Better Buildings, Better Plants
SUMMIT

MAY 17-19 2022

Learn more: betterbuildingssolutioncenter.energy.gov/summit
In It for the Long Haul: Long-Term Financing Solutions for Energy Savings

Wednesday, May 18th, 2022
4:00 PM – 5:30 PM ET
Agenda

1. Welcome and Introductions

2. Commercial Property-Assessed Clean Energy (C-PACE)

3. Energy Savings Performance Contracting

4. Power Purchase Agreements

5. Energy Efficiency Financing Structures

6. Closing and Q&A
Today’s Presenters

• **Sean Williamson, Policy Advisor**
  - U.S. Department of Energy

• **Nick Polier, Energy Programs Manager**
  - Virginia Department of Energy

• **Christopher Benson, Associate Director, Sustainability & Energy**
  - University of Utah

• **Guy Van Syckle, Director of New Markets**
  - Hannon Armstrong
The Better Buildings Financing Navigator is an online tool that helps public and private organizations find financing solutions for energy efficiency and renewable energy projects.

With the Navigator, you can…

1. **Explore**: Learn the basics of the clean energy financing market
2. **Find**: Answer a few simple questions to see which financing options might be a fit for your project
3. **Connect**: Speak to Better Buildings Financial Allies who may be able to finance your project

Available at: [https://betterbuildingssolutioncenter.energy.gov/financing-navigator](https://betterbuildingssolutioncenter.energy.gov/financing-navigator)
Financial Allies Overview

Who are the Financial Allies?

- 50+ market-leading financing companies that have committed to funding energy efficiency and renewable energy projects
- Represent large, medium, and start-up companies
- Active in all sectors (C&I, MUSH, and residential)

What are the goals of the Financial Allies program?

- Educate the market about financial products available
- Connect building owners and vendors with financing providers
- Unlock the market with implementation models and best practices
- Recognize the Allies for their success
Energy Savings Performance Contracting (ESPC) Toolkit

Best practices that partners used to establish and implement ESPC, including a host of M&V resources.

https://betterbuildingssolutioncenter.energy.gov/energy-savings-performance-contracting-espc-toolkit

Commercial Property Assessed Clean Energy (C-PACE) Working Group

- C-PACE Working Group: Year in Review
- C-PACE Financing and the Special Assessment Process
- Lessons in C-PACE Leadership: The Path from Legislation to Launch
- Toolkit: C-PACE Financing for Resiliency

External Financing for Carbon Reduction Projects

Fact sheet that summarizes 7 common external financing modes.

DOE Resources

Carbon Financing Decision Tree - [https://betterbuildingssolutioncenter.energy.gov/carbon-hub/financing](https://betterbuildingssolutioncenter.energy.gov/carbon-hub/financing)

External

- Does the project include renewable energy?
  - Yes
  - No

- Do you want ongoing support in maintaining equipment performance?
  - Yes
  - No

- Are there specialized financing programs active in your area?
  - Yes
  - No

Inner

- Do you want to create a dedicated fund specifically for carbon reduction or sustainability initiatives?
  - Yes
  - No

- Do you want ongoing support in maintaining equipment performance?
  - Yes
  - No

- Do you have on-hand capital to deploy?
  - Yes
  - No

- Do you want to own the equipment?
  - Yes
  - No

- Energy Savings Performance Contract (ESPC)
- Energy-as-a-Service
- PACE
- On-Bill Financing and Repayment

- Green Revolving Fund (GRF)
- Capital Investment Fund
- Green Bonds
- Carbon Fee Fund
- CapEx/OpEx Outlay
DOE Resources

Finance and Resilience Roadmap

Explore a set of resources and case studies designed to help commercial building owners develop a plan for measuring, managing, and mitigating resilience risk

https://betterbuildingsolutioncenter.energy.gov/finance-resilience-toolkit
Sean Williamson
U.S. Department of Energy
Commercial PACE Toolkit: Resources to Propel Your C-PACE Program

May 18, 2022
3:30 p.m. - 5 p.m. ET

Sean Williamson, Policy Advisor
U.S. Department of Energy
Agenda

- Understanding Commercial PACE (C-PACE)
- Department Of Energy’s C-PACE Working Group
- Overview of the C-PACE Toolkit
- Highlighting Key Resources
  - C-PACE Financing and the Special Assessment Process
  - Improving Access to C-PACE for Smaller Businesses: Three Case Studies
  - Energy and Building Market Assessment Tool: C-PACE Application
PACE Mechanism Yields Beneficial Features

Typical C-PACE Transaction

- C-PACE features:
  - Long terms (20+ years)
  - Transferable to next property owner
  - Taxpayer funds not required

- Important differences between Commercial PACE (C-PACE) and Residential PACE (R-PACE)
Where is C-PACE Available?
Cumulative C-PACE Financing
2009-2020

- **$2.1 B**: Investment in projects across 20+ states
- **14%**: Investment in new construction projects
- **50%**: Investment in energy efficiency *only* projects
- **CA, OH, CT, CO, TX**: Top-5 States by dollar volume

Source: PACENation, [PACE Market Data](#)
DOE’s C-PACE Working Group: Achievements and Participants

**Impact:** Achieved $70 million in C-PACE-financed projects (2018-2020) exceeding the goal of $60 million two years early. Includes efficiency upgrades across an estimated 2.6 million square feet and 20 buildings.

**Partner Achievements:** Partners sought to launch C-PACE programs AND get projects completed.

- 75% have launched programs
- 40% have completed projects

**Participants:** 70+ participants including 33 state and local participants and 41 market partners.

<table>
<thead>
<tr>
<th>Partners (17)</th>
<th>Observers (8)</th>
<th>Advisors (8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arlington County, VA</td>
<td>New York, NY &amp; NYCEEC</td>
<td>California Municipal Fin. Authority</td>
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<td>Bernalillo County, NM</td>
<td>Philadelphia, PA—Philadelphia Energy Authority</td>
<td>Connecticut Green Bank</td>
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<td>Chicago, IL</td>
<td>Portland, OR—Prosper Portland</td>
<td>Dallas, TX</td>
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<td>Commonwealth of Massachusetts and MassDevelopment</td>
<td>Reno, NV</td>
<td>Ohio Port Authorities and Energy Special Improvement Districts</td>
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<td>Cook County, IL</td>
<td>State of Alabama</td>
<td>Show Me PACE Clean Energy District (Missouri)</td>
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<td>Delaware Sustainable Energy Utility</td>
<td>State of Nevada</td>
<td>State of Colorado</td>
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<td>State of New Mexico</td>
<td>State of Texas—State Energy Conservation Office</td>
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<table>
<thead>
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<th>State of Nevada</th>
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<tbody>
<tr>
<td></td>
<td>State of New Jersey</td>
<td>State of Pennsylvania</td>
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</table>
State and Local Participants (33 total)

Partners: 17 (5 states, 12 local governments)
Observers: 8 (5 states, 3 local government)
Advisors: 8 (6 states, 2 local government)
Introducing the C-PACE Toolkit

Part 1 – C-PACE 101: Build a Foundation
- C-PACE: A Fact Sheet for State and Local Governments
- Lessons in Commercial PACE Leadership: The Path from Legislation to Launch

Part 2 – Establish, Join, or Design a Program
- State-by-State PACE Legislation and Programs (PACENation)
- C-PACE Financing and the Special Assessment Process (Brief #1)
- State and Local Coordination Resources
- Energy and Market Assessment Tool: Commercial PACE Application

Part 3 – Implement a Program and Generate Uptake
- Practices for Demonstrating C-PACE Program Energy Savings (Brief #2)
- C-PACE Project Origination: Leverage Points for Growing the Project Pipeline (Brief #3 – Forthcoming)

Part 4 – Topics of Special Interest
Serving Underserved Market Segments
- Improving Access to C-PACE for Smaller Businesses: Case Studies from Three States (NASEO)

Resilience and New Construction
- Financing for Resilience with Commercial PACE
- C-PACE Financing for New Construction
Introducing the C-PACE Toolkit

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Resilience and New Construction
- Financing for Resilience with Commercial PACE
- C-PACE Financing for New Construction
- Trend towards 3rd party program administration
- C-PACE special assessment process tasks:
  - Recording
  - Billing
  - Collections and remittances
  - Enforcement
- Another trend: 3rd party handling of special assessment process tasks
- Minimal staff time spent on special assessment process
- Low defaults to date
Case Studies on Improving Access to C-PACE

- **Value:** Small and medium projects (less than $500,000) represent most of the commercial buildings in the U.S. Access to C-PACE for these projects will support small business owners, accelerate decarbonization, and facilitate economic development and job creation.

- **Three Case Studies:** Colorado, Michigan, Minnesota
  - **Colorado:** Community banks and rural lender networks
  - **Michigan:** Two Pathways – PACE and PACE Express
  - **Minnesota:** Leveraging a state revolving loan fund
Energy and Building Market Assessment Tool: C-PACE Application

**Purpose:** Provide jurisdictions with localized data, estimations, and analyses to inform C-PACE program creation, planning, and implementation. Available for any U.S. state, county, or city (with more than 1,000 commercial buildings).

**Applications:**
- Inform goal-setting and demonstrate energy savings opportunity
- Target marketing resources to segments with greatest savings potential
- Target partnership-building opportunities with contractors and building owners

**Outputs:**
- Executive Summary and Actionable Takeaways
- Building characteristics organized by building count, floor area, and use
- Energy use analysis by use type, end use, and floor area
- Energy and cost savings potential with and without cost-effectiveness

*Example Output – Table: Energy consumption in GBtu/year and building count by floor area*
Energy and Building Market Assessment Tool: Example

**Inputs**

**ENERGY EFFICIENCY & RENEWABLE ENERGY**

C-PACE Application

The Building and Energy Market Assessment Tool: Commercial PACE Application is designed to provide detailed analysis to state and local governments about their specific commercial building stock to inform the adoption and implementation of building-sector energy policies and programs. The Tool and this report are an outcome of the U.S. Department of Energy’s (DOE) Commercial PACE Working Group, the report is specifically customized to provide state and local jurisdictions with relevant data, estimates, and analysis to inform commercial property-assessed clean energy (C-PACE) program creation, planning, and implementation. The Tool has broad applications beyond C-PACE and is intended to be a resource that can support state and local decisions related to a multitude of building-sector energy policies and programs (e.g., building energy benchmarking policies).

Instructions:
1. In the table below, select "City", "County", or "State" using the dropdown menu in the "Analysis Level" input, depending on which type of jurisdiction you would like to analyze.

2. Select the state of your jurisdiction using the drop-down menu under "State Code" in the table below. If your "Analysis Level" is "State" you may stop here and proceed to the "Report PDF" tab.

3. If your jurisdiction is a city or county, select the appropriate one from the dropdown menu under "County" or "City" in the table below. Only the counties and cities in the selected state will appear. Only cities with more than 1,000 buildings and counties with more than 20 buildings are included. Proceed to the "Report PDF" tab when finished.

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<th>Notes</th>
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<td>2. State Code</td>
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<tr>
<td>3a. County</td>
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<tr>
<td>3b. City</td>
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</tbody>
</table>
Energy and Building Market Assessment Tool: Example

Outputs

Tables

Table E5.1.  Lifetime net savings potential ($USD) by retrofit technology and use type, only retrofits with SIR>1
Table E5.2.  Lifetime energy savings potential (MBtu) by retrofit technology and use type, only retrofits with SIR>1
Table 1.  Building size and count information by building use type
Table 2.  Building vintage distribution by building use type
Table 3.  Occupancy type distribution by building use type
Table 4.  Ownership type distribution by building use type
Table 5.  Energy consumption in GBtu/year and building count by floor area range
Table 6.  Energy consumption disaggregated by end use and building type in kBtu/sq.ft./year
Table 7.  Number of buildings by retrofit technology and use type, only retrofits with SIR>1
Table 8.  Total floor area (sq ft.) by retrofit technology and use type, only retrofits with SIR>1
Table 9.  Gross savings (thousand $USD) potential by retrofit technology and use type, only retrofits with SIR>1
Table 10.  Lifetime net savings ($USD) potential by retrofit technology and use type, only retrofits with SIR>1
Table 11.  Lifetime energy savings (MBtu) potential by retrofit technology and use type, only retrofits with SIR>1
Table 12.  Lifetime gross savings (thousand $USD) potential by retrofit technology and use type, regardless of SIR
Table 13.  Lifetime energy savings (MBtu) potential by retrofit technology and use type, regardless of SIR
Table A.1.  Use type mapping used for analyses in this report
Department of Energy Resources

- **C-PACE Toolkit**
  - C-PACE 101: Build a Foundation
  - Establish, Join, or Design a Program
  - Implement a Program and Generate Uptake
  - Topics of Special Interest

- **Energy and Building Market Assessment Tool: C-PACE Application**
  - Tool (50 MB Excel File)
  - User Guide
Stay Connected

- State and Local Solution Center:
  
  http://energy.gov/eere/slsc
  
  More than 400 tools, resources, and best practices

- State and Local Spotlight:
  
  http://energy.gov/slsc/subscribe
  
  Monthly newsletter with ~33,000 subscribers

Sean Williamson
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State and Local Inbox
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Nick Polier
Virginia Department of Energy
Financing Energy Efficiency Upgrades with Energy Savings Performance Contracting

Nick Polier
Energy Programs Manager
Office of Renewable Energy & Energy Efficiency (REEE)
Agenda

- Terminology
- Energy Savings Performance Contracting
- Virginia’s Statewide Procurement Program
- Financing Upgrades with Energy Savings Performance Contracting
- Measurement & Verification
- Solar Enhanced Projects
- Questions
Terminology

- **ECM** = Energy Conservation Measure
- **EE** = Energy Efficiency
- **ESCO** = Energy Service Company/Contractor
- **ESPC** = Energy Savings Performance Contracting
- **IGA** = Investment Grade Audit (aka TEA)
- **M&V** = Measurement & Verification
- **TELP** = Tax Exempt Lease Purchase / Municipal Lease
Energy Savings Performance Contracts

ESPC is designed to be a vehicle for financing energy upgrades in facilities.

- Facility Needs identified
- Proposed ECMs selected
- Term of Contract defined
- “Avoided Cost” pays for the project
- Guaranteed kWh and $ Savings
- Project Performance is verified

SOURCE: energy.gov/eere/
Virginia’s ESPC Program

Program Established in 2002

Over 280 Projects
Over $1B in Project Investment

Commonwealth of Virginia ESPC Contracts by Year

Energy Savings Performance Contracting
3 year Project History

2020
Total Contract Amount: $46.4M
Projects:
- VDOT
- VA Beach Public Schools
- Prince William County Schools
- New River Valley Regional Jail
- Essex County
- Loudoun County Schools
- City of Emporia
- Bedford Regional Water Authority

2021
Total Contract Amount: $42.9M
Projects:
- VA Beach City Schools
- Charles City County Schools
- City of Virginia Beach
- Loudoun County Schools Phase II
- Pittsylvania County Schools Phase III
- Virginia Museum of Natural History
- Shenandoah County Schools
- Fairfax County

2022
Total Contract Amount: $25.9M
Projects:
- Northampton County Schools
- Northampton County
- Loudoun County Schools Phase III
- Fredericksburg City Schools
- Virginia Distribution Center
Virginia’s ESPC Program

- Expedited Procurement
- DGS is the Contract Manager
- Virginia Energy Role
- Customer Involvement/Input
- Project Selection
- Annual Savings vs Annual Payments
Financing ESPC Projects

● Remember: Avoided costs pay for the cost of the Project

● You may already be paying for a project

● Financing Options
  ○ Self Fund
  ○ Lease
  ○ Combination

● Allowed to “buy down”

SOURCE: energy.gov/eere/femp
Measurement & Verification

- Mandatory
- Verifies Project Performance
- Explains the How
- Review
- Non-Performance
- Life

SOURCE: energy.gov/eere/femp/
Solar Enhanced ESPC in Virginia

- Program established in 2019
- $3M Total: $2M for State Agencies / $1M for Public Bodies
- Repurposed ARRA funds
- VA Energy & DOE requirements
- ESPC that includes Solar PV
- Help cover cost of Solar
- VA Clean Energy Goals
Virginia Energy &
Charles City County School Board Solar
Enhanced ESPC Project

Charles City County High School
Energy Conservation Measures

- Building Controls
- HVAC
- Building Envelope
- Boilers
- Hot Water Upgrades
- Ground Mount Solar PV
- Lighting
- Wastewater Treatment
- Scoreboard Improvements
- Track Resurfacing

Total Project Cost: $4.6M
● Size: 714.4kW Ground Mount Solar Array
● Cost: $2.1M (of the $4.6M total)
● VA Energy Grant: $500,000
● Projected Total Annual Savings: $171,226 or 1,708,511kWh
● Projected Annual Solar Savings: $86,824

● VA Energy’s First Solar Enhanced ESPC Project
● Public Body Customer
● 59% Reduction in energy consumption at the High School
● Historically Economically Disadvantaged Community (71% minority)
Questions

Nick Polier (CEM, CMVP)
Virginia Department of Energy
Renewable Energy/Energy Efficiency
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276-523-8190 (office)
276-220-9146 (cell)
Better Buildings, Better Plants Summit
In It for the Long Haul: Long-Term Financing Solutions for Energy Savings

STRATEGIES & LESSONS LEARNED
FINANCING SUSTAINABLE OPERATIONS AT THE UNIVERSITY OF UTAH

Christopher Benson, MBA, PE, CEM, LEED AP
May 18, 2022
Agenda

1. Background
2. Operational Strategies
3. Deep Dive Example w/ Large-Scale Renewable PPAs
4. Contact
BACKGROUND: Scale

Public Research University in Salt Lake City, UT, U.S.A

46k students, staff, faculty

MAIN CAMPUS

• 275 buildings (18M sq ft floor area) for classroom, office, research, healthcare, housing, etc

• 6 Districts and 36 Auxiliary partners

• $30M/yr utility bills. 1% of all electricity and gas use in Utah

• $5B in building assets w/ significant diversity in age/tech.
BACKGROUND:
University Climate Commitment

RESOLUTION: THEREFORE, be it resolved that the Academic Senate requests that the University of Utah recommit to achieving net-zero carbon emissions quickly and by no later than 2050...
BACKGROUND: One U Short-Term Goals

Core Goals Strategy 2025:
- Promote Student Success
- Generate Knowledge
- Engage Communities
- Ensure Vitality
BACKGROUND: Significant Progress & Returns Through Reinvestment of Savings w/ Revolving Sustainability Fund
BACKGROUND: Notable Milestones – Renewable Energy Leadership

University of Utah has the 2nd largest long-term contract of any College/University for Renewable Energy
BACKGROUND:
Notable Milestones –
Energy Efficiency
Goal Met

- U.S. Department of Energy
  Better Buildings Challenge
  goal exceeded in 2020
  (25% EUI reduction)

Lowest total energy use of
last 12 years,
despite 28% growth in square footage

UofU Source EUI History and Projections

Source EUI (kBtu/sq ft)

Source EUI (kBtu/sq ft)

BBC 2020 Goal EUI (kBtu/sq ft)

UofU Energy Use Intensity Trends and Projections as of 2022-05
BACKGROUND:
Notable Milestones – Significant Water Savings

18% Total Water Savings in 2019
BACKGROUND:
UofU Carbon Footprint as % of Baseline

UofU Carbon Footprint FY07 (eGRID 2007 UT)
- Electricity: 65%
- Natural Gas: 11%
- Land Travel: 21%
- Air Travel: 2%
- Other: 1%

Projected UofU Carbon Footprint FY23 (eGRID 2019 UT)
- Electricity: 8%
- Natural Gas: 25%
- Land Travel: 16%
- Air Travel: 2%
- Other: 1%

ACHIEVED REDUCTION (FROM...
OPERATIONAL STRATEGIES: Portfolio-Wide Projects

OPERATIONAL STRATEGIES:
UofU Carbon Footprint – Split by Classification

UofU Carbon Sankey (DRAFT): Benson 2021-09
OPERATIONAL STRATEGIES: Stakeholder and Expert Engagement (SEED2SOIL)

- Social Engagement, Evaluation, and Discovery
  - Social Engagement
  - Evaluation
  - Discovery

- Sustainable Operations Working Groups
  - Sustainable Operations Working Groups
  - Sustainable Operations Investment Leadership
  - Project Labor Accounting Navigation Team

- Historical Analytic Results and Visualized Evidence Support Team

- SOW: Food
- SOW: HVAC
- SOW: Lighting
- SOW: Building Water 
& Sewer
- SOW: Grounds, Ecosystems, 
& Stormwater
- SOW: Materials 
& Equipment Purchasing
- SOW: Materials, 
Equipment, 
Purchase Order
- SOW: Building 
& Energy
- SOW: Waste, Recycling, 
& Compost

- GFSC Research Management
- GCSC Research Award
- GCSC Research/ New Technology
- GCSC Small Projects Team
- O&M Support

- Problematics Sessions
- Open Call for Ideas from Researchers
- Ideas from Strategic Plans
- Online Submission
- Harvest Lessons Learned
- Ideation sorted by Areas of Influence

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Financing Sustainable Operations at the UofU 2022-05-18

OPERATIONAL STRATEGIES: SEED2SOIL Idea Filtration

Source
- GREEN GAS
- UNDER EVALUATION
  - Procurement Policy
  - Microgrid
  - Backup Generator & Fuel Cell
  - Waste and Offsets

Assets/Technology
- HEAT PUMP HW BOILERS
- SATTELITE CAMPUS
- SINGLE CAR DEMAND
- INTERMODAL HUB
- PLANT SHUTDOWN
- SENSOR AND STAND-ALONE COOLING
- FLUE WOOD RETROFITS

Efficiency
- BUILDING SCHEDULING
- PLANT OPTIMIZATION
- AHU SETPOINT OPTIMIZATION
- THERMOSTAT TRAINING
- AUTO UO MOBILES
- HEAT PUMP DHW
- INDOOR LIGHTING
- FLEET TO ELECTRIC
- SPACE HEATER SWAP

Waste and Offsets
- ON-SITE COMPOST
- WORK FROM HOME AND REMOTE ATTENDANCE
- FLIGHT OFFSETS
- ECO SYSTEMS AND REFORESTATION

IN PROGRESS/COMPLETE
- OFF-SITE RENEWABLE ELECTRICITY
- LONG-TERM TRANSITION OF ELECTRICITY
- WORK FROM HOME POLICY
- THERMAL ENVELOPE WEATHERIZATION
- PLANT SHUTDOWNS
OPERATIONAL STRATEGIES: Early Emphasis on SIR to Build the Revolving Sustainability Fund Snowball

**Financing Sustainable Operations at the UofU 2022-05-18**

**Table: Other Value Considerations**

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<th>Equip</th>
<th>Issue type</th>
<th>Measure Name</th>
<th>Measure Ease (1-3: simple fix, 2-some investigation/design, 3-major project)</th>
<th>Measure Life (yr)</th>
<th>Full-Scale Upfront Cost</th>
<th>Full-Scale Annual Labor for Full Persistence (FTE)</th>
<th>Full-Scale Annual Net Value to Investment Ratio (SIR)</th>
<th>Savings to Investment Ratio Year</th>
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<tr>
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<td>scheduling/shutdowns</td>
<td>operate for elec demand peaking vs base heating</td>
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<td>BAS override, reverse control, PID tuning</td>
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<td>occupancy scheduling and temp setbacks vs minimal (me N Y Y N</td>
<td>3</td>
<td>5.0</td>
<td>$828,495</td>
<td>0.4</td>
<td>$1,587,949</td>
</tr>
<tr>
<td>STEAM TRAP</td>
<td>corrective maint issue</td>
<td>blow through, flooded, plugged</td>
<td>N Y N N</td>
<td>2</td>
<td>4.0</td>
<td>$62,720</td>
<td>0.1</td>
<td>$92,400</td>
</tr>
<tr>
<td>HEATING PLAN</td>
<td>scheduling/shutdowns</td>
<td>seasonal plant shutdowns</td>
<td>N Y N N</td>
<td>3</td>
<td>1.0</td>
<td>$94,500</td>
<td>0.2</td>
<td>$340,200</td>
</tr>
<tr>
<td>AHU</td>
<td>corrective maint issue</td>
<td>external leak (usually noticed and fixed without intervention)</td>
<td>N Y N N</td>
<td>2</td>
<td>4.0</td>
<td>$13,323</td>
<td>-</td>
<td>$11,481</td>
</tr>
<tr>
<td>AHU VALVES</td>
<td>corrective maint issue</td>
<td>clogged/damaged valve seat, open bypass, loose connection</td>
<td>N Y Y N</td>
<td>2</td>
<td>4.0</td>
<td>$70,178</td>
<td>0.4</td>
<td>$49,710</td>
</tr>
<tr>
<td>FY21 INIC P&amp;I</td>
<td>corrective maint issue</td>
<td></td>
<td></td>
<td>N Y N</td>
<td>5</td>
<td>$15,000</td>
<td>0.0</td>
<td>$4,478</td>
</tr>
</tbody>
</table>
OPERATIONAL STRATEGIES:
RSF Carbon Neutrality Timeline (2050 goal year)

University of Utah Carbon Footprint
DEEP DIVE EXAMPLE, LARGE-SCALE RENEWABLE PPAS:
UofU History of Off-site Geothermal and Solar Projects

**2017: May to July**
- Renewables RFP published
- Intent to award: Cyrq (20MW geothermal) & BHRE (10MW PV)

**2017: Oct to 2018: Feb**
- Board of Trustees consent
- Contract finalization
- Final review & President Pershing signatory

**2018: Sept to 2019 March**
- Cancelation of BHRE (unable to meet commitments)
- Guidance from Procurement, General Council, Budget Office, Facilities Committee, & CMP Committee
- Replacement renewables RFP published

**2019: Aug to Oct**
- RFP winner identified.
- 20MW Solar option selected and contracts/construction starts

**FINAL STAGES**
- Nov 2019: 20MW geothermal begins delivery
- Oct 2022: Replacement solar scope begins delivery
LARGE-SCALE RENEWABLE PPAS:
Leadership Among Peers

- 20+% reduction in total carbon footprint
- Top National Rankings on EPA list of Green Power Partnership
- Precedence setting. UT choice for energy supply, regardless of space or geography
- Huge opportunity to boost LEED Certification for construction projects
LARGE-SCALE RENEWABLE PPAS:
Solar RFP Options and Approval Path

Options Considered
1. No action (geothermal only)
2. Direct scope replacement of previously-approved solar scope (25 year, 10MW solar) with better price
3. Expanded scope (25 year, 20MW solar) with better price
4. Other

Approval Path
- Initial Purchase Agreement Review
- President’s Cabinet
- BOT Executive Committee
- Board of Trustees
LARGE-SCALE RENEWABLE PPAS: Winning Combo… Why Solar and Geothermal?

- Energy price of solar energy < geothermal
- Seasonal compliment close match to consumption (reducing peak demand charges)
LARGE-SCALE RENEWABLE PPAS: Right Sizing and Risk of Over-Committing

Electrical Consumption (MWh/yr)

- Solar (55,000 of 20MW option)
- Geothermal (148,000)
- Hydro, cogen, on-site solar (25,000)

Elec load: status quo
Elec load: w/ efficiency & electrification

2005 2015 2025 2035 2045
LARGE-SCALE RENEWABLE PPAS:  
Process - Validated Model and Assumptions

**Validated financial model.** Aligned results from original Energy Strategies, Rocky Mountain Power, and University

Discount Rate for Net Present Value: 5%

(PRE-COVID) Evaluated With Two Cost Escalation Rates. Including most-conservative rates of NIST Energy Escalation Rate Calculator (EERC)

Evaluated With Two Electricity Growth Projections. Including most-likely trends of reductions through efficiency and increased electrification
LARGE-SCALE RENEWABLE PPAS: Recognizing Time Sensitivity

Short-term spike in University electrical costs until solar scope is replaced

Large supplier project backlog. Multi-year delay for renewables projects not already pre-approved.

Tax credits for suppliers reduce after 2019 and were set to expire in 2021
LARGE-SCALE RENEWABLE PPAS:  
Market Trends Dominate Sensitivity Analysis

PRE-COVID, Market Escalation Rate was Main Driver of Long-Term Sensitivity

Elec Cost Impact vs No Renewables  
Option 2 (Geothermal + 20MW Solar): -9% to +8%

Over project life, NIST tool projected utility elec cost escalation slightly above rate of inflation (2%)
LARGE-SCALE RENEWABLE PPAS: Market Insight and Cost Competitiveness

Market Insight Gained Through PPA

- Solar was the most cost-effective compliment to geothermal w/o storage
- 20MW size provided best value under all modeled scenarios
- 25-year options have best value, but shorter-term options are viable

Cost Competitiveness

<table>
<thead>
<tr>
<th>2020 UofU Elec Costs As Blended Rate</th>
<th>2019 EIA Avg Commercial Elec Costs as Blended Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>20MW solar</strong></td>
<td><strong>$42 /MWh</strong></td>
</tr>
<tr>
<td>(supplier cost + utility delivery and demand)</td>
<td><strong>n/a</strong></td>
</tr>
<tr>
<td><strong>Substation with renewables combo</strong></td>
<td><strong>$68 /MWh</strong></td>
</tr>
<tr>
<td>(geothermal, solar, and grid)</td>
<td><strong>n/a</strong></td>
</tr>
<tr>
<td><strong>Substation without renewables</strong></td>
<td><strong>$67 /MWh</strong></td>
</tr>
<tr>
<td>(grid-only: majority coal/gas)</td>
<td><strong>$92 /MWh</strong></td>
</tr>
<tr>
<td>UT: <strong>$92 /MWh</strong></td>
<td><strong>USA: $109 /MWh</strong></td>
</tr>
</tbody>
</table>
LARGE-SCALE RENEWABLE PPAS: Anticipated Risks, Mitigation, and Lessons Learned

<table>
<thead>
<tr>
<th>RISK</th>
<th>MITIGATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delays or non-performance of supplier</td>
<td>• Fast track w/ pre-approved projects</td>
</tr>
<tr>
<td></td>
<td>• Contract terms provide financial damages</td>
</tr>
<tr>
<td></td>
<td>• Backup power always available from grid without interruption</td>
</tr>
<tr>
<td>Uncertainty of market and technology innovation</td>
<td>• Purchase agreement and fixed costs act as hedge</td>
</tr>
<tr>
<td></td>
<td>• Contractual option to buy out</td>
</tr>
<tr>
<td>Electric loads fall more than expected</td>
<td>• Option to add more points of delivery or resell to 3rd party</td>
</tr>
</tbody>
</table>

LESSON LEARNED 1: Big impact with panel procurement due to industry investigations, potential retroactive fines, and import restrictions

LESSON LEARNED 2: Much larger price escalation than modeled from global pandemic effects and price inflation
CONTACT

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Assoc. Director, Facilities Sustainability & Energy
University of Utah
Chris.Benson@utah.edu
Guy Van Syckle
Hannon Armstrong
WHO WE ARE

First U.S. public company solely dedicated to investments in climate change solutions

Climate-Positive Investor

~$2 Billion
Invested Annually

Markets & Asset Classes

Behind-The-Meter
- Energy Efficiency
- Distributed Solar
- Storage

Grid-Connected
- Solar Land
- Onshore Wind

Sustainable Infrastructure
- Clean Water
- Ecological Restoration
- Resiliency
INVESTING IN LONG TERM PARTNERSHIPS

Our programmatic funding platform is built on deep relationships with leading clean energy and infrastructure companies and top institutional investors.
## CLIENT SOLUTIONS

<table>
<thead>
<tr>
<th>Commercial &amp; Industrial</th>
<th>Federal</th>
<th>State &amp; Local</th>
<th>Grid-Connected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency, Solar, Transportation, &amp; Storage</td>
<td>Efficiency, Renewables &amp; Storage</td>
<td>Efficiency, Renewables, Transportation, &amp; Storage</td>
<td>Utility-Scale Wind, Solar, &amp; Storage</td>
</tr>
</tbody>
</table>

### Contract Structures

- **Energy as a Service ("EaaS")**
- **Property Assessed Clean Energy ("PACE")**
- **Off Balance Sheet Structures and Operating Lease Structures**
- **Energy Savings Performance Contract ("ESP")**
- **Utility Energy Savings Contract ("UESC")**
- **Utility Privatization ("UP")**
- **Power Purchase Agreement ("PPA")**
- **Enhanced Use Lease ("EUL")**
- **Public Private Partnerships ("P3")**
- **Energy Services Agreement ("ESA")**
- **Equity interests**
- **Power Purchase Agreement ("PPA")**
- **Land Transactions (Sale leaseback)**
- **Gen-tie/BOP (Sale leaseback)**
CUSTOMER & EE DEVELOPER RELATIONSHIP

<table>
<thead>
<tr>
<th></th>
<th>PACE</th>
<th>Lease</th>
<th>Energy Services Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customer payment obligation</strong></td>
<td>Fixed tax assessment</td>
<td>Fixed lease obligation</td>
<td>Subject to performance of equipment</td>
</tr>
<tr>
<td><strong>Customer balance sheet impact</strong></td>
<td>Assets up, Tax liability on property</td>
<td>Assets up, Liabilities up</td>
<td>Assets flat &amp; liabilities flat, subject to developers control over assets</td>
</tr>
<tr>
<td><strong>Owner of Installed Equipment</strong></td>
<td>Customer</td>
<td>Lessor</td>
<td>EE developer then transferred to financier</td>
</tr>
</tbody>
</table>
LEASE STRUCTURE

Customer

- Customer executes a separate lease agreement, bond purchase agreement, etc. to fund the project
- Fixed Lease payments, etc.

Bank, Leasing Company, or Financial Institution

EE Developer

- Guarantees Installation of Asset
- Guarantees annual energy savings

Performance Contract

O&M or M&V Payments
ENERGY SERVICES AGREEMENT ("ESA") STRUCTURE

- EE developer guarantees installation of Asset and annual energy savings and/or KPI’s
- Hannon funds installation cost + margin
- Buys ESA payments from EE developer under Master Purchase Agreement or lends against ESA payments
- Takes customer credit risk

Customer

EE Developer

All Project Payments Assigned to Trustee

Paying Agent (Bank that manages wiring & account logistics)

Energy Savings Agreement

O&M or M&V Payments

Benefit Payments Directed to HA
<table>
<thead>
<tr>
<th></th>
<th>Credit Facility or Loan Agreement</th>
<th>Master Purchase Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Developer Goal</strong></td>
<td>Build assets on balance sheet and recurring revenue</td>
<td>Recognize revenue at project completion</td>
</tr>
<tr>
<td><strong>General Description</strong></td>
<td>Hannon Armstrong funds EE project developer as contract agreements are joined as collateral under the Loan Agreement</td>
<td>HA purchases contract receivables from EE project developer</td>
</tr>
<tr>
<td><strong>Asset Owner</strong></td>
<td>EE developer</td>
<td>Hannon or Customer</td>
</tr>
<tr>
<td><strong>Liability Treatment</strong></td>
<td>Loan on EE developer balance sheet</td>
<td>No liability to EE developer</td>
</tr>
<tr>
<td><strong>Revenue Recognition</strong></td>
<td>100% of revenue recognized over life of contract</td>
<td>Purchase price recognized as revenue in yr 1, O&amp;M % of cashflows recognized over term of contract</td>
</tr>
</tbody>
</table>
HANNON ARMSTRONG CASE STUDIES

Corporate Energy Efficiency:  
ESA + Loan Agreement Structure  
>$35 million  
Credit facility for an energy efficiency vendor backed by energy as a service agreements across 10+ food service franchisees and corporate entities funding over 3,000 individual installations.

Industrial Energy Efficiency:  
ESA + Purchase Agreement Structure  
>$25 million  
Purchased energy as a service payments from an EE developer to fund the upfront cost of efficiency improvements across automotive manufacturing facilities and corporate offices under a rolling series of purchase orders and modifications over a 5 year period.
## PRACTICES TO AVOID DELAYS AND STICKING POINTS

<table>
<thead>
<tr>
<th></th>
<th>Practice</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Screen for Credit Quality of Customers</td>
<td>Secure 3 yrs of audited financials of customer (or confirm credit rating) early in financing process such that financier can screen for credit quality.</td>
</tr>
<tr>
<td>2</td>
<td>Review Accounting Goals</td>
<td>Consider customer’s and EE developers accounting goals early in process (ie revenue recognition, off balance sheet, etc).</td>
</tr>
<tr>
<td>3</td>
<td>Standardize Documentation and Review Early with Financier</td>
<td>Utilize standardized contracting agreements across clients and projects wherever possible to enable scaling. Establish contract documentation in consultation with prospective financier.</td>
</tr>
<tr>
<td>4</td>
<td>Clarify Termination Rights</td>
<td>Ensure there is a clear obligation from either customer or EE developer to make scheduled payment in event of contract termination.</td>
</tr>
<tr>
<td>5</td>
<td>Prepare for Scope and Agreement Modifications</td>
<td>Build in features in customer and financier documentation to accommodate project modifications.</td>
</tr>
</tbody>
</table>
Q & A
Thank You!

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