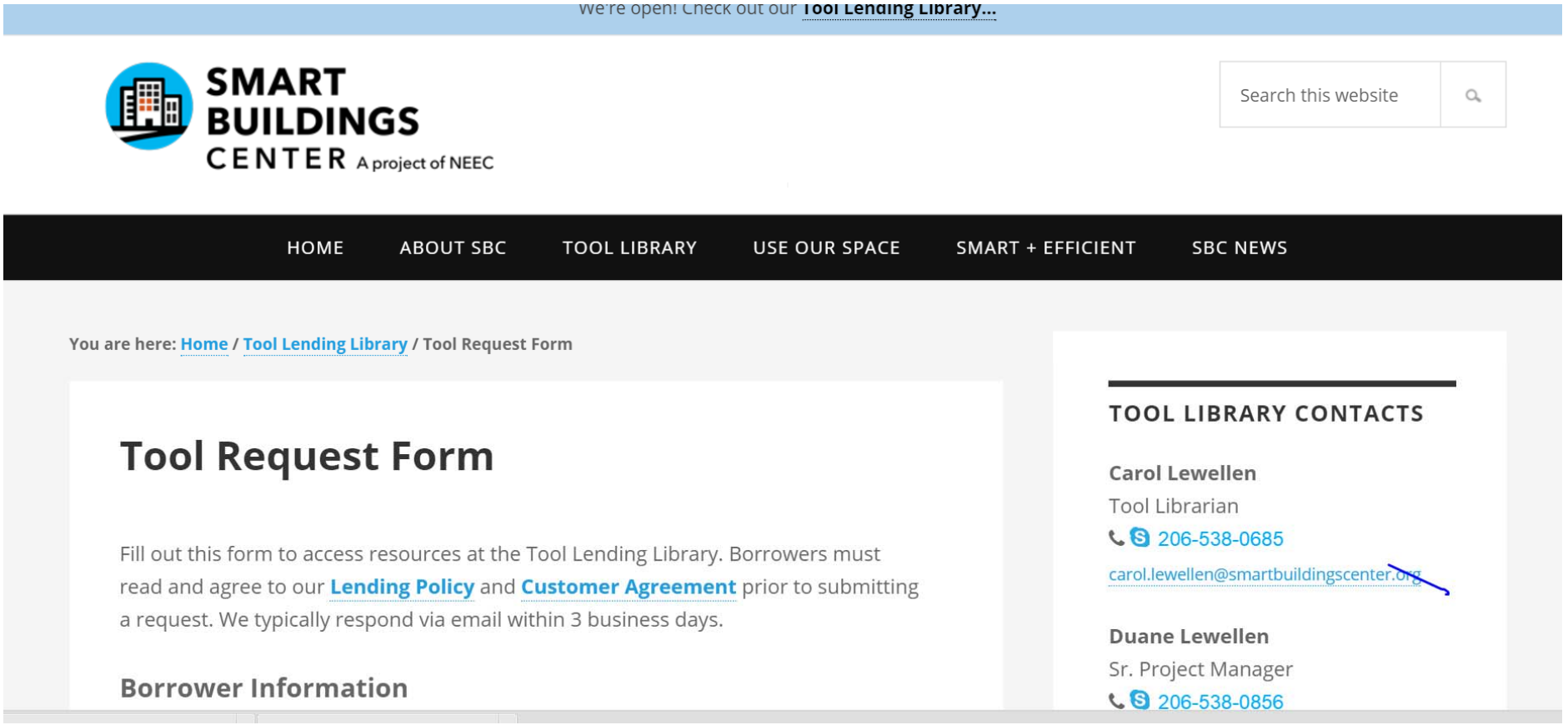
Our **library of videos and application notes** has information on measurement techniques, step-by-step instructions for some tools, and useful tips. It's a great place to start exploring all the potential applications of our inventory.

Tool Lending Policies

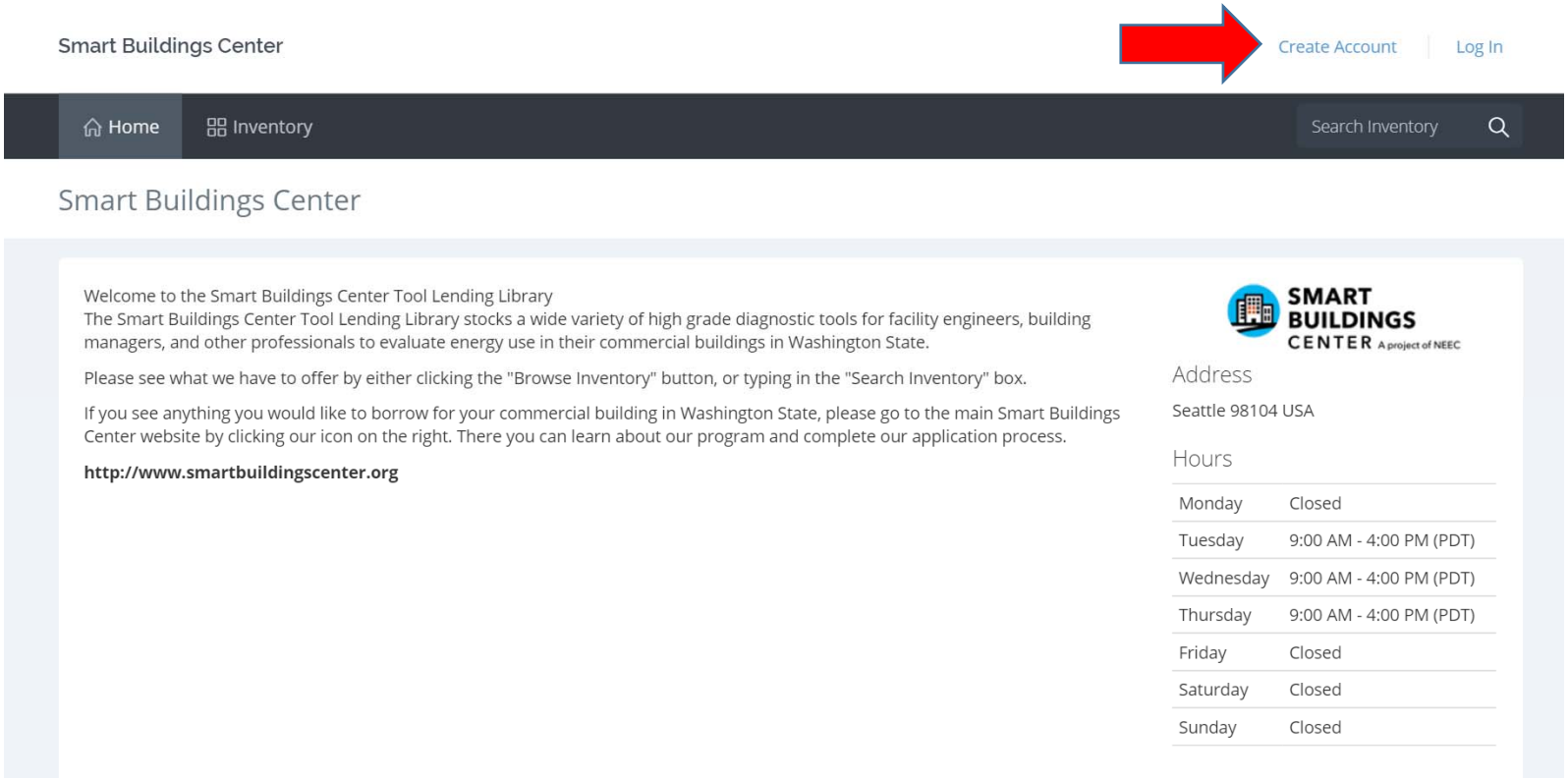
- CUSTOMER AGREEMENT
  - NEEC is not liable for any damages arising out of use of the tools
  - Agree to return tools in good working order and on time
  - Agree to replace tool(s) if they are damaged or lost
  - Power and flowmeters are not revenue grade and should not be used for utility billing

- TOOL LENDING POLICY
  - Tool availability on a first come, first served basis
  - Tools can be reserved for future use
  - Electric power meters must be installed by licensed, qualified electrician
  - Infrared cameras and ultrasonic flow meters require certificate of insurance prior to loan

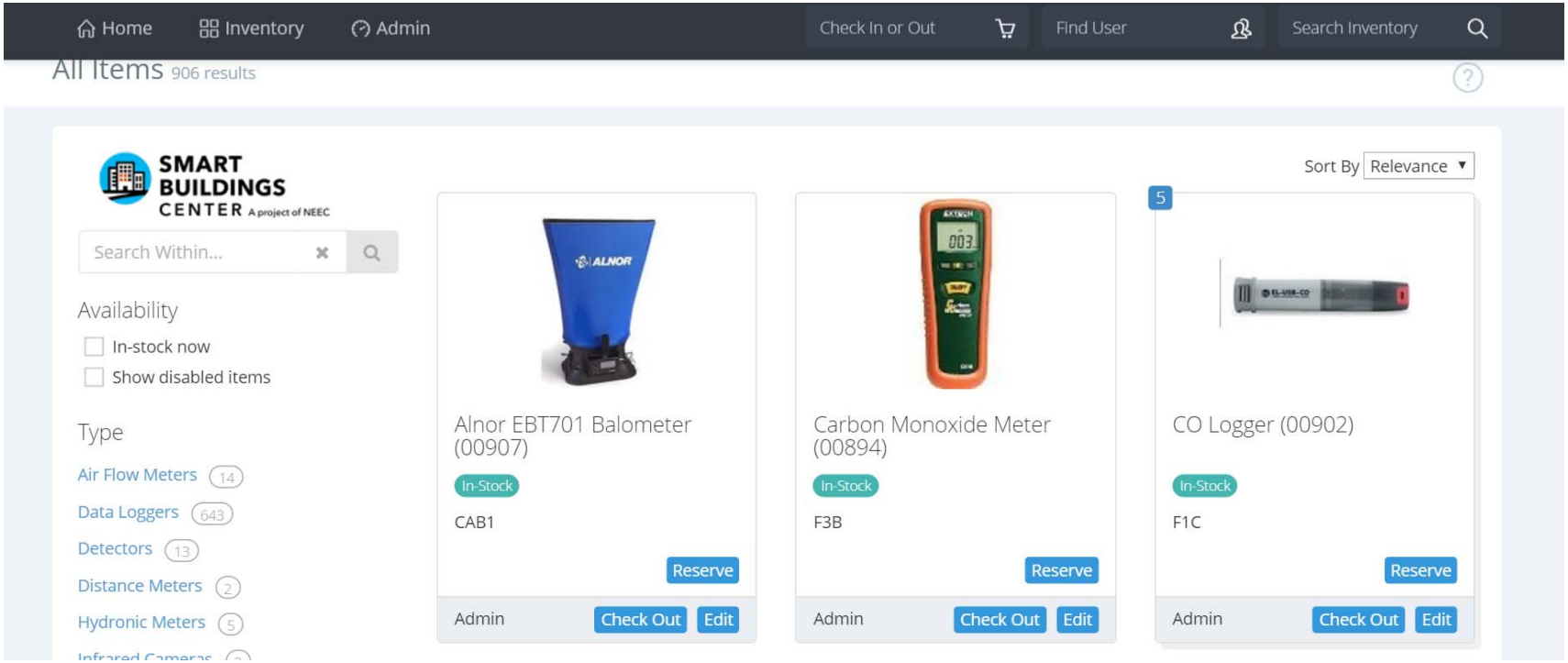
Tool Request Form



Tool Reservation System



Reserve Tools & Check Out



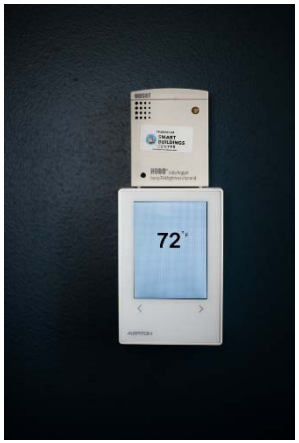
Tool Delivery & Return

Pick up and return to the Smart Buildings Center
Tuesday thru Thursday 9am-4pm

Delivery and return via shipping

Diagnostic Tool Applications

- HVAC
- Lighting
- Domestic Hot Water
- Water Use



HVAC Diagnostic Tool Packages

Seattle Tune Up Accelerator Diagnostic Tool Packages

	Tune Up Assessment Elements	Diagnostic Approach	Diagnostic Tool Application(s)
1.	**Heating Ventilation, and Air Condition**		
a.	Review HVAC equipment schedules (Including daily weekly, seasonal, day/night, occupied/unoccupied hours).	Record start/stop operation of supply fans, return fans, exhaust fans pumps, chillers, and boilers associated with HVAC equipment and compare to occupancy schedule(s)	Electric motor logger Electric contact logger Energy/Power logger
b.	Review HVAC set points (including space temperatures, supply air temperatures, CO2, boiler temperatures, chilled water temperatures, economizer changeover temperatures, and building pressure).	Measure operating condition(s) and compare to setpoint:	***Static Measurements:*** Vane Anemometer Thermal Anemometer Hand-held Infrared Thermometer Digital Psychrometer Digital Manometer ***Logging:*** Temp/Humidity/Light Logger 4-Channel Logger With Remote Sensors WIFI Temp/Humidity logger Carbon Dioxide meter with data logger Desktop IAQ logger Carbon Monoxide logger Differential pressure transmitter with data logger

HVAC Applications

- Verify equipment start/stop schedules
- Verify setpoints
- Calibrate critical sensors
- Verify equipment sequence of operation
- Troubleshoot airflow/air balance issues
- Identify simultaneous heating & cooling

Equipment Start/Stop Schedules

Application: Supply fans, return fans, exhaust fans, terminal unit fans, boilers, chillers, circulation pumps

Diagnostic Approach: Log equipment operating schedule and compare to building occupancy

Onset Hobo Motor Logger

Dent Elitepro XC Energy logger

Fluke 1730 Energy Logger

Dent Motor Maglogger

Verify Set Points & Sequence of Operation

Application: Zone temperature, supply air temperature, boiler supply water reset, chilled water reset, outside air temperature, mixed air temperature, economizer high limit

Diagnostic Approach: Measure or log temperature conditions and compare to set point

Digital psychrometer

Thermal Anenometer

Laser Thermometer

Wifi Temp Logger

Temp/Humidity logger

4-channel data logger

Sensor Calibration

Application: Temperature sensors, humidity sensors, air/water flow sensors, CO2 sensors, CO sensors

Diagnostic Approach: Measure condition and compare to sensor output

GE Ultrasonic Flow Meter

Fluke 975 Thermal Anenometer

Vaisala MI70 Temp/Humidity/CO2 meter

Extech CO meter

Onicon Insertion Flow Meter

Airflow & Ventilation Measurements

Application: Supply/exhaust/return air cfm, outside air cfm, CO2 levels, building pressure, duct pressure

Diagnostic Approach: Measure airflow or pressurization and compare to desired condition

Dwyer Digital Manometer

TSI Vane Anenometer

Thermal Anenometer

Flow Hood

Differential Pressure Logging

CO2 Measurement & Logging

Lighting Diagnostic Tool Packages

2.	**Lighting**		
a.	Identify any areas where lighting levels appear to be significantly higher than Appropriate for the space use and occupant needs.	Spot check lighting levels	***Static Measurement:*** Light meter ***Logging:*** Light level logger
b.	Verify lighting sensors are working and located Appropriately for the current functioning of the building.	Spot check operation of occupancy daylighting sensors	Light/occupancy logger Lighting level logger
c.	Review lighting controls schedules and sequences.	Verify lighting control schedules match occupancy	Light/occupancy logger

Lighting Levels & Controls

Application: Evaluate light levels and automatic control systems

Diagnostic Approach: Measure light levels and compare to standards, verify correct operation of occupancy and daylighting sensors

Light Level Logger

Light Meter - Fluorescent

Light Meter - LED

Ballast Checker

Light & Occupancy Logger

Domestic Hot Water Tool Packages

3.	**Domestic Hot Water**		
a.	Review domestic hot water temperature set points.	Measure hot water temperature at tap	***Static Measurement:*** IR thermometer ***Logging:*** WIFI temp logger with remote sensor Temp logger with remote sensor
b.	Review circulation pump controls.	Determine stop/stop schedule and/or aquastat temperature setting	Motor Logger Contact logger Data logger with external temperature sensor

Domestic Hot Water Applications

Application: Verify hot water temperature and proper operation of recirculation system controls

Diagnostic Approach: Measure hot water temperature. Verify schedules for recirculating systems

Laser Thermometer

4-channel logger with external sensors

Motor logger

Water Usage Tool Packages

4.	**Water Usage**		
a.	In irrigated areas over 500 square feet, verify irrigation schedule are in place, and review schedules.	Compare schedule to best practice	
b.	Verify irrigation rain sensors are calibrated, functioning properly, and located appropriately to collect relevant moisture data to trigger the system operating system.	Measure and calibrate rain sensor	Electric multimeter
c.	Verify cooling tower conductivity meter used to control blow down is calibrated and functioning properly.	Measure cooling tower sump conductivity and compare to setpoint	Handheld conductivity/PH tester
d.	Review water feature schedules.	Verify pump operation schedule	Motor logger Contact logger

Water Usage Applications

Application: Verify irrigation sensors are calibrated, calibrate conductivity controller sensors, verify water feature schedules

Diagnostic Approach: Measure and calibrate sensors, log water feature pump operation

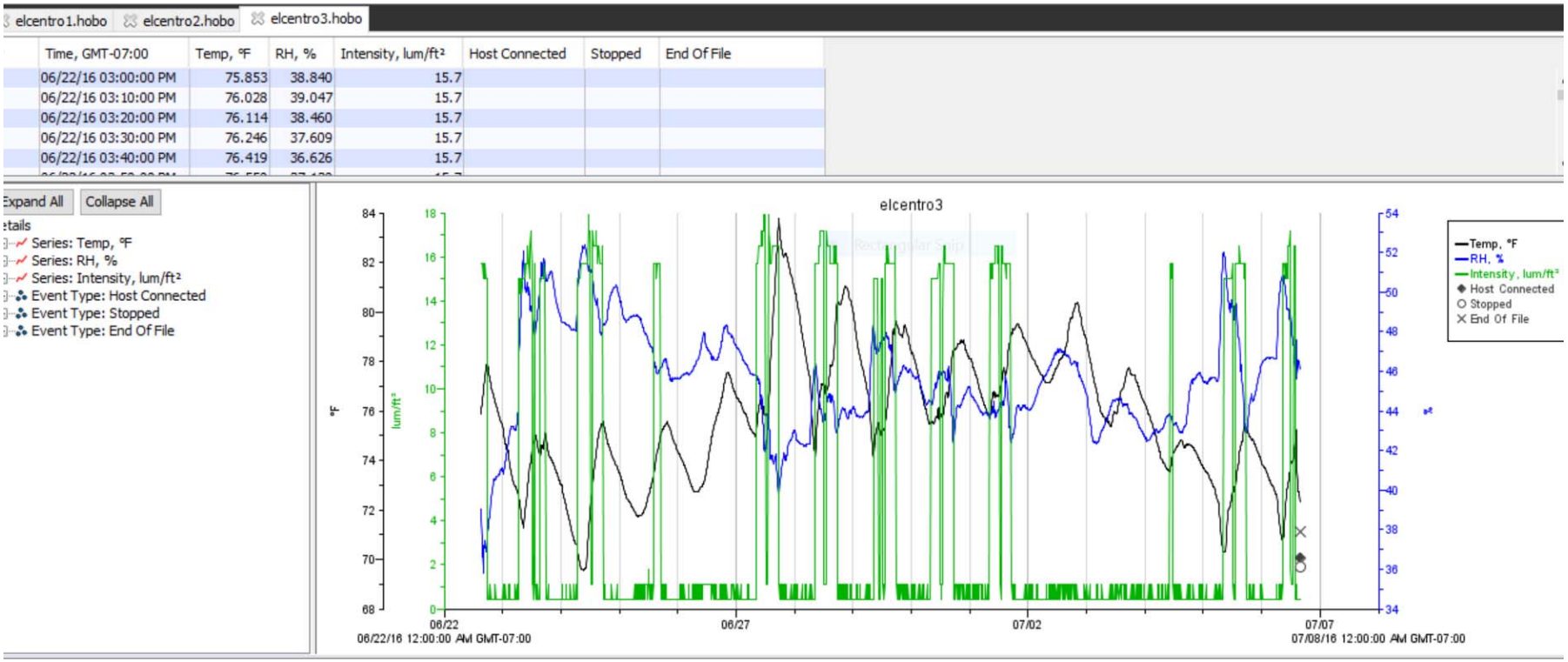
Conductivity Meter

Electrical multi-meter

Motor logger

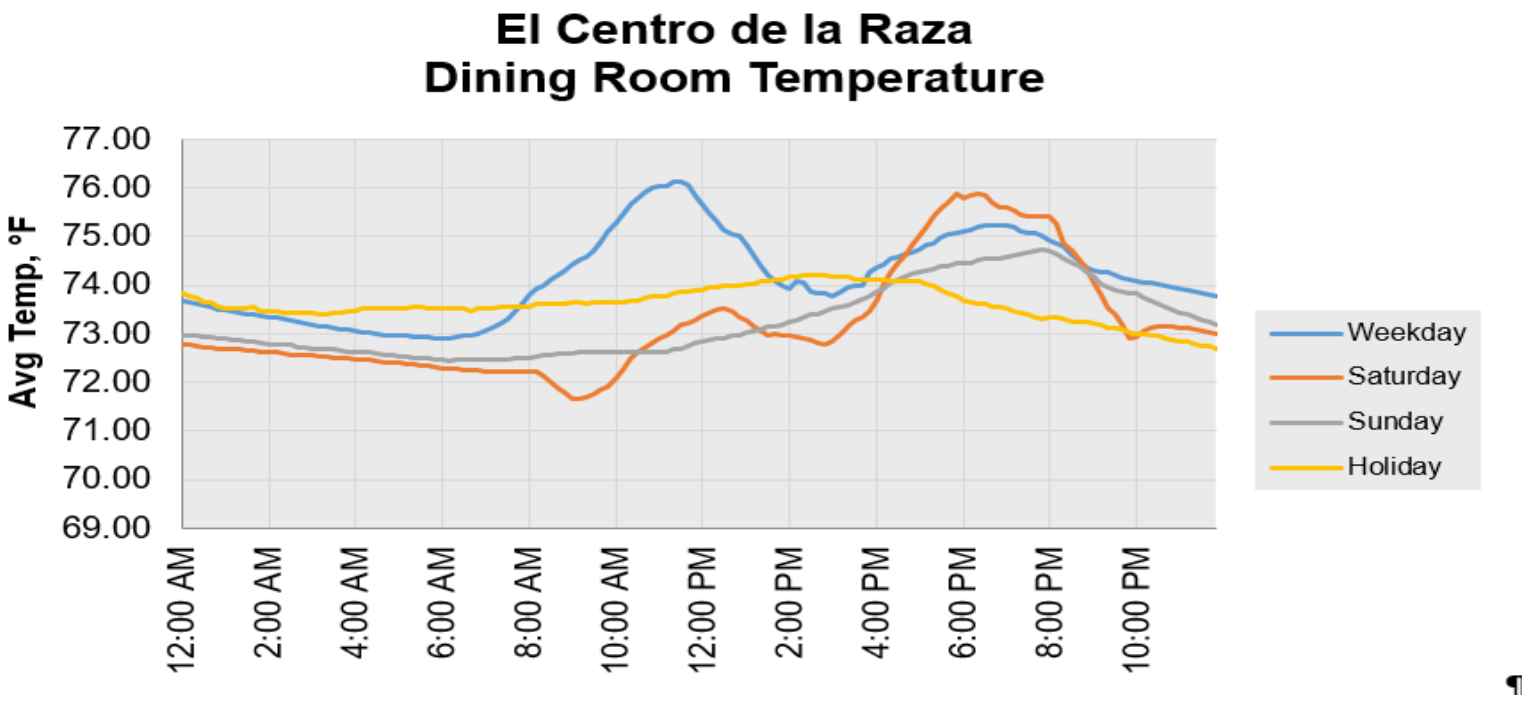
Data Analysis Tools

Manufacturer Software



Data Analysis Tools

ECAM Excel Add-in



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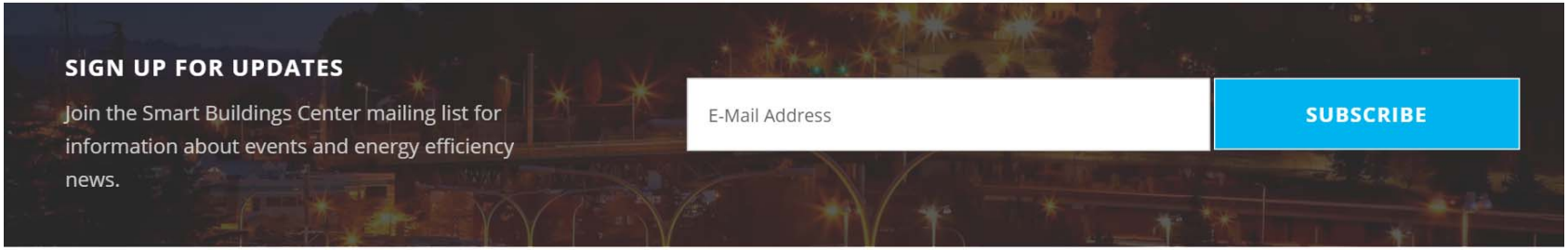
Signup For SBC Updates



SBC NEWS

Seattle City Light's Strategic Plan Update April 13

APRIL 8, 2016

TOOL LENDING LIBRARY

Logging CO2 at the Smart Buildings Center

DECEMBER 14, 2015

Tool Library Resources

Tool Lending Library
Duane Lewellen, 206-538-0856
duane.lewellen@smartbuildingscenter.org
http://www.smartbuildingscenter.org/tool-library/

Tool Resources
http://www.smartbuildingscenter.org/tool-library/tool-resources/
http://www.pge.com/mybusiness/edusafety/training/pec/toolbox/tll/appnotes/index.shtml

ECAM Excel Add-in

Universal Translator
http://utonline.org

QUESTIONS ?

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BUILDING TUNE-UP ACCELERATOR

LUNCH BREAK

SEATTLE
BUILDING TUNE-UP ACCELERATOR

UTILITY INCENTIVE PROGRAMS

SEATTLE CITY LIGHT

PUGET SOUND ENERGY

SEATTLE PUBLIC UTILITIES

(slides in other slide deck)

SEATTLE

BUILDING TUNE-UP ACCELERATOR

15 MINUTE BREAK

SEATTLE
BUILDING TUNE-UP ACCELERATOR

Building Renewal:
A Roadmap to Deeper Savings

PRESENTED BY:
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Integrated Design Lab

Associate Professor and Director
University of Washington
Department of Architecture
cmeek@uw.edu

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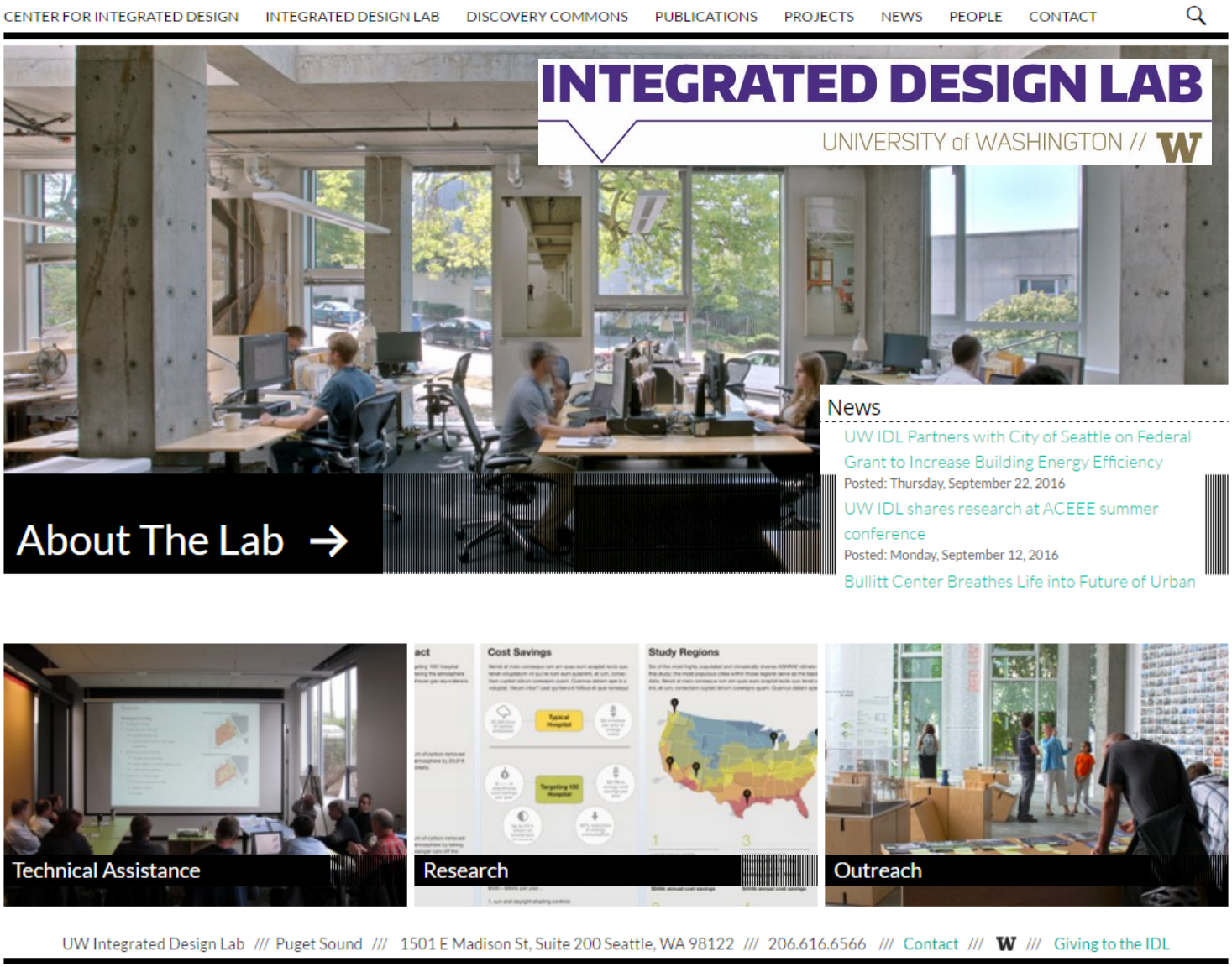
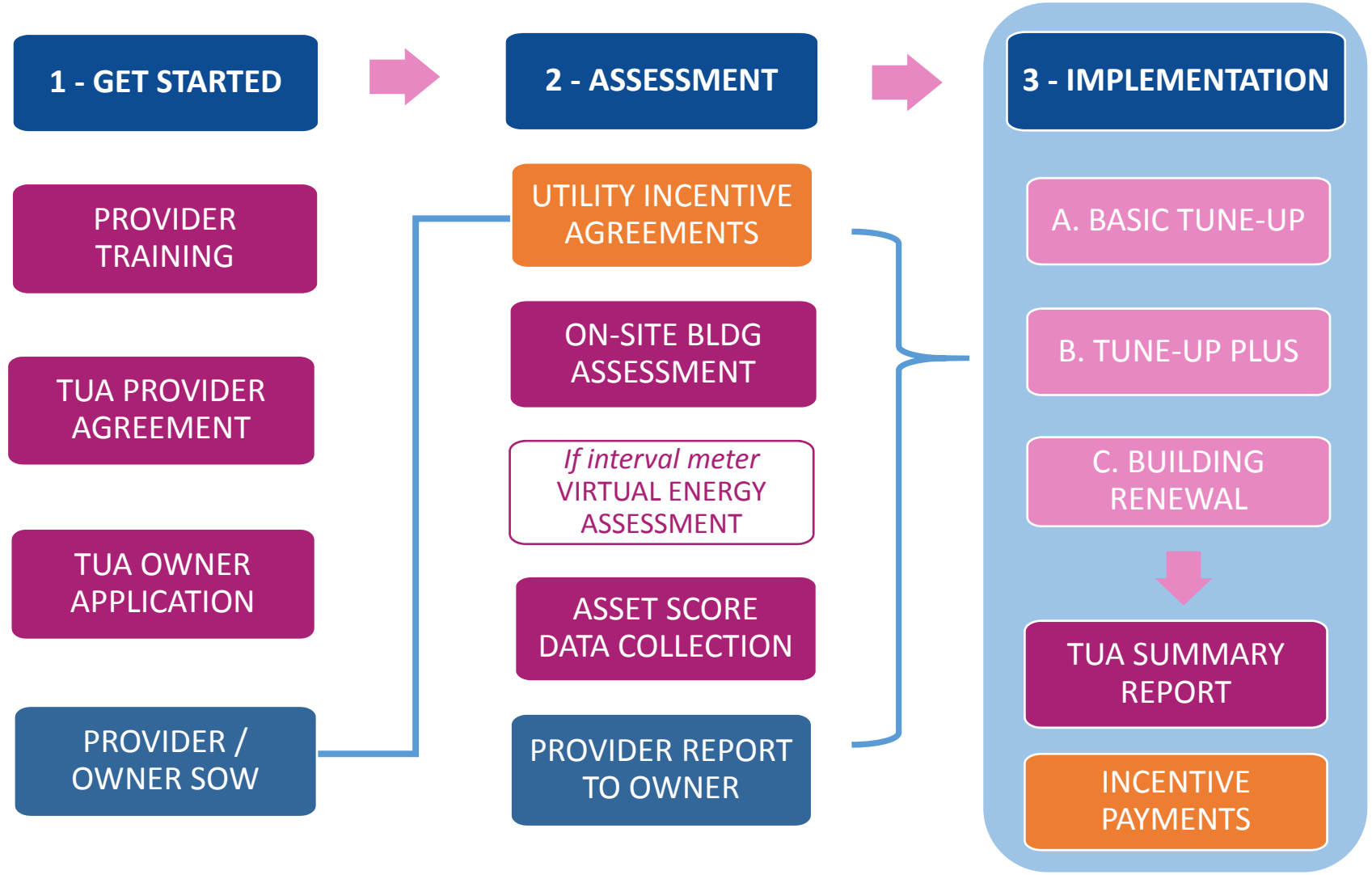


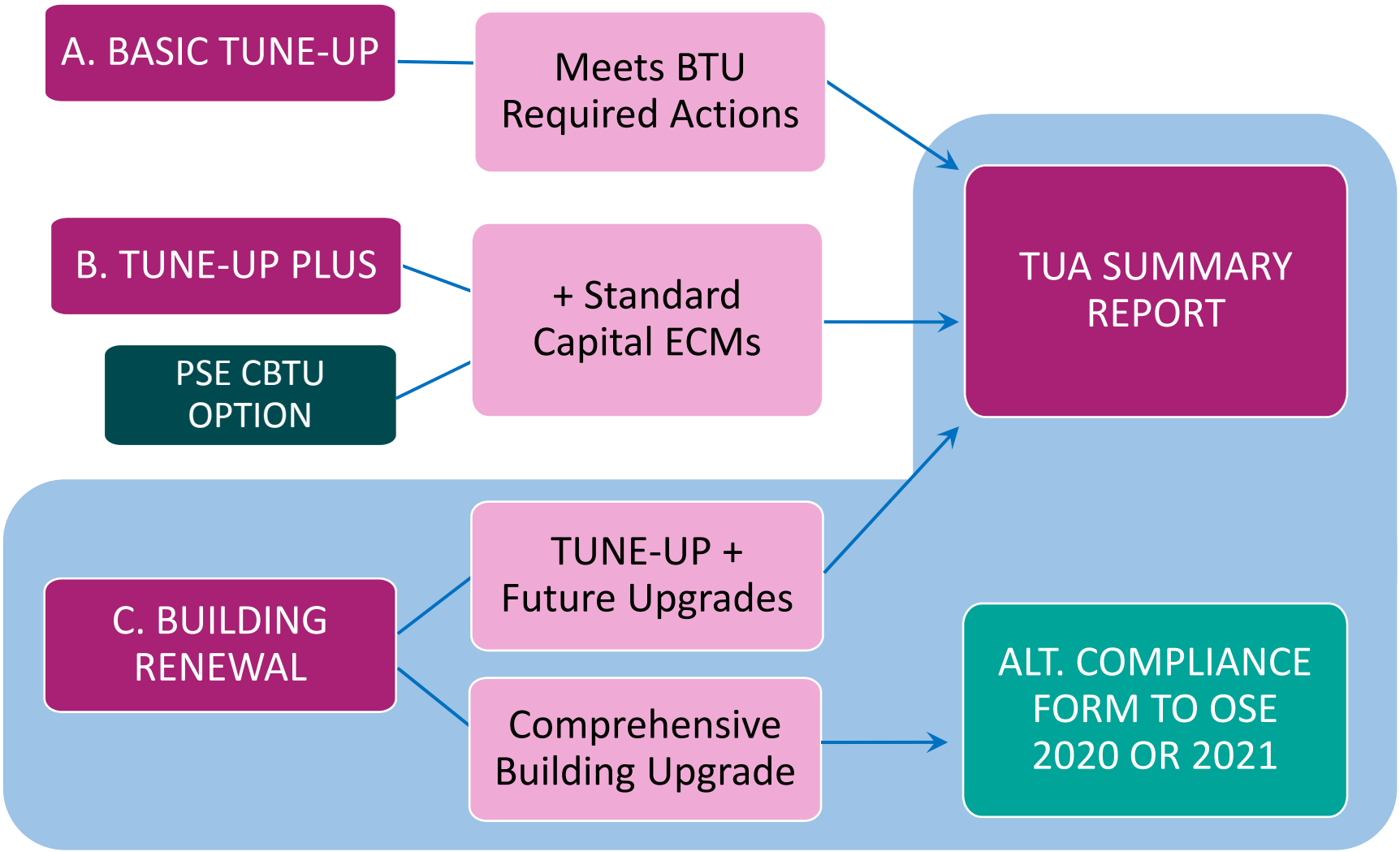
AGENDA

TIME	TOPICS
10 Minutes	What is Building Renewal?
15 Minutes	Opportunities and Technical Approach
10 Minutes	Resources
10 Minutes	SPARK Tool Intro and Demo
5 Minutes	Timeline and Contacts
10 Minutes	Q&A

How does Building Renewal fit into the TUA?



How does Building Renewal fit into the TUA?



What is Building Renewal?

"A customized technical approach for building modernization that significantly improves a building's energy performance, revitalizes its market or operational position, and increases asset value."

What is Building Renewal?

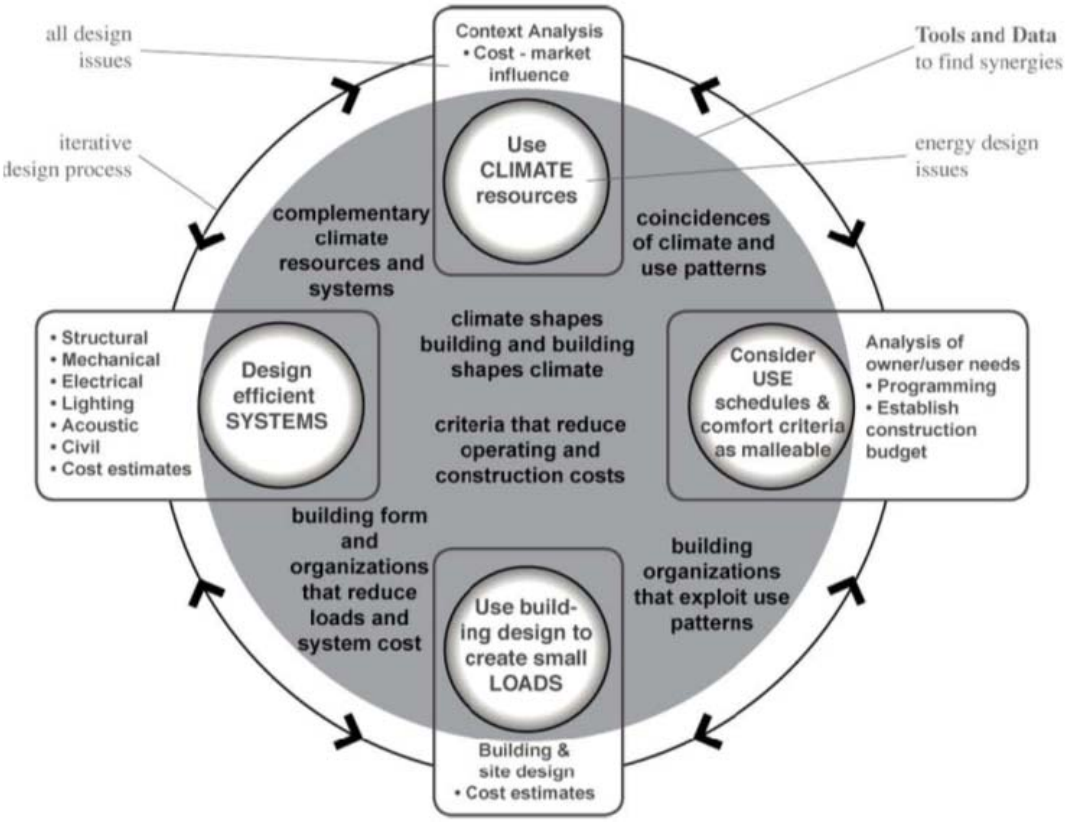
Key Components:

- An integrated holistic approach
- Strategic building investments
- A structured package of synergistic energy-efficiency measures
- Improved energy savings
- Non-energy benefits

What is Building Renewal?

The whole is greater than the sum of its parts…

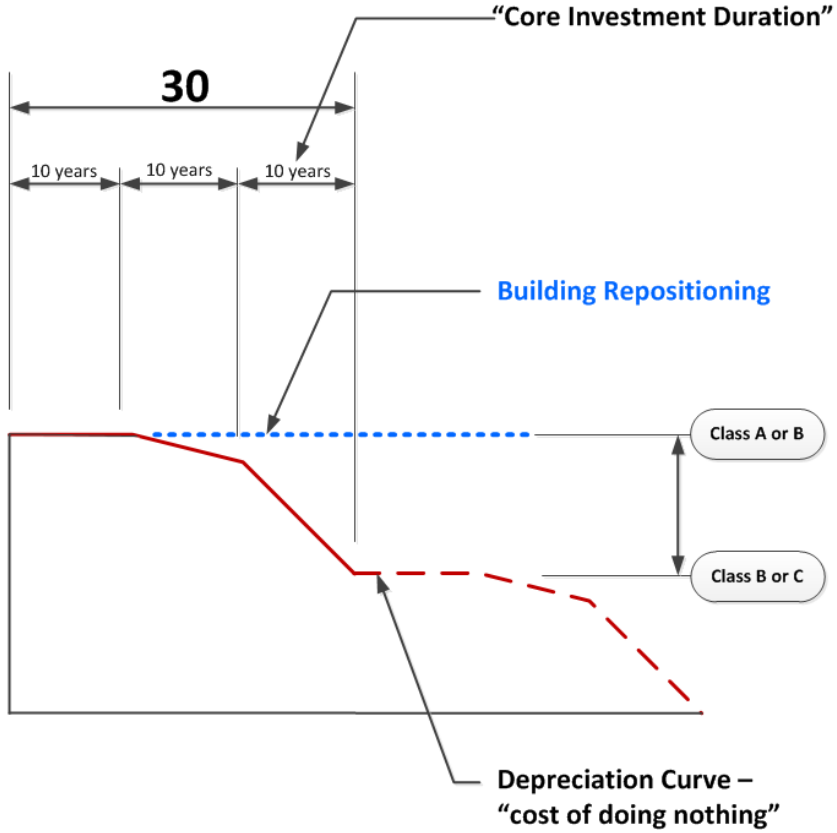
Integrated design synthesizes climate, use, loads and systems resulting in a more comfortable and productive interior environment, and a building that is significantly more energy-efficient.



What is Building Renewal?

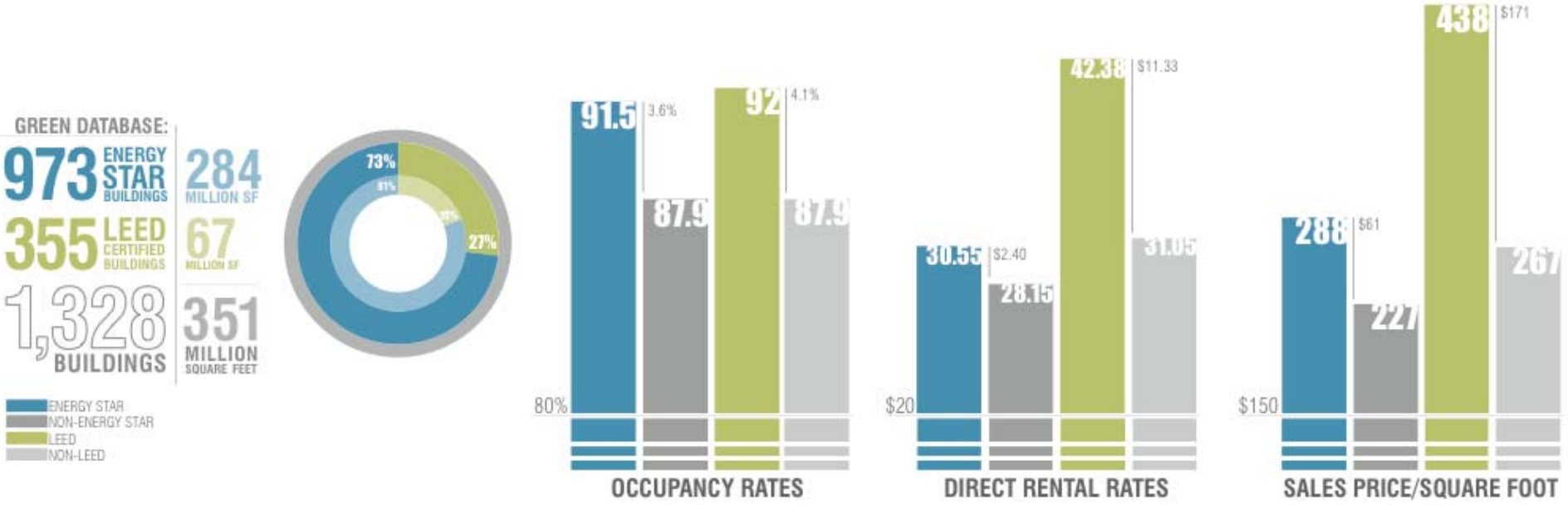
Adds Value Beyond Energy Savings:

- Investments can be aligned with the existing building life cycle to build upon and reinforce each other
- Integrated measure package mapped out across a multi-year investment horizon to improve asset value



What is Building Renewal?

Increases asset value/economic performance



http://www.costar.com/uploadedFiles/Partners/CoStar-Green-Study.pdf

What is Building Renewal?

Identify Key Improvement Opportunities

Integrated Measure Packages provide a suite of targeted energy efficiency measures that align investments in the building with deeper energy savings goals.

O&M

ENVELOPE

LIGHTING

PLUG LOADS

BUILDING HVAC

PLANT HVAC

HVAC CONTROLS

IMP gory		Measure Description
		EUI
O&M	1	Low cost
O&M	2	Medium cost
O&M	3	High cost
O&M	4	Resource Conservation Manager
Envelope	5	Wall Insulation
Envelope	6	New windows
Envelope	7	Envelope Sealing
Lighting	8	LPD Reduction (Improved Light Sources)
Lighting	9	Perimeter Daylighting
Lighting	10	Comprehensive Lighting Control
Plug Loads	11	LED Task Lighting
Plug Loads	12	Occupancy Sensor Controls
Building HVAC	13	VAV Retrofit (built-up)
Building HVAC	14	VAV Retrofit (packaged)
Building HVAC	15	Hydronic Heat Pump Retrofit
Building HVAC	16	New Advanced VAV System
Building HVAC	17	New De-coupled DOAS System
Building HVAC	18	New Heat Pumps
Plant	19	New Chiller Plant
Plant	20	Retrofit Chiller Plant
Plant	21	New Condensing Boilers
Plant	22	Variable Flow Pumping Retrofit (Chiller Plant)
Plant	23	Variable Flow Pumping Retrofit (Boiler Plant)
Plant	24	Variable Flow Pumping Retrofit (Hydronic Heat Pump System)
HVAC Controls	25	Optimized VAV-Central Plant Control Package (DDC)
HVAC Controls	26	Optimized Decoupled/DOAS-Central Plant Control Package (DDC)
HVAC Controls	27	Optimized Packaged VAV Controls (DDC)
HVAC Controls	28	Optimized Hydronic Heat Pump Controls (DDC)

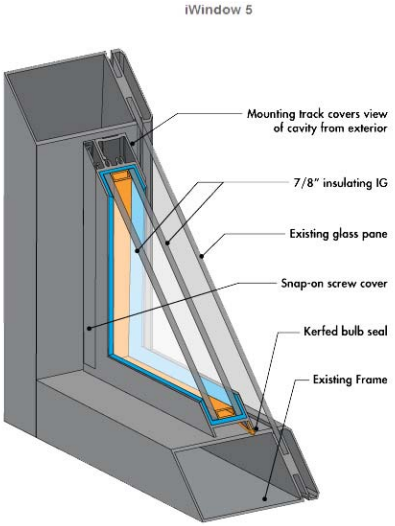
Measure Categories: O&M

Core Assessment of the Tune-up Accelerator

- Identify O&M issues
- Tune-Up activities
- Asset score evaluation
- Quick fixes
- Recommendations (owner's report)
- Summary (compliance) reporting form

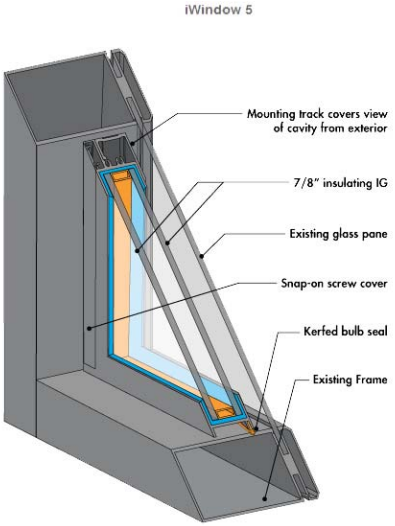
Building Renewal Measures

- Building Renewal measures build on the tune-up and evaluation to identify opportunities for deeper savings



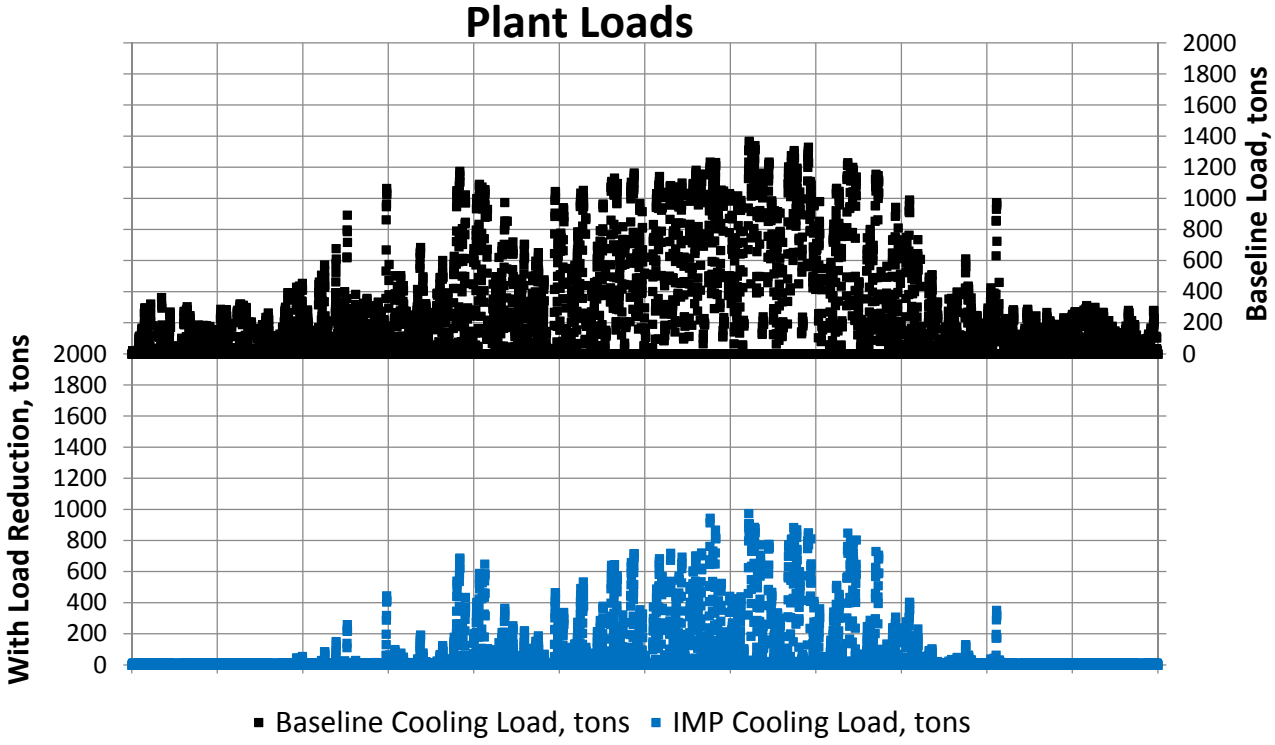
Building Renewal Measures: Load Reduction

- Envelope/Glazing
- Lighting Systems
- Plug load/Process load management
- Tenant Engagement



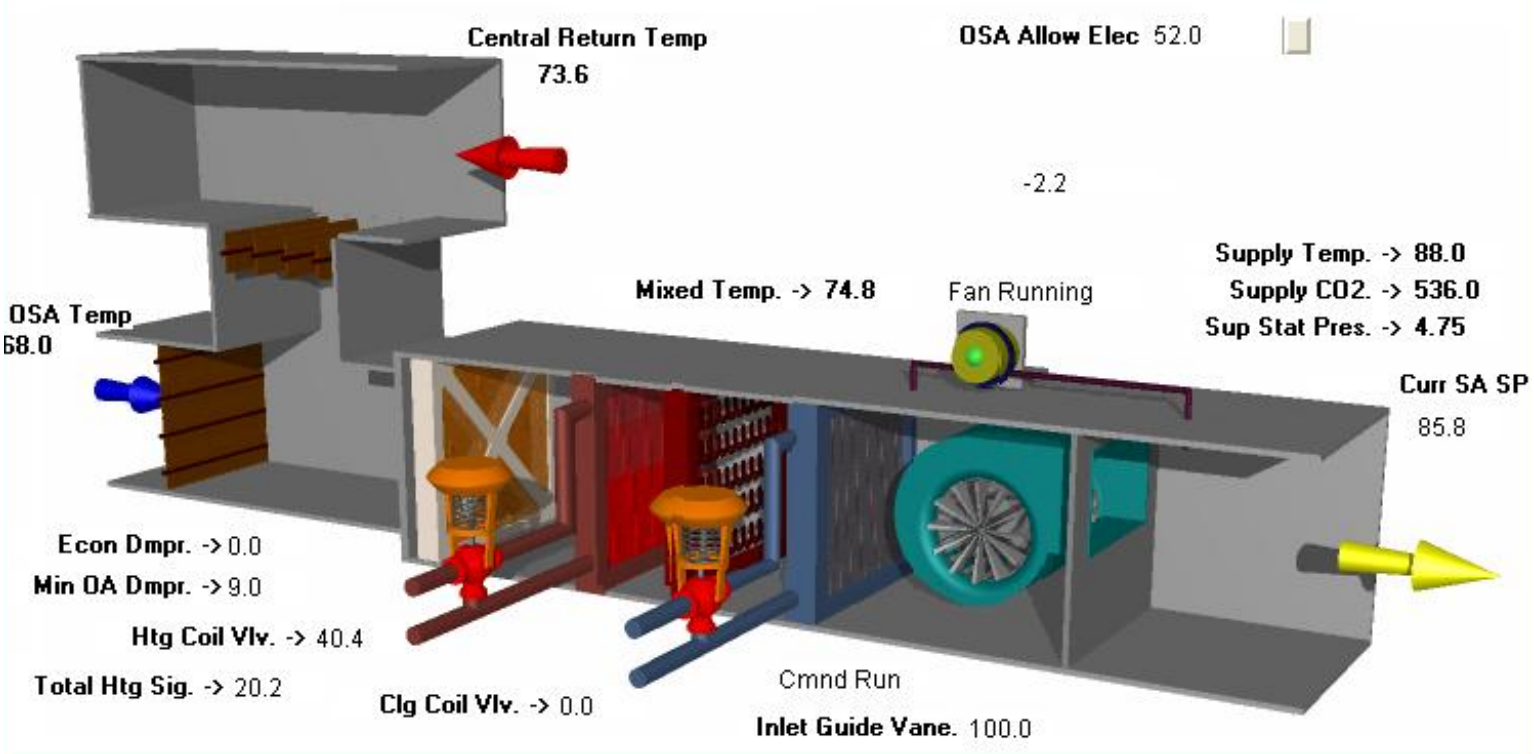
Building Renewal Measures: Efficient Systems

- Central Plant HVAC
- Building HVAC



Building Renewal Measures: Controls Upgrade

- Controls Implementation/Upgrade

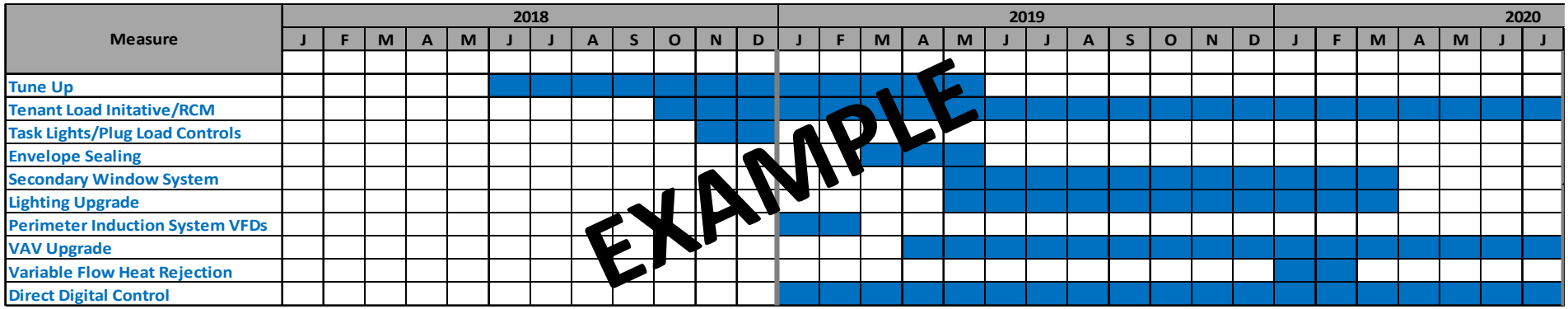


Building Renewal Measures: O&M

- Tune-Up (Core Activity)
- Resource Conservation Manager
- Ongoing M&V
- Re-Commissioning

Concept-Level Phasing

Develop Implementation Sequence and/or Timeline



Building Renewal: Development Resources

INTEGRATED DESIGN LAB

UNIVERSITY of WASHINGTON //

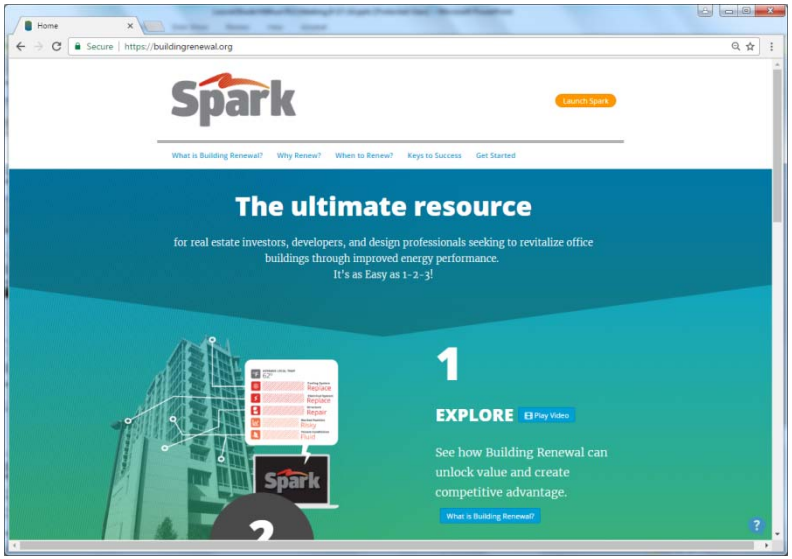
The University of Washington's Integrated Design Lab will provide technical assistance to owners and service providers as they work w/ consultants on engineering design, permit process, utility incentives and contractor selection.

Resources exist for approximately **25 participant buildings** pursuing deeper energy savings through building renewal at three levels of project engagement.

Building Renewal: Development Resources

Level 1 (+/- 25 Buildings) – IDL will provide best-practices recommendations, and where appropriate, SPARK Tool-derived measure packages

- **Document areas for improvement**
- **Best practices recommendations**
- **Spark Tool assessment and report**



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Building Renewal: Development Resources

Level 2 (+/- 15 Buildings) – Level 1 activities and **walk-through with Vendor/Building Owner and technical recommendations**. In collaboration with OSE and project Vendors, UW IDL will provide, supplemental technical assistance which may include:

- Setting performance goals
- Implementation process
- System integration recommendations
- Efficient building envelope
- Efficient electric lighting
- Efficient mechanical HVAC systems
- Passive systems integration

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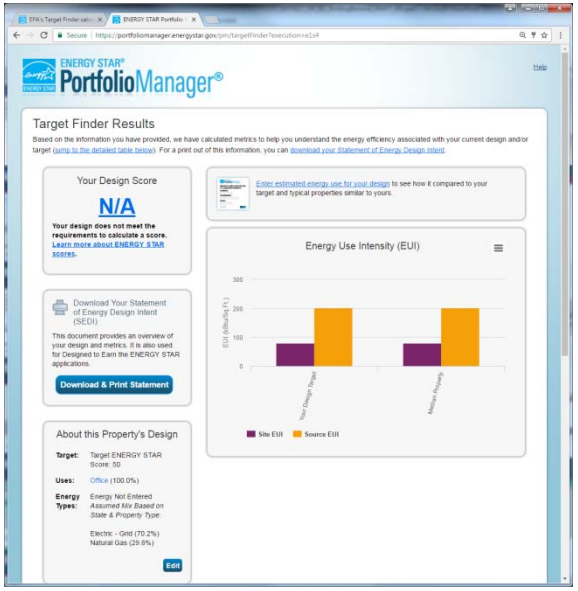
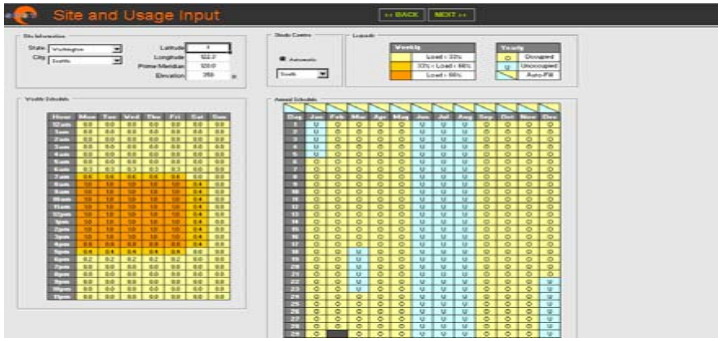
Building Renewal: Development Resources

Level 2 (+/- 15 Buildings) Examples of Activities

Specific measure analysis:





Goal Setting/Lighting/Controls Retrofit Evaluation/Envelope upgrades

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Building Renewal: Development Resources

Level 3 (+/- 5 Buildings) – Level 2 activities plus Technical Assistance including **simulation-based analysis and recommendations**. In collaboration with OSE and project Vendors, UW IDL will provide, as time and resources permit, project-specific analytical assistance including:

- Climate and site analysis
- Demonstration of thermal and visual criteria
- Daylight and electric lighting simulation modeling
- Energy simulation modeling
- System integration analysis
- Establishment of performance verification methods

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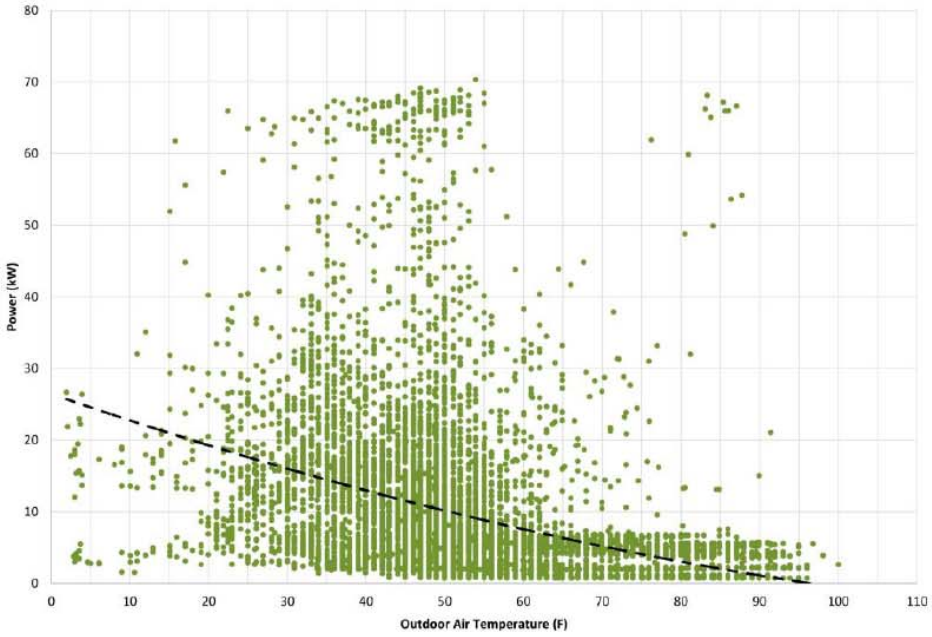
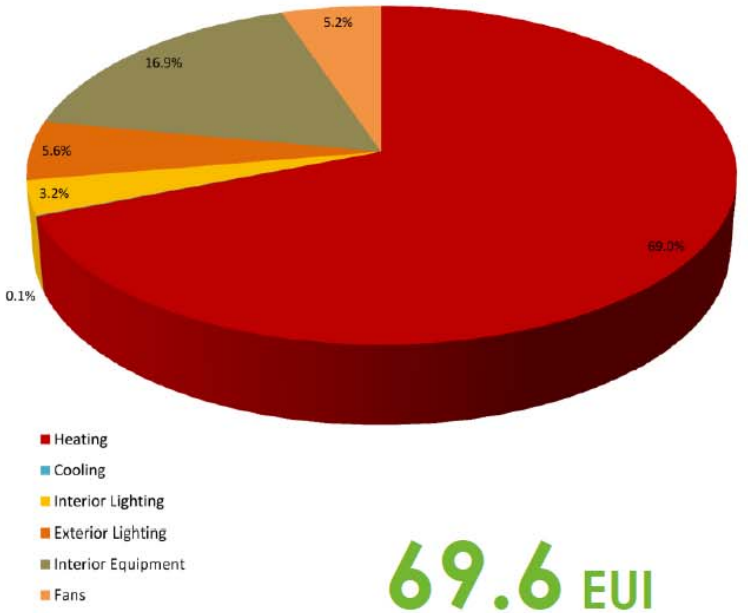
Building Renewal: Development Resources

Level 3 (+/- 5 Buildings)

Detailed whole building energy analysis + recommended measures evaluation





69.6 EUI

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Opportunities: Leverage Points for BR

- Significant capital investments planned
- Major equipment at or near end-of-service life
- Building significantly under-performing the market
- Anticipated change of use
- New major tenant
- Planned future envelope/roof repairs or replacement
- Outdated systems (e.g. Lighting, HVAC)
- Considering aesthetic upgrade
- Energy use significantly higher than peer buildings

Project Identification

Spark

https://buildingrenewal.org/

Developed by BetterBricks

- Uses EnergyPlus seed models to simulate energy performance
- Incorporates business case
- Exports report and technical appendix

BUILDING ENERGY Asset Score*

(*covered in other training modules)

https://buildingenergyscore.energy.gov/buildings

Developed by Dept. of Energy

- Uses simplified EnergyPlus models to simulate energy performance
- Requires detailed building information
- Exports report and Open Studio Model

Step 1: Is further analysis needed?

Spark

QuickScreen

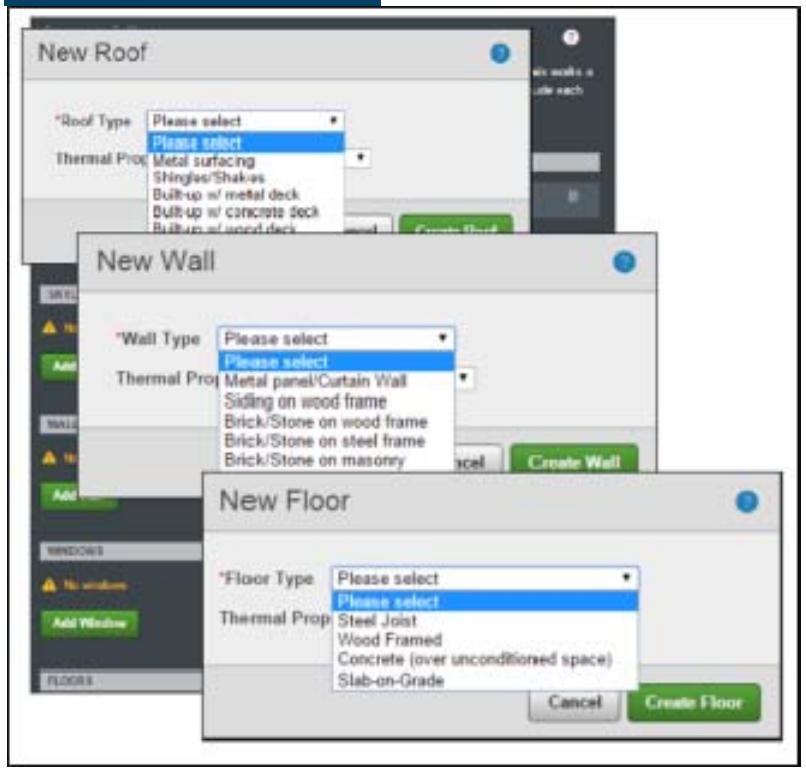
Rapidly diagnosing market, financial, tenant and technical factors, QuickScreen will deliver a short report based on your responses. The summary report characterizes your building as a "Strong", "Potential" or "Limited" as a candidate for a Building Renewal project.

The higher your score the more you should consider using Spark to investigate Building Renewal for your building.

1	Are utility incentives, grants, or other financial subsidies available for helping to offset project costs?	Yes	No
2	Are significant capital investments planned for the building?	Yes	No

17 Questions to determine if appropriate for further evaluation

BUILDING ENERGY
Asset Score



Simplified inputs with default values and gives a range of performance and improvement

Step 2: Input building information

information requested

information requested in simplified form

not requested

Category	Asset Score - Short Form	Asset Score - long form	Spark - Building Renewal
General Information			
Name and address			
Year Completed			
Gross Floor Area			
Rentable Square footage			
# of Floors			
Building Use Type			
Portfolio Manager Score			
Planned modernization or renovation			
Construction			
Roof Type			
Roof Thermal Properties			
Cool Roof (yes/no)			
Floor Type			
Floor Thermal Properties			
Slab on grade insulation			
Wall Type			
Wall Thermal Properties			
Window Framing Type			
Window Glass Type			
Window U-value			
Window SHGC			
Window VT			
# of Windows			
Skylight Type			
Skylight U-value			
Skylight SHGC			
Skylight VT			
Skylight Layout			
Envelope been resealed in last 15 years			

Spark

Categories

- General
- Utility Data
- Envelope
- Lighting/Plugs
- Chillers
- Boilers
- VAV
- Business

BUILDING ENERGY Asset Score

Categories

- Geometry
- Use Types
- Construction
- Lighting
- Heating & Cooling
- Water Heaters
- Operations
- Business

Step 3: Simulation and report results

Spark

Outputs

- Report with suggested measures and economic analysis
- Technical Appendix detailing the measures and performance assumptions

BUSINESS CASE

THE VALUE CREATION OPPORTUNITY

By implementing the project scope described in this report, Lake Union Building may signicantly improve its energy performance, increase cashflow, revitalize and enhance its competitive market position and boost asset value. The combination of operations and maintenance (O&M) and energy expense savings, increased rents, and asset appreciation drive value creation. Key assumptions and resultant opinions of project cost and investment returns are summarized below.

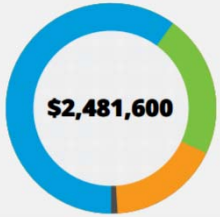
KEY INDICATORS

Internal Rate Of Return (IRR): **19%**

Net Present Value (NPV): **$1,158,200**

Present Value(PV) Of Value Creation Components

Asset Appreciation	$1,487,000
Rent Differential	$538,200
Energy Savings	$421,000
Reduced O&M Expense	$35,400
	$2,481,600



Estimated Project Costs

		$/rsf	$/gsf
Total Project Cost	$1,323,400	$17	$15
Project Incentives *(est)*	$0	$0	$0
Net Project Cost	$1,323,400	$17	$15

Net Operating Income - *with stabilized vacancy*

	Year 1	Year 10
Energy Savings	$52,300	$74,400
O&M Expense Reduction	$4,600	$6,000
Rent Differential	$23,900	$149,400
	$80,800	$229,900

Key assumptions

Time horizon for analysis	10 year fixed
Consumer price index (CPI) or Inflation	3.0%
Capitalization (CAP) rate	7.0%
Discount rate	7.5%
Energy cost escalation	4.0%

Step 3: Simulation and report results

BUILDING ENERGY
Asset Score

Outputs

- Report with energy performance of building with inputs
- Open Studio Model

BUILDING ENERGY
ASSET SCORE 1
OVERALL BUILDING SCORE

BUILDING INFORMATION

Lake Union Building Copy Copy
1700 Westlake Dr.
Seattle, WA 98109

Building Type: **Office**
Gross Floor Area: **89,092 ft²**
Year Built: **1970**

Score Date: **04/17/2017**
Building ID #: **8792**
Software Release: 3.2.2.528

Potential Score **8.0**
Estimated Savings[1] **32%**
Current Score **6.0**

1 Uses **MORE** Energy — 10 Uses **LESS** Energy[2]
High-Efficiency

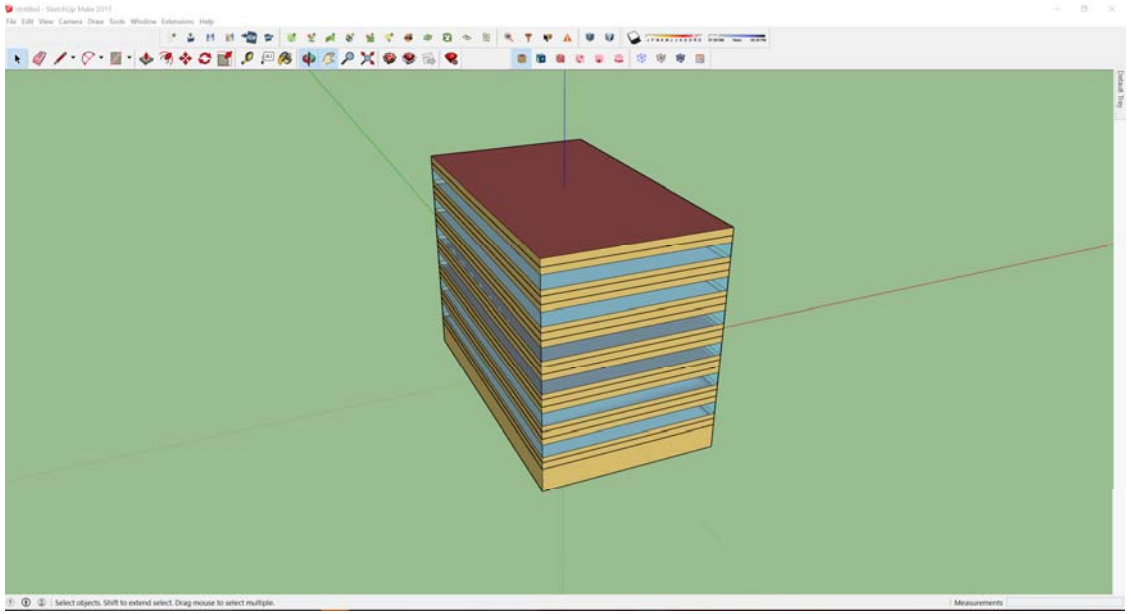
Standard Occupancy and Operating Conditions		Estimated Source Energy Use (kBtu/ft²)	
Number of Assumed Occupants	446	Current Building	118
Hours of Operation	48.6 hrs/wk	Upgraded Building	80
Cooling Set Point	75° F		
Heating Set Point	70° F		
Misc. Energy Loads	0.75 W/ft²		

Energy Use Intensity by Fuel Type
Site Energy Use (kBtu/ft²)
Source Energy Use (kBtu/ft²)
Fuel Type [Site EUI , Source EUI]
Gas [0.0, 0.0]
Electricity [37.6, 118.1]
District Hot Water [0.0, 0.0]
District Steam [0.0, 0.0]
Propane [0.0, 0.0]
Fuel Oil [0.0, 0.0]
District Cooling [0.0, 0.0]

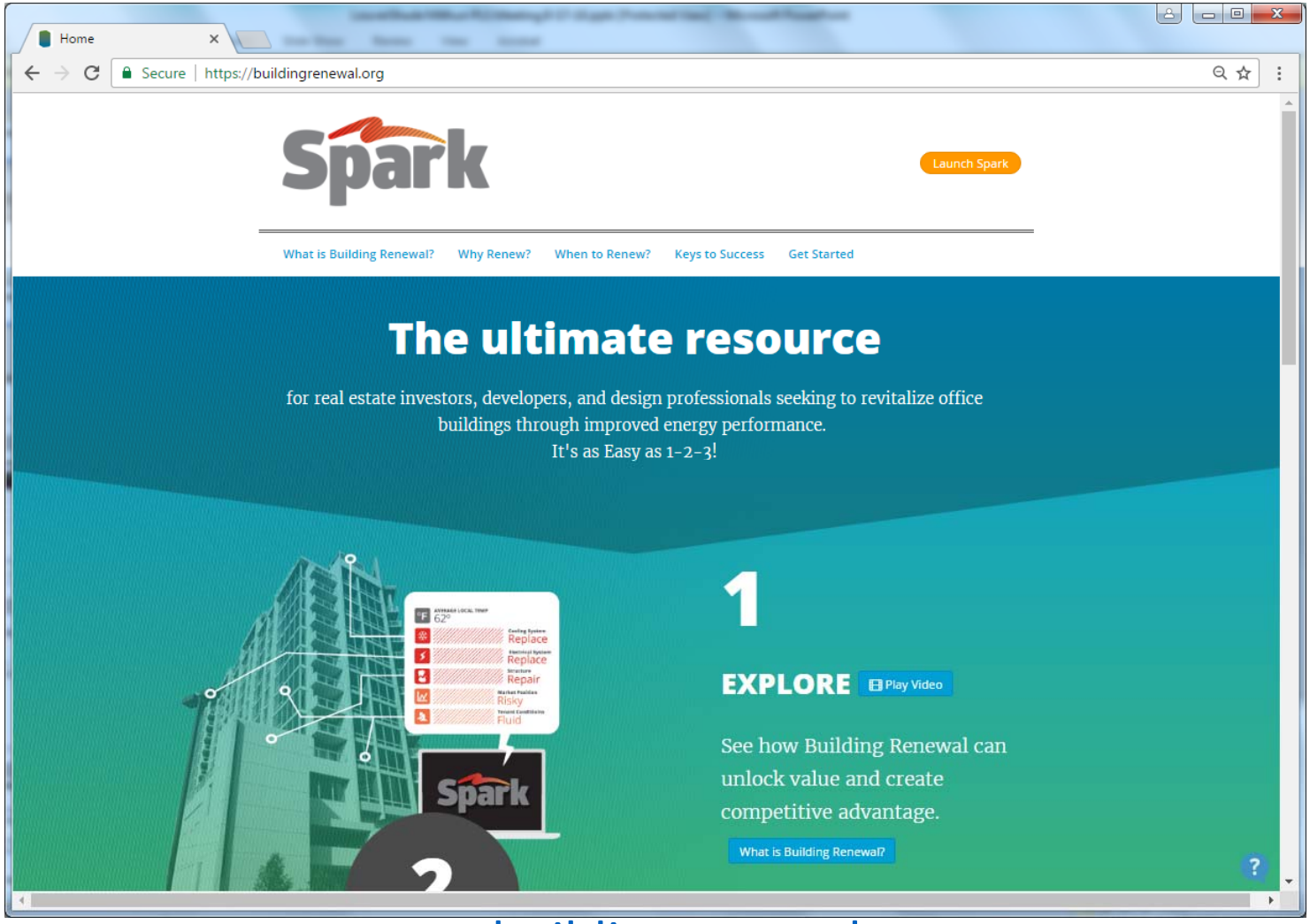
Step 4: Use energy model

Detailed whole building energy analysis including unique EEMs tailored to specific project opportunities

Asset Score simulation includes Open Studio Model that can be modified using Open Studio, EnergyPlus, and/or other interfaces to refine analysis of possible measures.



SPARK Tool



www.buildingrenewal.org

SPARK Tool: Target

Built on a framework that can apply to multiple project types

Developed for non-owner occupied commercial leased office buildings over 20,000 SF

Tool users: Professionals tasked with planning, designing or implementing building renovation projects

Tool report: Targeting building investors and owners

SPARK Tool

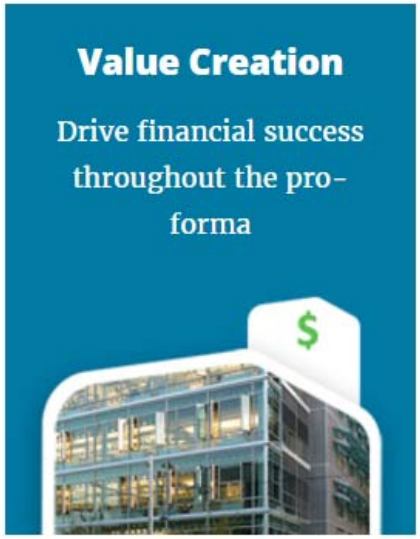
Tool Objectives

1. Inform and inspire investigation of building renewal

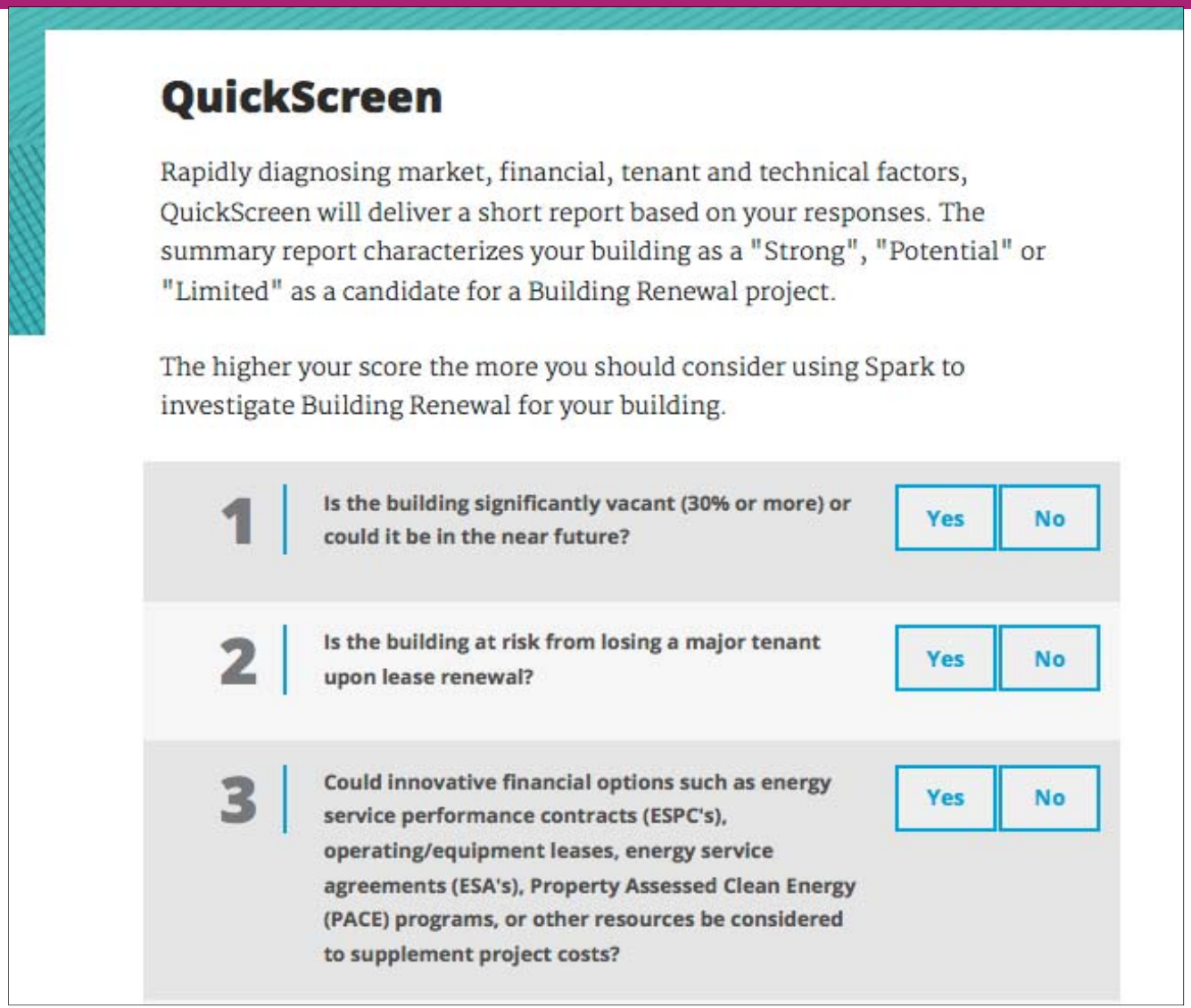
2. Assess technical project potential for a specific building

3. Estimate the total value of the investment

SPARK Tool: Non-Energy Benefits



SPARK Tool: Quick Screen



QuickScreen

Rapidly diagnosing market, financial, tenant and technical factors, QuickScreen will deliver a short report based on your responses. The summary report characterizes your building as a "Strong", "Potential" or "Limited" as a candidate for a Building Renewal project.

The higher your score the more you should consider using Spark to investigate Building Renewal for your building.

1	Is the building significantly vacant (30% or more) or could it be in the near future?	Yes	No
2	Is the building at risk from losing a major tenant upon lease renewal?	Yes	No
3	Could innovative financial options such as energy service performance contracts (ESPC's), operating/equipment leases, energy service agreements (ESA's), Property Assessed Clean Energy (PACE) programs, or other resources be considered to supplement project costs?	Yes	No

SPARK Tool: Quick Screen

4	Are significant capital investments planned for the building?	Yes	No
5	Is the building considered at risk from environmental regulations, codes, or mandates?	Yes	No
6	Is the building is considered at risk of becoming unattractive to tenants or the market at large?	Yes	No
7	Is the energy use of the building considered too high? (for example, the building's ENERGY STAR score is less than 75)?	Yes	No
8	Are current or prospective tenants asking about the building's energy performance or certifications (such as LEED or ENERGY STAR)?	Yes	No

SPARK Tool: Quick Screen Report

Result: STRONG Candidate

Your building is a strong candidate for a successful Building Renewal – a whole-building energy savings project that reduces the building's energy use by over 35%.

BR Index Score

15/20

Market Position:	3	Risky
Tenant Conditions:	3	Fluid
Financial Flexibility:	5	Unleveraged
Systems + Structures	4	Aging

Market Position

3
Risky

The building is at risk of losing market appeal from tenants and/or investors, shows signs of decreasing asset value, and may need to incur additional costs to comply with codes. Risky buildings are good candidates for an BR project because the energy efficiency focus can anchor a repositioning strategy and deliver reduced operating costs and improved tenant comfort.

Tenant Conditions

3
Fluid

Significant opportunity exists to implement major construction projects within the building, either through current or future vacancies, the ability to relocate tenants, or tenant willingness and desire to improve environmental performance.

Financial Flexibility

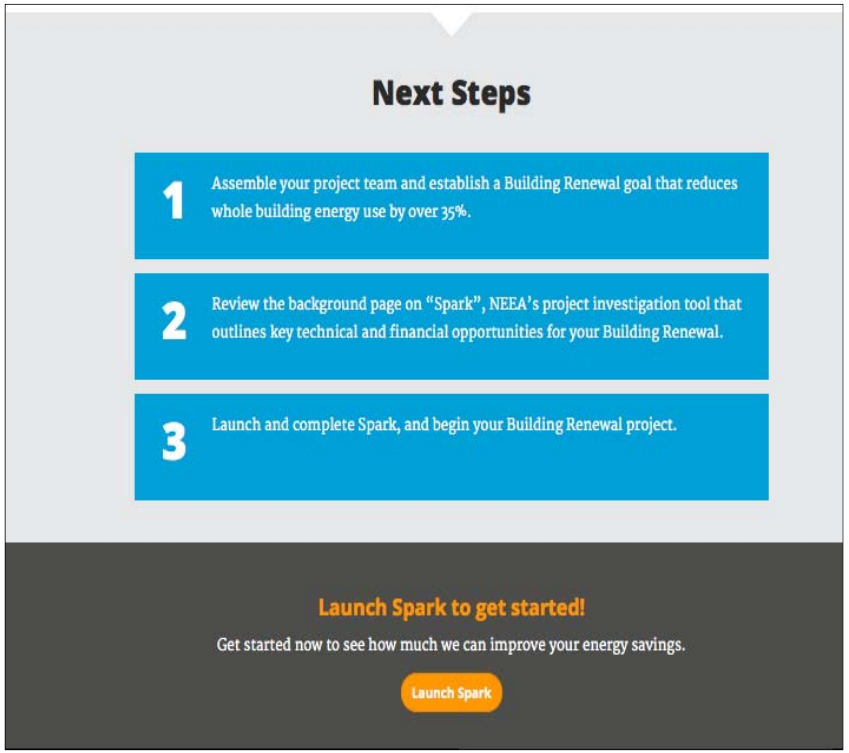
5
Unleveraged

The building's financial situation is such that a variety of options are available to fund the BR project, including a willingness to explore additional debt, energy services agreements, equity infusions, or other unique financial resources. Furthermore, planned capital projects offer an ideal window of to facilitate an BR project, integrating systems and envelope upgrades with other building enhancements.

Systems + Structures

4
Aging

The building has systems or structures in need of repair or replacement, such as the envelope or central plant. Aging buildings are good candidates for BR projects, where necessary investments in equipment and upgrades can be integrated to deliver deep energy savings.



Next Steps

1. Assemble your project team and establish a Building Renewal goal that reduces whole building energy use by over 35%.
2. Review the background page on "Spark", NEEA's project investigation tool that outlines key technical and financial opportunities for your Building Renewal.
3. Launch and complete Spark, and begin your Building Renewal project.

Launch Spark to get started!

Get started now to see how much we can improve your energy savings.

Launch Spark

Inputs – General Questions

Hydronic heat pump version

General | Utility Data | Envelope | Lighting/Plugs | HVAC | Boilers | Business

General Questions

What is the name of the building? My first commercial building

What is the address of the building?

Main Street

Peoria | IL | 00000

What was the date of the original building construction? 1975

Number of floors in the building? Do not include parking garages or other unconditioned space. 7

What is the gross square footage of conditioned (heated and/or cooled and ventilated) building space? 25000

What is the rentable square footage? 23750

Is a major renovation or modernization project planned, or expected to take place during next five years? Yes | No

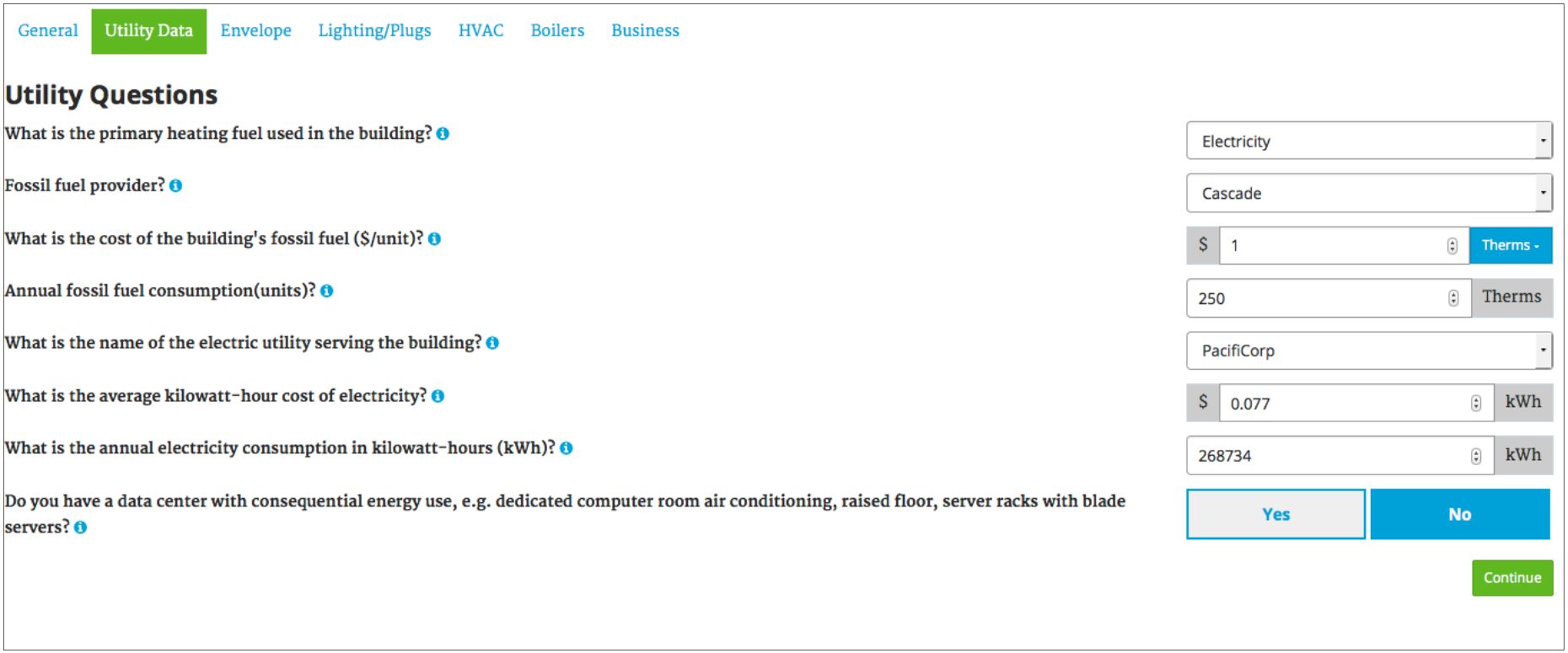
Briefly describe the scope of the anticipated major renovation project(s) and the year(s) in which they are expected to take place. Lots of stuff

If you have an ENERGY STAR® Portfolio Manager account and know the building's score, please enter it. 63

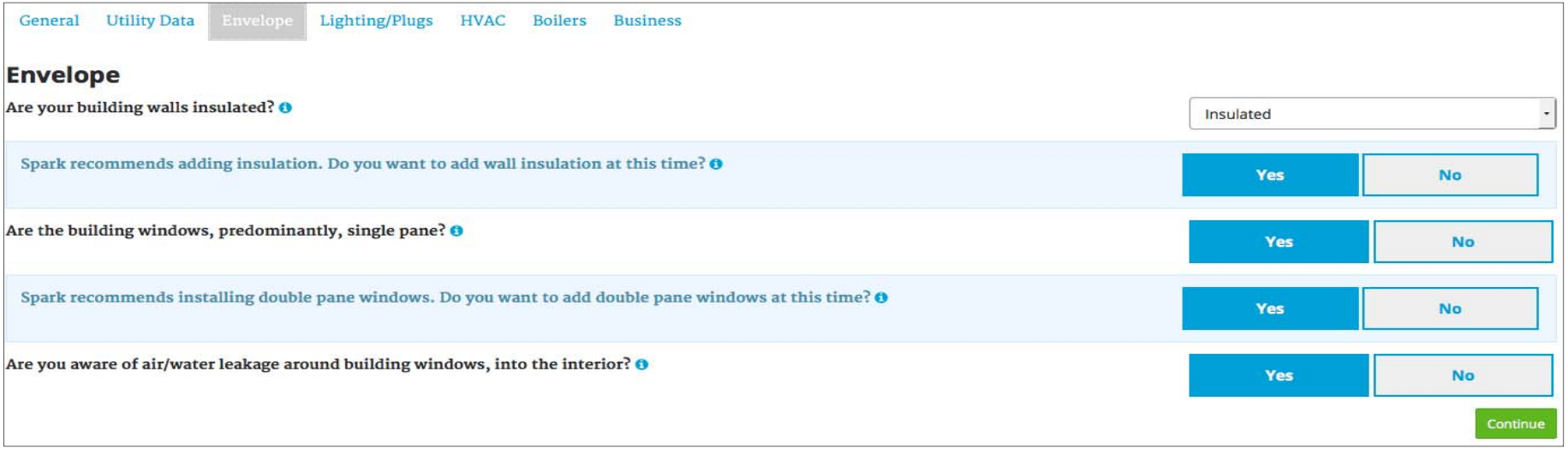
Do you have a hydronic heat pump system or an existing constant volume or VAV system to condition the building? Hydronic Heat Pump

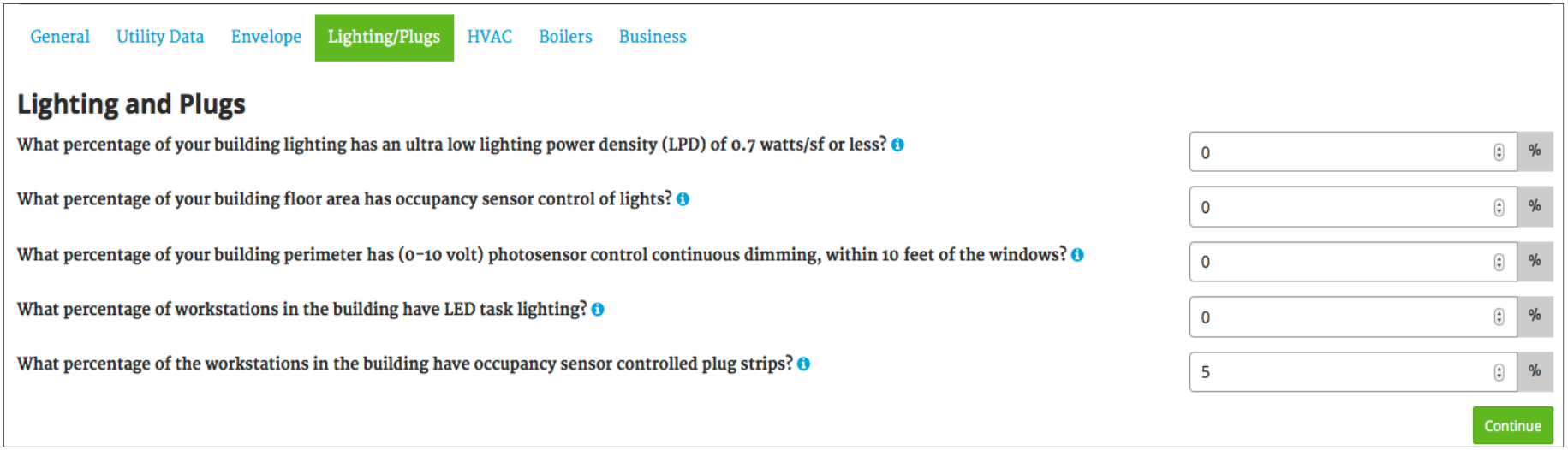
Continue

Inputs – Energy Data

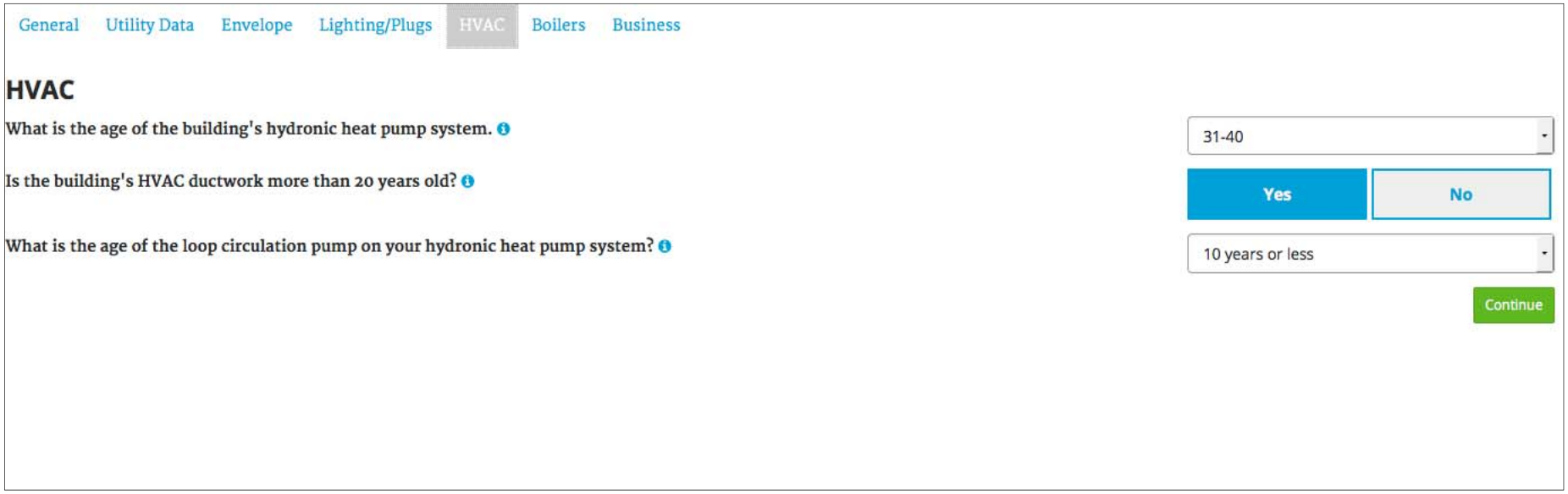


Inputs – Major Systems

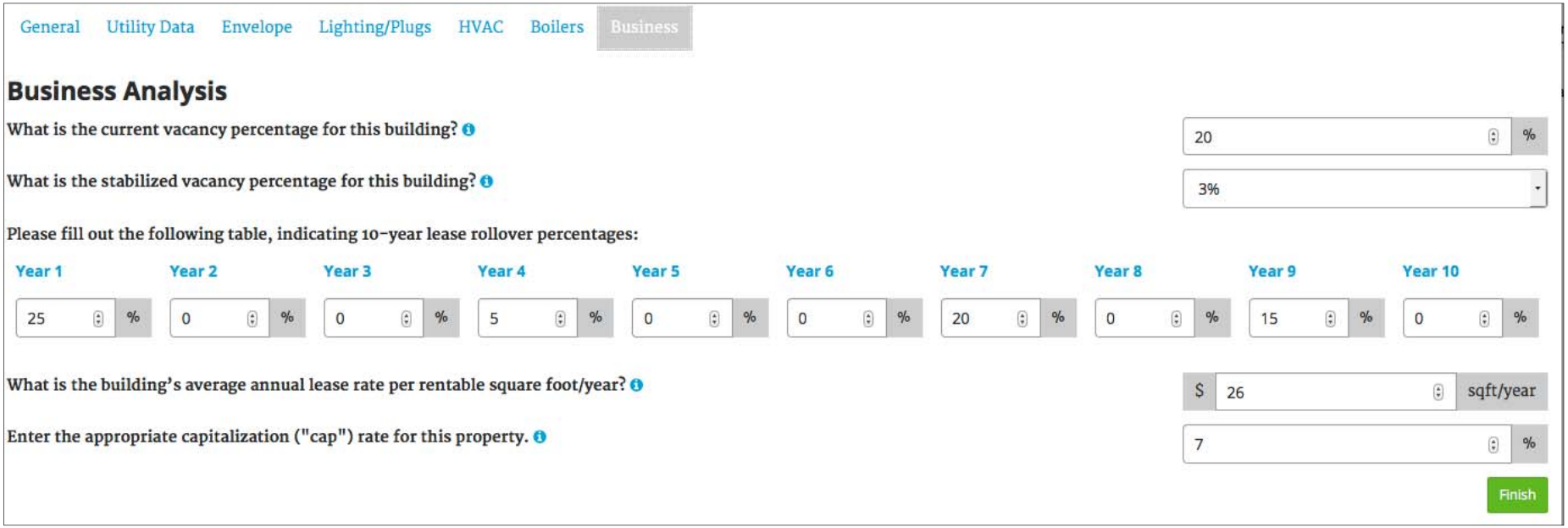




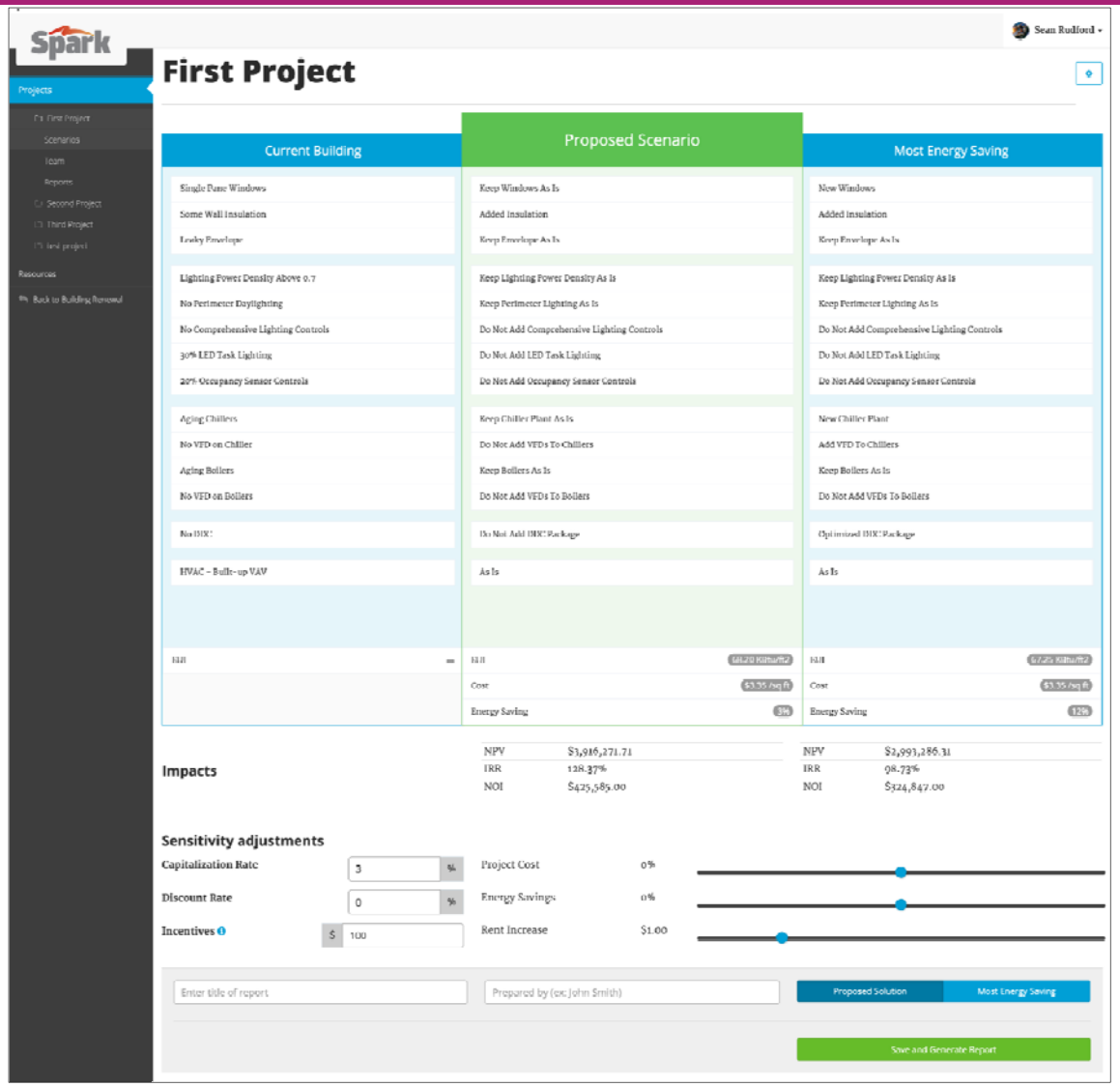
Inputs – Major Systems



Inputs – Business Analysis



Comparative Analysis



Assessment Report - Opportunities

Building Renewal
For competitive real estate advantage

Business Case Proposal

Metro Tower
Bellevue, WA.

Prepared by:
Gilda Goodwrench

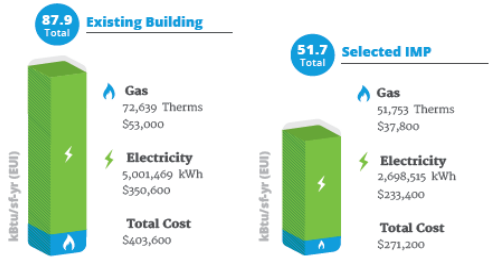
November 18, 2014

BUILDING RENEWAL
THE OPPORTUNITY

By implementing the complete package of energy efficiency measures recommended in this report, the Metro Tower has an opportunity to undergo a modernization that will significantly improve its energy performance, revitalize its competitive market position and increase asset value. The proposed project scope package of measures will result in total estimated energy savings of 41% at an estimated return of 15.6%.

Energy efficiency improvements and economic indicators are presented as if the entire package of energy efficiency measures is completed at the same time and as part of the same integrated, project scope. Reducing heating and cooling loads first optimizes HVAC system sizing and energy and economic performance. From a practical perspective, we understand that the proposed package of measures may need to be phased as opportunities and tenant rollover permit. The aim of this Building Renewal proposal is to provide an integrated package of measures with suggested measure sequencing to optimize results and provide the basis for a building roadmap to significantly higher energy performance.

ENERGY SAVINGS



Energy Use: ⬇ **41%**
Energy Cost: ⬇ **33%**
Annual Energy Savings: **$132,400**

Building Renewal Report | 2

Assessment Report – Project Scope Excerpt

PROJECT SCOPE

PACKAGE OF MEASURES

The following project scope energy efficiency measures have been envisioned as an integrated, bundled solution, to achieve 41% energy savings

New windows
Replace old, inefficient window assemblies with newer double pane units offering better thermal performance.

Envelope sealing
Reduce air leakage through the building enclosure.

LPD reduction
Reduce lighting load by delivering lower ambient lighting and high quality task lighting at each workstation.

Comprehensive control *(daylight and vacancy controls throughout)*
Reduce and/or turn off electric lights when unnecessary.

New chiller plant
Install a new high efficiency chiller (or chillers), with efficiency improvement of 20% to 30% compared to the existing chillers.

New condensing boilers
Replace aging boilers; improve plant part load operation by installing modulating boilers and/or modular boiler plants that can effectively operate at low load conditions, without excessive cycling.

Variable flow pumping retrofit - chiller plant
Pump replacement offers the opportunity to improve the mechanical efficiency of the pumps. This measure applies primarily to chilled water pumping systems but can also be applied to condenser water systems in some plants.

Variable flow pumping retrofit - boiler plant
Upgrade of existing constant flow heating water systems to energy-saving variable flow can involve some or all of the following: new piping, new pumps and motors, valve upgrade or replacement, VFD installation, and new controls.

Optimized VAV-central plant DDC package
Optimize existing controls, or Install a direct digital control system that controls all elements of the HVAC system and is tightly scheduled for building occupancy and other exterior influences. The system should not only execute control functions, but also collect and archive relevant building performance data for use in M&V activities.

Technical Addendum
A technical addendum can be downloaded from Spark, with descriptions of each energy efficiency measure, in sufficient detail to understand the measure intent and performance assumptions. These measure descriptions also discuss certain implementation issues and construction options.

Assessment Report – Key Indicators Excerpt

BUSINESS CASE

KEY INDICATORS

Internal Rate Of Return: **15.6%**

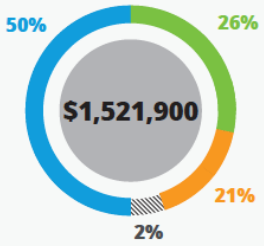
Net Present Value: **$1,521,900**

Estimated Project Costs		$/rsf	$/gsf
Incremental Project Cost	$3,355,100	$13.69	$13.54
Project Incentives *(est)*	$ 350,000	$1.43	$1.41
Net Project Cost	$ 3,005,100	$12.26	$12.13

Stabilized Impact On Net Operating Income	$/yr
Energy savings	$132,400
O&M expense reduction	$12,400
Rent differential	$10,100
	$154,900

NPV of value components *(10 year discounted cash flow)*

Asset Appreciation	$2,279,700
Rent differential	$1,191,500
Energy savings	$969,600
Reduced O&M expense	$86,200



Key assumptions

Time horizon for analysis	*10 years fixed*
Consumer price index (CPI) or Inflation	*3%*
Capitalization (CAP) Rate	*8.5%*
Discount Rate	*9.5%*
Energy Cost Escalation	*4%*

SPARK Tool: Testimonial Video

https://www.youtube.com/watch?v=biURp1P1jl8

SPARK Resources/Training

This page has registration links to all webinars: www.betterbricks.com/trainings

And here is a link to a recorded Spark webinar on the BetterBricks YouTube page: https://youtu.be/yBxh2fTXxFA

UPCOMING: Spark Tool – Assess your building's potential (September 13th, 2017, 10 am)

Register Here: https://attendee.gotowebinar.com/register/8245099538930073858

The webinar will focus on how to leverage Spark's integrated technical and financial reports to communicate the business case for building renewal projects. The webinar will include an overview of the building renewal strategy, a live demonstration of the Spark Tool, and a look at the customized integrated measure packages the Tool can create.

Presenters to include:

- Stan Price, Smart Building Center
- Emily Pearce, Waypoint
- Jeff Cole, Konstrukt

Earn Building Operator Certification Points

Resources and Contacts

University of Washington Integrated Design Lab (UW IDL)

- Technical Support – Building Renewal
- Recommended Opportunities
- Targeted Data Evaluation
- Targeted Simulation Support
- SPARK Tool Assistance

Contact:

Christopher Meek: cmeek@uw.edu
UW Integrated Design Lab
206-616-6566
http://www.cidseattle.com/idl/

Project Goals: Refinement and Scalability

- UW IDL will document implementation of Building Renewal progress though June 2019
- Our aim is to better understand opportunities and barriers for implementation of deeper savings and building renewal concepts
- Our intent is documenting project specific services delivered, outcomes, and lessons learned, to share with service providers and the City of Seattle OSE
- Long term owner engagement and assistance will be developed through the SBC and IDL

Q&A

Questions/feedback?

Thank you!

Training Wrap Up & Next Steps

Day 2 Review

- Building walk down and Asset Score practice
- Diagnostic Tool Lending Library resource
- Building Renewal and Spark Tool

Next Steps

- Please fill out the Evaluation Form
- Service Provider Agreement
- Help sign up buildings!

SEATTLE

BUILDING TUNE-UP ACCELERATOR

EVALUATION FORM

Helpdesk Support from SBC

Help Desk Hotline

206-800-7211

Help Desk Email

accelerator@seattle.gov

SMART BUILDINGS CENTER A project of NEEC

SEATTLE

BUILDING TUNE-UP ACCELERATOR

THANK YOU!