
2021 IDEA Innovation Awards
Thursday, December 16, 2021
2:00-3:00pm EST

Insights & Innovations
An IDEA Information Series

Housekeeping Slides

Webinar and Q&A Format

This webinar is scheduled for one hour, including the presentation and approximately 15 minutes for Q&A. If needed, the webinar will extend past the hour to answer as many audience questions as we can.

This webinar will be recorded

and streamed on the IDEA website within 24 hours of the conclusion of this webinar. Registrants will also be sent a follow-up email with links to the recording and presentation slides. A link to the presentation slides is also provided in the chat box if you want to print out and follow along.

How to Submit Questions

Please submit questions via the "Q&A" box during the presentation portion of the webinar. The Q&A icon can be found in the menu bar at the bottom of your screen. Questions will be reviewed by IDEA and posed to the presenters by the host at the conclusion of their presentation.

If you are having audio or video issues, please send a note via the Chat to our host, Jason Beal.

INTERNATIONAL DISTRICT ENERGY ASSOCIATION
Virtual Learning

Innovation Award Committee Chair

Bob Smith
Vice President
RMF Engineering

About the IDEA Innovation Award

Established in 2013, the IDEA Innovation Award recognizes collaboration among IDEA members in deploying replicable projects, devices or strategies that demonstrate efficiency gains, resource optimization, pollution reduction or operational improvements.

The award showcases examples of technology, engineering and operational innovation within the district energy industry. Presented annually at IDEA's Annual Conference & Trade Show, the award is evaluated in four main categories:

Judging Criteria

- **Ingenuity:** the technology has to be a new technical, business, or operating practice that shows ingenuity.
- **Measured Success:** the technology must be working for a sustained period of time with demonstrated efficiency success that can be measured.
- **Replicable:** the innovation must be replicable, meaning that this idea can be easily applied elsewhere.
- **Economic & Environmental:** the innovation must demonstrate economic and environmental benefits.

The Future is Bright

- This years' Innovation Awards was one of the most diverse and close competitions in recent memory.
-
- The great news is that there was quite a variety of technologies that all have notable merit. This bodes well for the future of district energy.

- As committee chair, I would like to thank the Innovation Committee for their hard work in judging this year's submissions. We are pleased to honor this year's winner and runners-up.

- You can view winning submissions on the IDEA website


Meet the Winners
University of Virginia and Innovas
Honorable Mentions
Everactive
City of Edmonton
Ecosystem

Application of Everactive Wireless Batteryless Continuous Steam Trap Monitoring at UVA Steam Distribution System

Brian Alessi
Vice President of Marketing
Everactive

Winner: Honorable Mention

University of Virginia steam trap background

- 1,900 steam traps
- Conducts annual steam trap survey
- Un-quantified energy loss from traps

The problem

Global Costs of Steam Trap Failure are Well-Known

Annual steam trap failure rate

20%

Cost of wasted energy

$53B

Metric tons CO_2 emissions

232M

Risk of process downtime

Risk of EHS incidents

Existing solutions are costly & inefficient

Manual audits

- x **Labor-intensive**
- x **Sporadic**
- x **False readings**

OR

Battery-powered wireless sensors

- x **Steep costs**
- x **Battery maintenance**
- x **Difficult to scale**

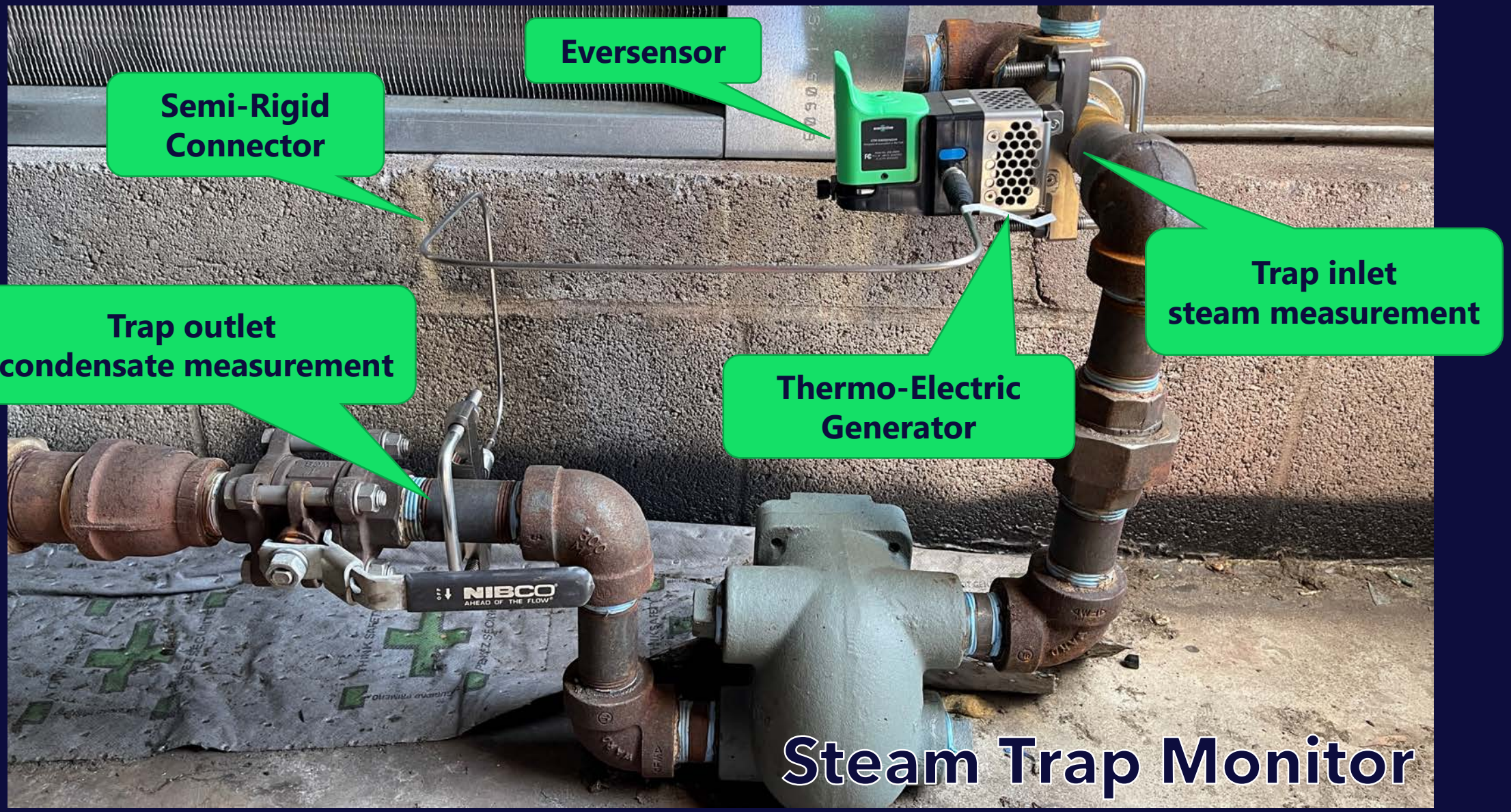
Why trade one maintenance event for another?

everactive

The approach

- UVA deployed **100** Everactive **wireless and batteryless** Steam Trap Monitor (STM) sensors in 2018 through a **Strategic Infrastructure Fund** (SIF) research grant to test the benefits of continuous monitoring.
- In late 2019 the deployment of STM sensors was found **successful** against manual surveys and other monitoring solutions.
- In March 2020 UVA commercially expanded to **391** steam traps in the most critical application, the **180#** steam supply to the large **UVA Hospital** and Medical Research facilities.

The solution



Self-powered wireless monitoring solutions

New Data to Your Preferred Systems

Gen 3 Eversensor

Always-On Network

- ✓Lowest power + low latency
- ✓Up to 1km bi-directional range
- ✓Thousand-node density per gateway

- ✓Low-levels of harvested energy
- ✓Continuous sensing & transmission
- ✓Distributed edge computing

Self-Powered Nodes

Gen 2 Eversensor

Custom Chips

- ✓Always-on ultra-low power radio
- ✓Sub-V_T digital processing
- ✓Energy harvesting PMU

Tech Stack

everactive

The results

- UVA had **384** continuously monitored traps from March 2020 to March 2021
- Assuming that the failures will have been **caught once a year** through UVA annual steam trap audits, we can estimate a potential energy loss
- With Everactive's STM solution, UVA was able to **repair all 14 failed traps** shortly after they were identified
- This resulted in an energy savings of **18,103 MMBTUs** and reduction of **$114,547** in energy cost
- That is total reduction of, resulting in a **90%** reduction in steam energy loss, with only **20%** monitoring coverage

STM Coverage **20.2%**	Energy Saved **18,103 MMBTUs**
Energy Reduction **90%**	Gross Energy Savings **$114,547**

everactive

University of Virginia case study

Key Assumptions

Steam traps	384
Avg. PSI	180
Steam cost	$10 / 1k lb.
Audit cost	$25/trap
Monitoring cost	$250/trap

Upfront HW
$0

Net Annual Savings
$28,147

1-Year ROI
29%

Annual CO_2 Savings
950 tons

Equivalent Gasoline
107,186 gals

Payback Period
2.0 months

	Yr. 0	***Yr. 1***	***Yr. 2***	***Yr. 3***	***Yr. 4***	***Y.r 5***
Gross Savings:	$0	$114,547	$114,547	$114,547	$114,547	$114,547
Audit Cost:	$0	$9,600	$9,600	$9,600	$9,600	$9,600
Installation:	$16,000	$0	$0	$0	$0	$0
Everactive Monitoring Service:	$0	$96,000	$96,000	$96,000	$96,000	$96,000
Utility Rebate:	$0	$0	$0	$0	$0	$0
Net Savings:	**($16,000)**	**$28,147**	**$28,147**	**$28,147**	**$28,147**	**$28,147**

everactive

Customer reaction

- The UVA steam maintenance team has been **sold on the technology** and is now **expanding** its STM deployment beyond steam distribution and into terminal equipment like the **critical air handler** at the hospital
- UVA is also currently exploring other applications of the **wireless & batteryless** monitoring technology in the form of **vibration monitors**, to assess the health of their rotating machines on campus and avoid costly failures and service interruption to critical services.

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Why it is innovative & unique

- The use of **temperature vs. ultrasound**. Temperature is a more stable reading of the status of a steam trap when monitored continuously.
- **Continuous monitor** of the steam traps allows for more accurate diagnosis and troubleshooting, compared to annual audits or battery-operated solutions that report annually or once a day.
- Requires **no batteries** and **harness the energy from the heat of the steam pipe**. Compared to other battery-operated monitoring solutions that require the sourcing, inventorying, replacement and management of hundreds of batteries.
- An **online dashboard** user interface where a steam trap details, and historical performance is captured and readily available.
- Everactive's **continuous support**, follow up and service, focused on customer success.

Thank You!

Winner: Honorable Mention

Blatchford Renewable Energy

District Energy Sharing System

System Owner
City of Edmonton,
Alberta, Canada

Christian Felske, Ph.D., P. Eng. Director
Renewable Energy Systems
Blatchford | Integrated Infrastructure Services
City of Edmonton 13th Floor, Edmonton Tower -
10111 - 104 Avenue NW Edmonton, AB | T5J 0J4
780-868-4554 | christian.felske@edmonton.ca

Blatchford Renewable Energy

Edmonton

Blatchford's Vision:

"Blatchford will be home to up to 30,000 Edmontonians living, working and learning in a sustainable community that uses ***100% renewable energy, is carbon neutral,*** *significantly reduces its ecological footprint, and empowers residents to pursue a range of sustainable lifestyle choices."*


BLATCHFORD SHX
BLATCHFORD RD

THANK YOU

Blatchford
Renewable
Energy

ecosystem

DEPAUW UNIVERSITY

Energy Performance Project

DEC 16 2021

OVERVIEW

Campus Before & After

New District Heating Network

New District Cooling Network

Building Highlight: Peeler Center

Key Project Metrics

Q&A

CAMPUS BEFORE

- Steam HW distribution network covering most, but not all, campus buildings. The network was old and required increasing amounts of repairs.
- Fragmented cooling system, with 5 small networks feeding 2-5 buildings and several isolated buildings
- Aging central cooling & heating equipment
- Several buildings operating on steam for in-building heating

STEAM NETWORK BEFORE

Central Plant

Planned Future Construction

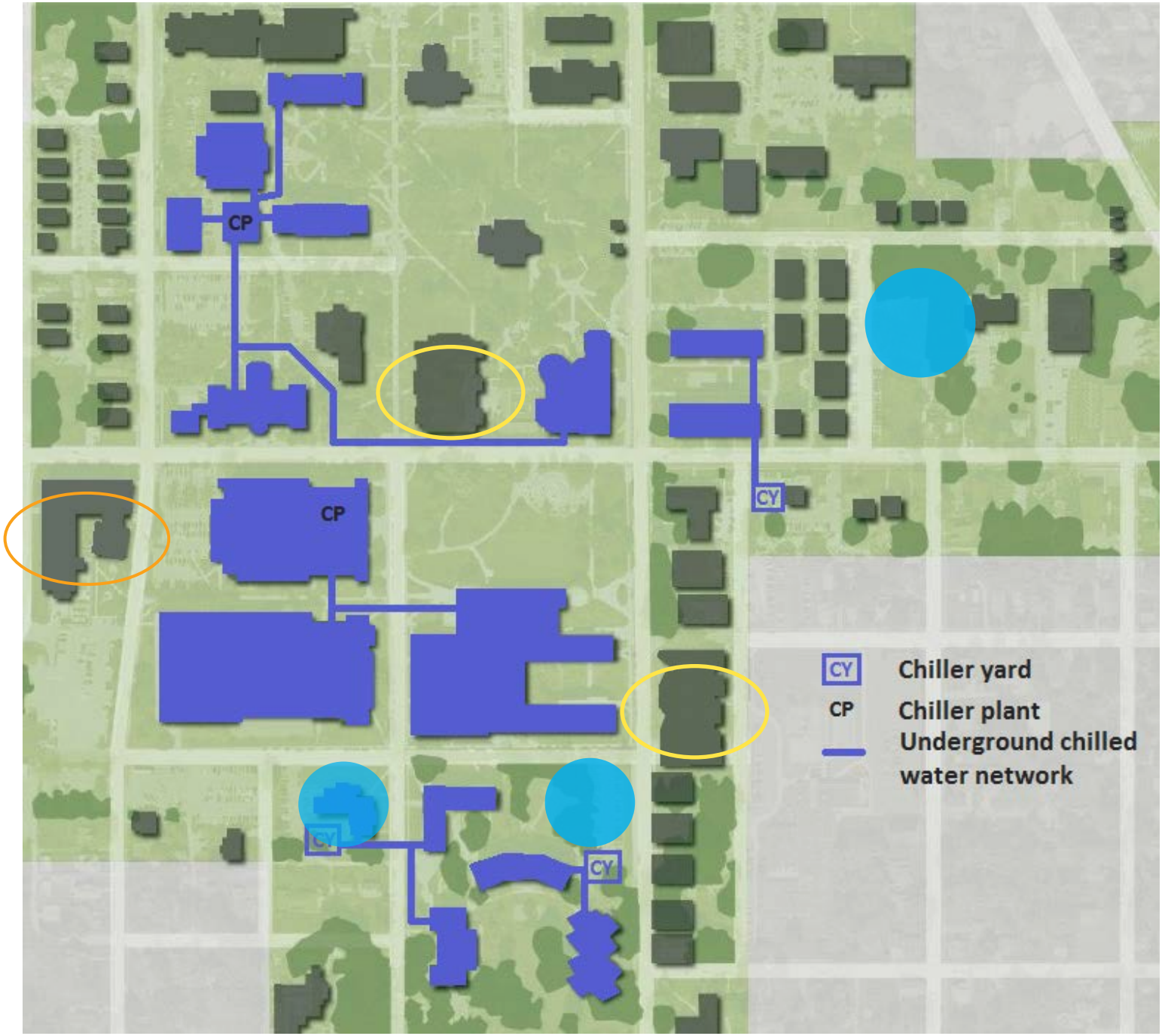
Islanded Buildings

CW NETWORK BEFORE

Planned Future Construction

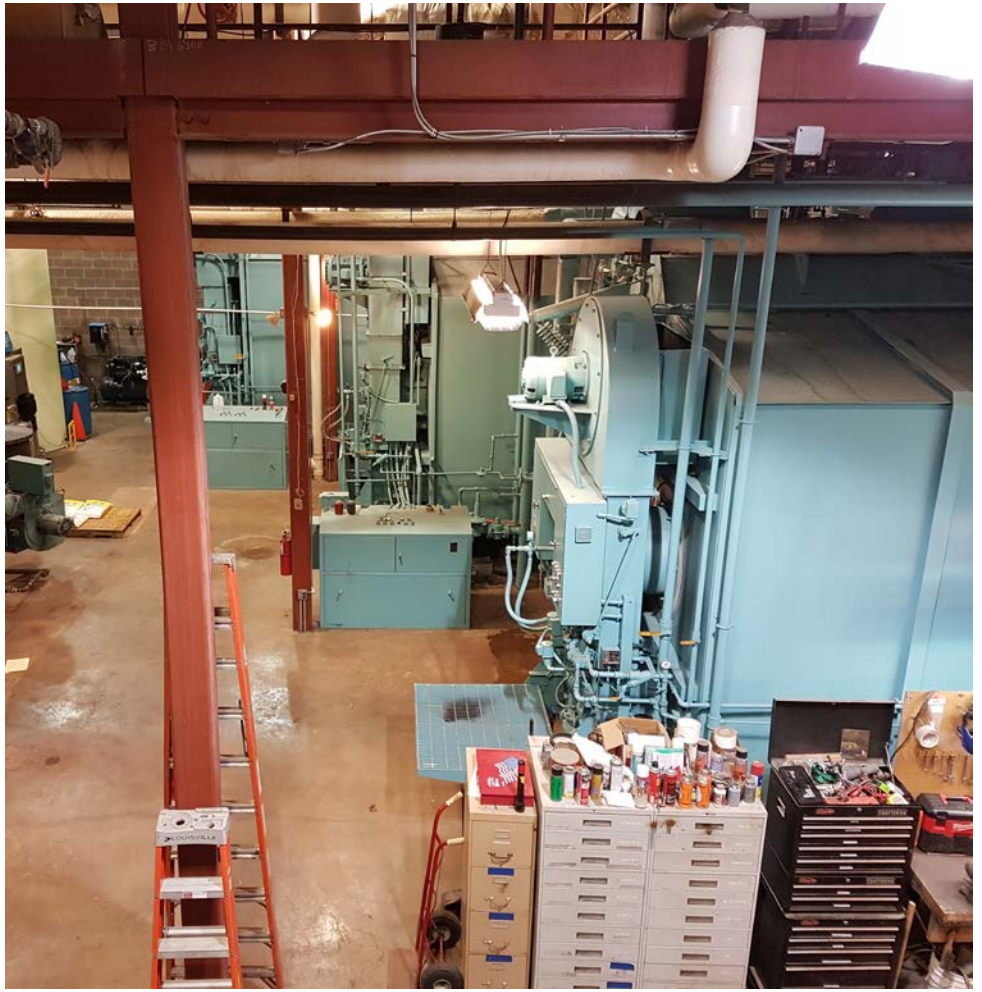
Islanded Building
Air Cooled Chiller

Islanded Buildings
with DX Cooling



159 MMBtu

STEAM PLANT



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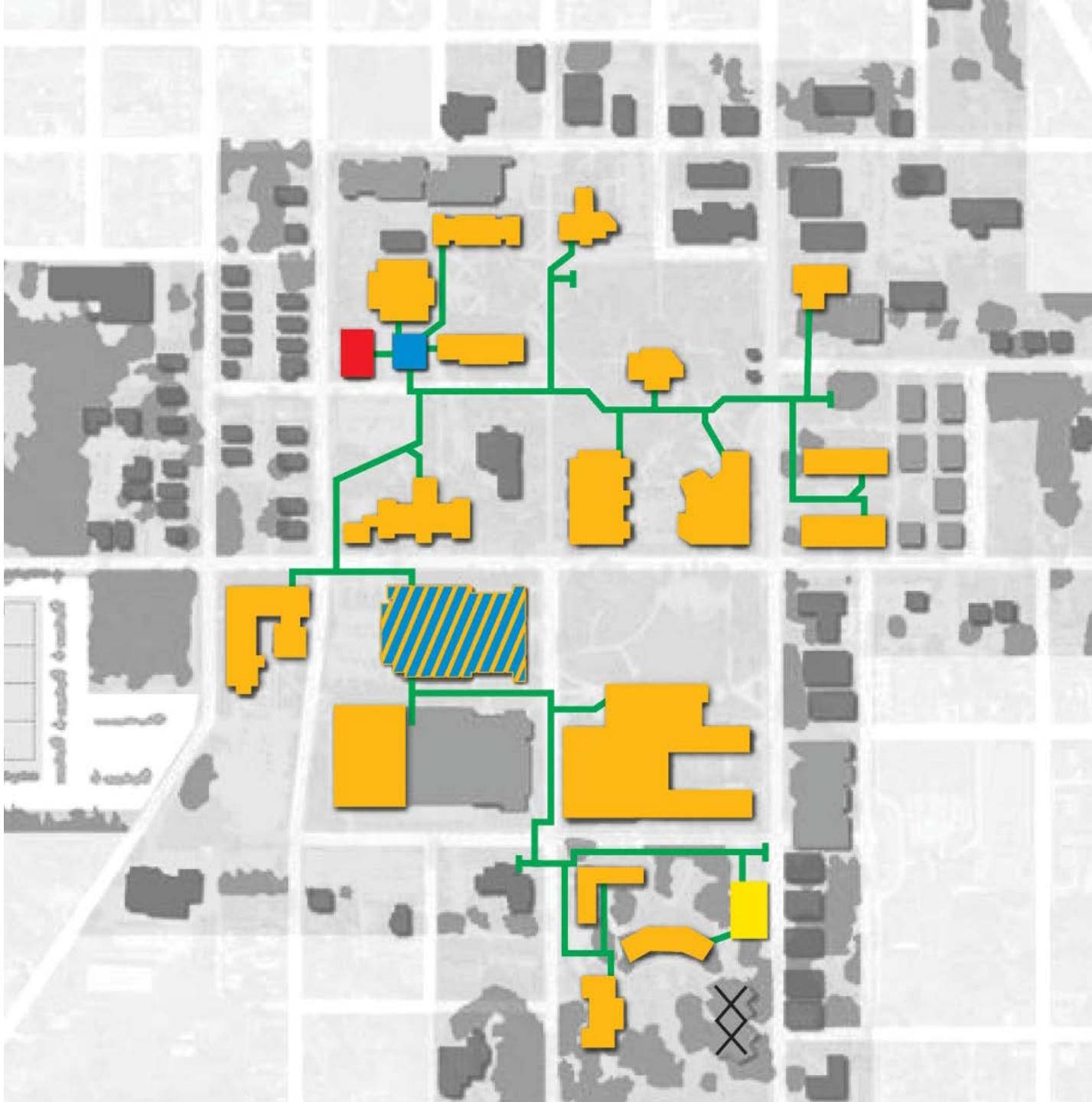
40.8 MMBtu

HOT WATER PLANT

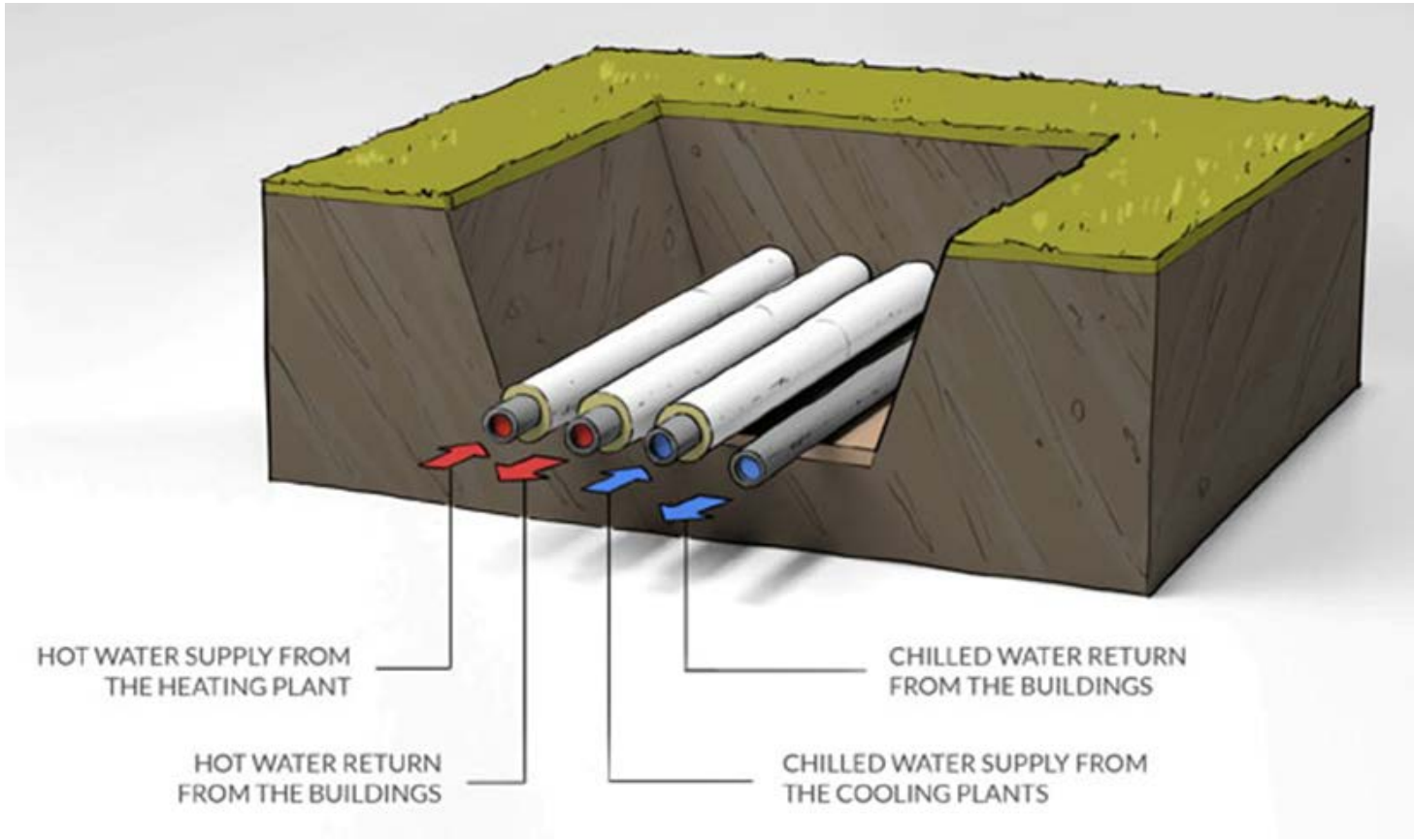
NETWORK DESIGN

- Heating Plant
- North Cooling Plant
- South Cooling Plant
- New Construction
- X Demolished



NETWORK DESIGN

- About 5,000 ft of 4 pipe trench
- Insulated PEXGOL HWS/HWR
- Insulated HDPE CWS
- Uninsulated HDPE CWR
- HW injection loop used instead of costly energy transfer stations



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NEW HOT WATER NETWORK

- Central plant supplying majority of campus buildings
- Network designed to accommodate all buildings on campus + expected future construction
- Design condition 190F & 100psi
- Piping material 95% PEXGOL + 5% Aquatherm
  - PEXGOL used for high flexibility, making majority of 45 & 90 degree turns without fittings
  - High flexibility allows shipping long coiled pipe lengths, eliminating underground seams except at building connection points

PIPING FLEXIBILITY

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NEW CHILLED WATER NETWORK

- 2 central plants supplying most campus buildings
- Installed over 2000 tons of new centrifugal chiller capacity out of total plant capacity of 3800 tons
- Innovative optimization techniques:
  - Plants can provide 1000 ton back up, improving redundancy & allowing a single plant to operate in shoulder seasons
  - All VFD chiller sequences optimized for peak equipment efficiency – loading and unloading chillers based on part load performance
  - Larger south plant has a single multi-cell cooling tower serving 3 chillers. Allows for very low return temperatures when only running 1 or 2 chillers

BUILDING HIGHLIGHT

PEELER CENTER

SEVERAL TYPES OF LOADS

- Perimeter heating system
- Terminal reheat for VAV boxes
- Steam AHU heating coils
- Reheat coils in AHU (summer only)

INNOVATIVE APPROACH

- Fully automated building switchover system with only 5 control valves
- CW AHU coils used for heating in winter to avoid additional equipment cost
- Loads put in cascade to increase building delta T
- Reused perimeter heating pumps for summer re-heat to reduce equipment cost

BY THE NUMBERS

	BEFORE	AFTER	REDUCTION
Electricity (kWh)	27,127,200	21,900,000	19%
Natural gas (MMBtu)	120,800	67,000	45%
Water (m^3)	124,945	114,631	8%
Energy (MMBtu)	213,400	141,700	34%
Energy intensity (kBTU/sq.ft)	125	83	34%

$14.8M

PROJECT COST

$732,000

ANNUAL SAVINGS

20+ YEAR

RENEWABLE KEY HEATING & COOLING INFRASTRUCTURE

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THANKYOU!

ecosystem

www. ecosystem-energy.com

Vladimir Naumov, P.Eng
vnaumov@ecosystem.ca

IDEA INNOVATION AWARD WINNER 2021

Automated chiller tube cleaning improves chilled water plant efficiency.

Justin Callihan – University of Virginia, Associate Director Chilled Water Plants

Michael Crocker – Innovas Technologies, Vice President

UNIVERSITY of VIRGINIA

INNOVAS TECHNOLOGIES

University of Virginia's Path To Automated Tube Cleaning

2012

In February 2012, UVA was approached with an innovative solution we didn't quite believe or fully understand.

MAY 2012

- Entered into a *test run* with a single unit and creative procurement strategy.
- 6000-ton plant with initial test run on a 2000 ton machine.

NOVEMBER 2012

- In November 2012, the trial was completed.
- Quantitative and qualitative analyses were compelling.

2013

In December of 2013, the Helios TCS becomes operational as standard equipment at new 6000-ton East Chiller Plant.

System Expansion

2015

In February 2015, UVA expands the Helios TCS to 3 additional chillers.

2016

In May 2016, the Helios TCS becomes standard equipment on a new 2400-ton chiller plant.

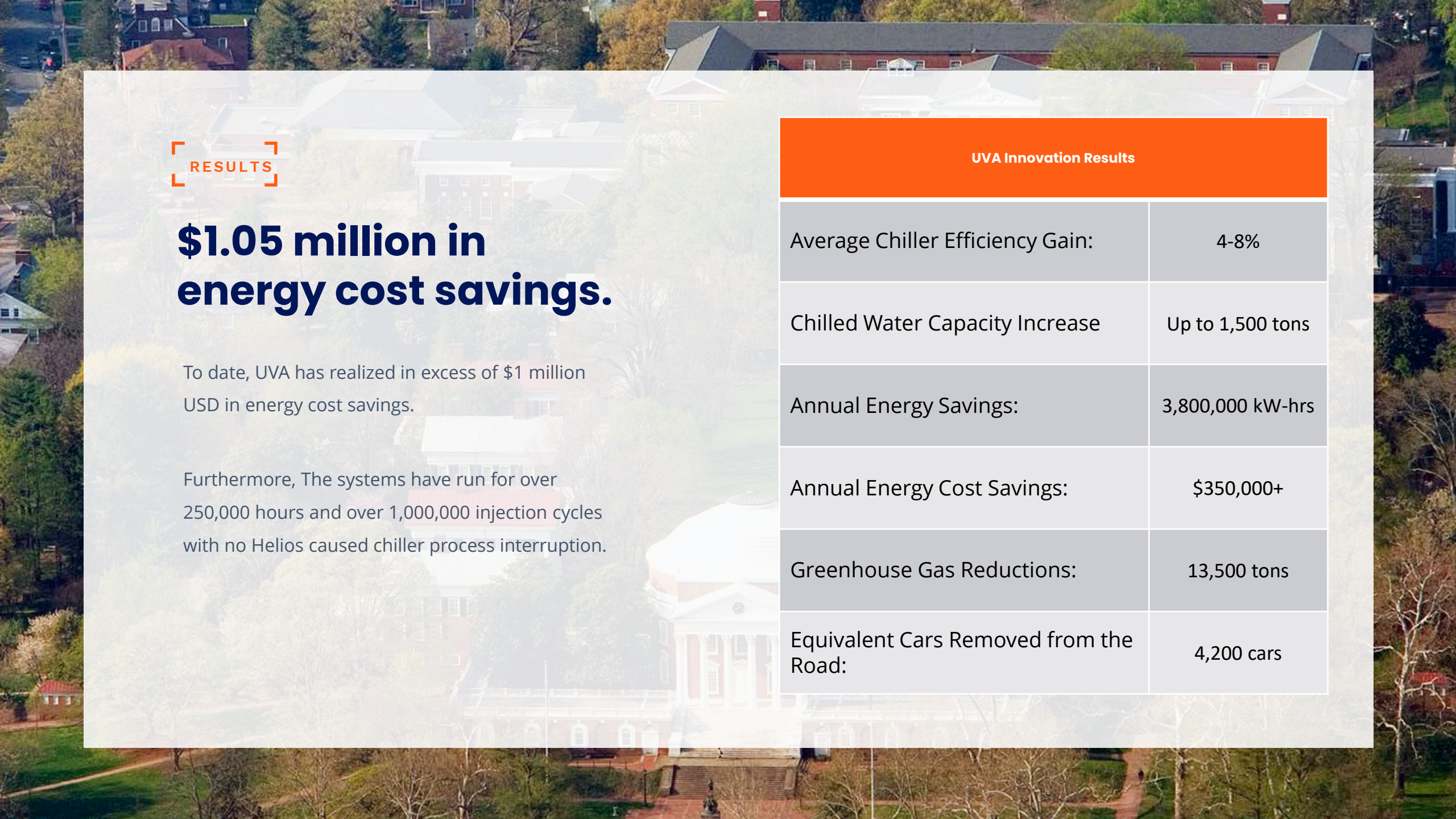
2017

In June 2017, UVA retrofits an existing 6900-ton chiller plant serving an aquatics and fitness center.

20K+ tons installed

FUTURE

UVA's future plans include installing the Helios TCS on all plants with appropriate justification.



RESULTS

$1.05 million in energy cost savings.

To date, UVA has realized in excess of $1 million USD in energy cost savings.

Furthermore, The systems have run for over 250,000 hours and over 1,000,000 injection cycles with no Helios caused chiller process interruption.

UVA Innovation Results	
Average Chiller Efficiency Gain:	4-8%
Chilled Water Capacity Increase	Up to 1,500 tons
Annual Energy Savings:	3,800,000 kW-hrs
Annual Energy Cost Savings:	$350,000+
Greenhouse Gas Reductions:	13,500 tons
Equivalent Cars Removed from the Road:	4,200 cars

3.

HOW IT WORKS

Example TCS Layout on chiller.

1. The Skid is comprised of the Controls Enclosure, Pump, & Application Controller.
2. The Collector is where balls are staged between injection cycles.
3. The strainer inside the Ball Trap prevents balls from escaping downstream.

HOW IT WORKS

How Tube Cleaning Systems Work

UVA's TCS have run for over 250,000 hours and over 1,000,000 injection cycles without any Helios related process interruption.

HOW IT WORKS

How Automatic Tube Cleaning Systems work.

1. The Skid is comprised of the Controls Enclosure, Pump, & Application Controller.
2. The Collector is where balls are staged between injection cycles.
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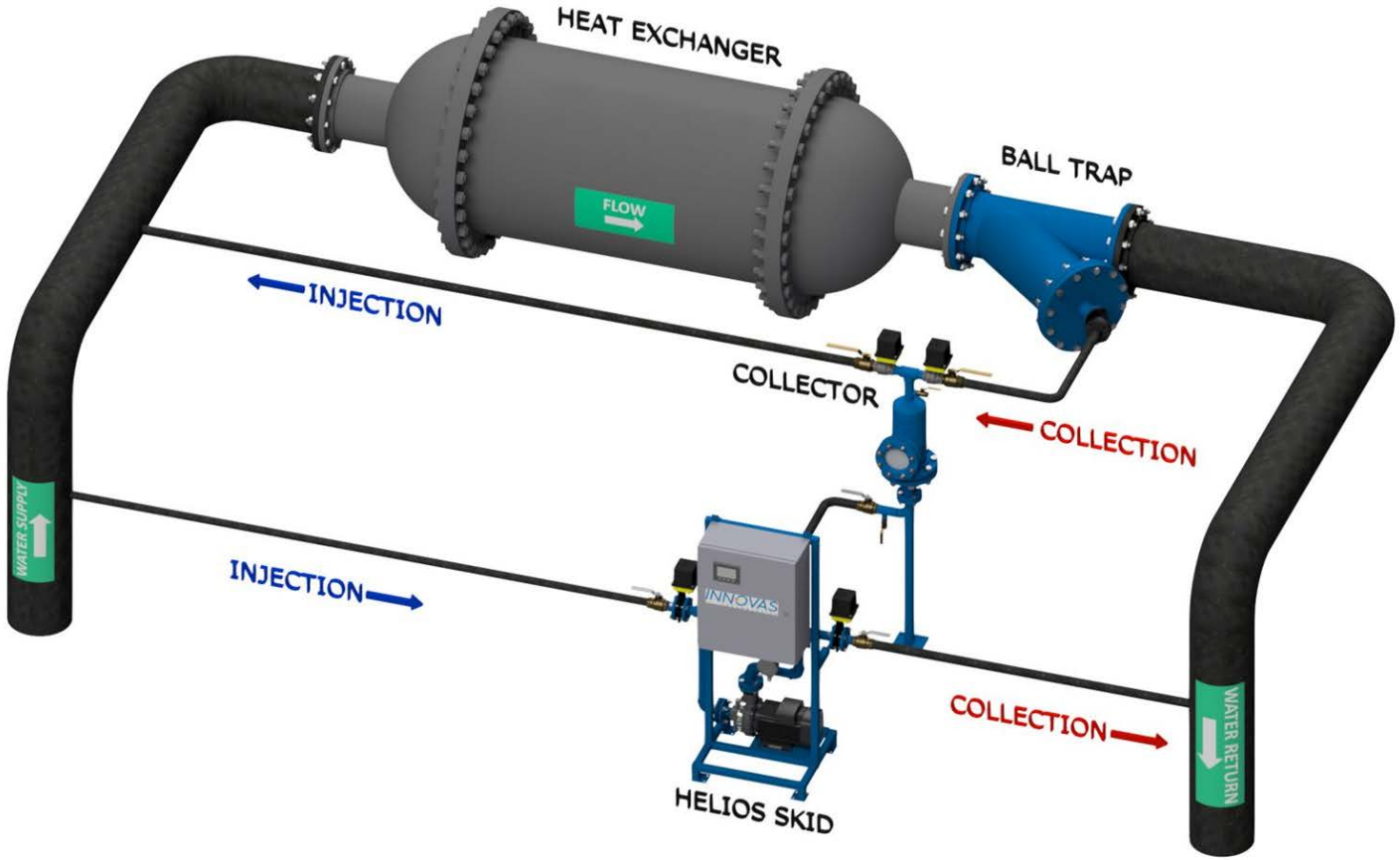


RETURN ON INVESTMENT

ATCS Technology: Multiple dimensions of value.

- Chiller energy efficiency improves 5-15%
- Reduce/eliminate manual tube brushing & cleaning
- Increases chiller capacity
- Improves chiller plant availability
- Reduce GHG emissions and environmental impact

RESULTS

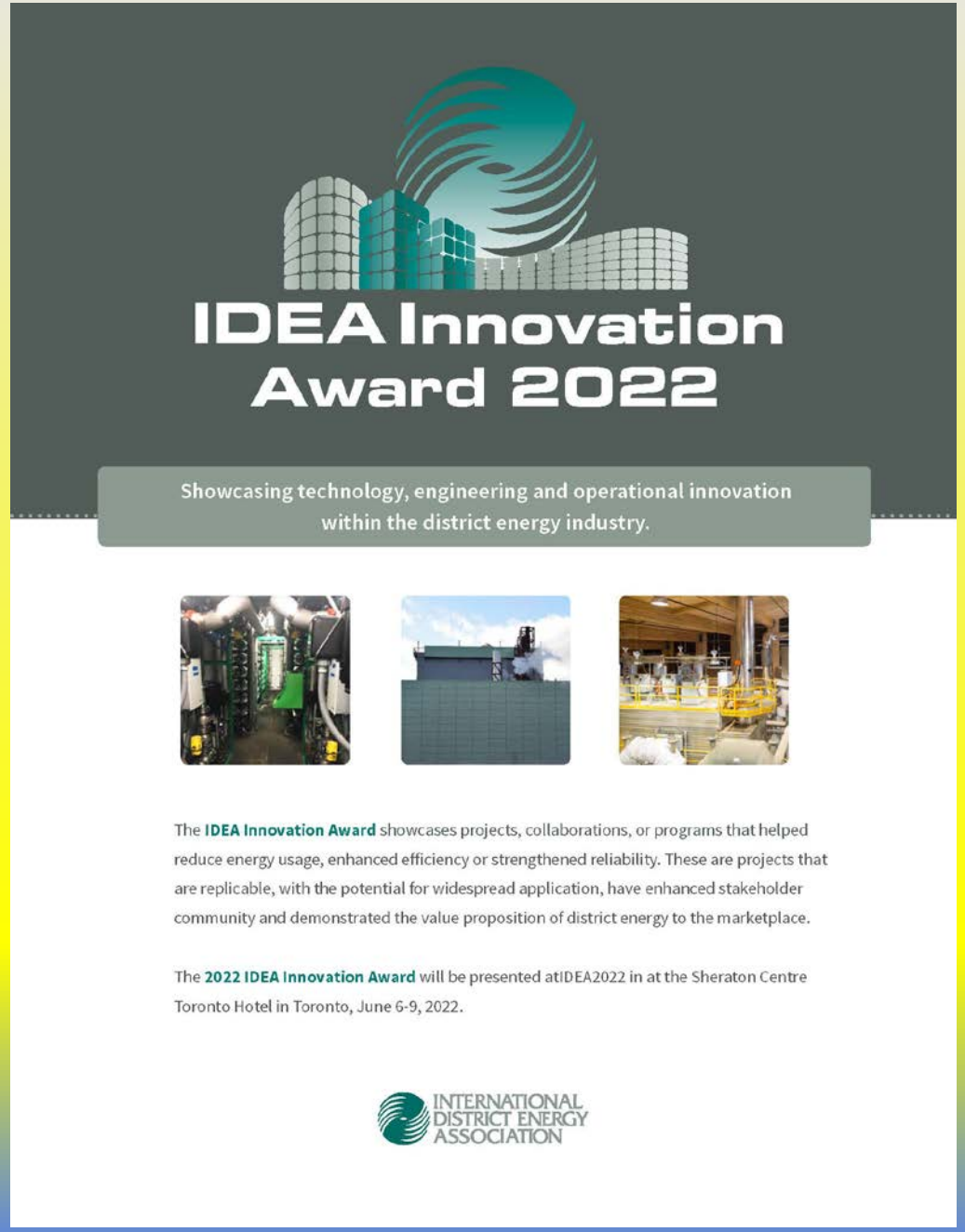
UVA Innovation Leadership: IDEA Members Benefit from Automatic Tube Cleaning Systems

To date, IDEA members have realized in excess of $3 million USD in energy cost savings and saved over 27,000 tons in greenhouse gas emissions.

IDEA Member Results	
Average Chiller Efficiency Gain:	9%
Chiller Capacity Increases:	Up to 17,000 tons
Annual Energy Savings:	33 million kW-hrs
Annual Energy Cost Savings:	$3M+
Greenhouse Gas Reductions:	27,000 tons


THANK YOU
FOR WATCHING THIS PRESENTATION
UNIVERSITY of VIRGINIA
INNOVAS TECHNOLOGIES


Questions?



Will You Be Next Year's Winner?

Deadline to Submit for

2022 IDEA Innovation Award

Wednesday, April 6, 2022

Visit

https://bit.ly/2022InnovationAward

for more information

Winners Recognized at IDEA2022 in Toronto June 6-9, 2022

Our Next Event