



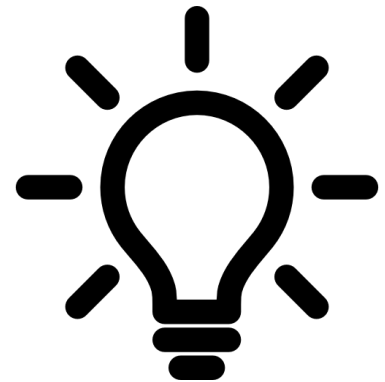
Creating a safer, more reliable underground electric network: Duquesne Light's Innovation Challenge

Josh Gould, Director, Duquesne Light
Innovation Center

Agenda

Creating a safer, more reliable underground electric network together

- I. **Introduction: Duquesne Light**
- II. UG Electric Cable: What are we solving for
- III. How we solve: Innovation Challenge
- IV. Progress to date



Duquesne Light Company (DLC)

Introduction

Investor-owned T&D utility (no generation, deregulated market)

817 sq. mi. service territory, encompassing Pittsburgh, PA and the surrounding area within parts of Allegheny and Beaver Counties

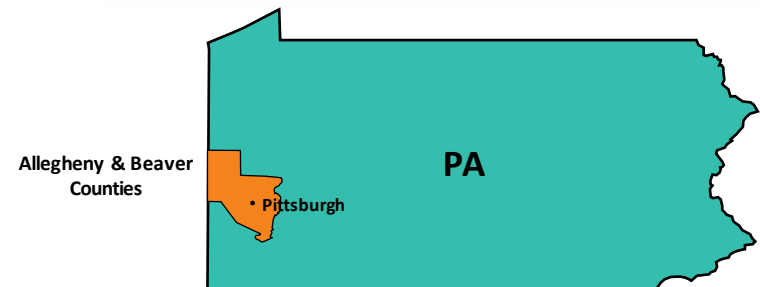
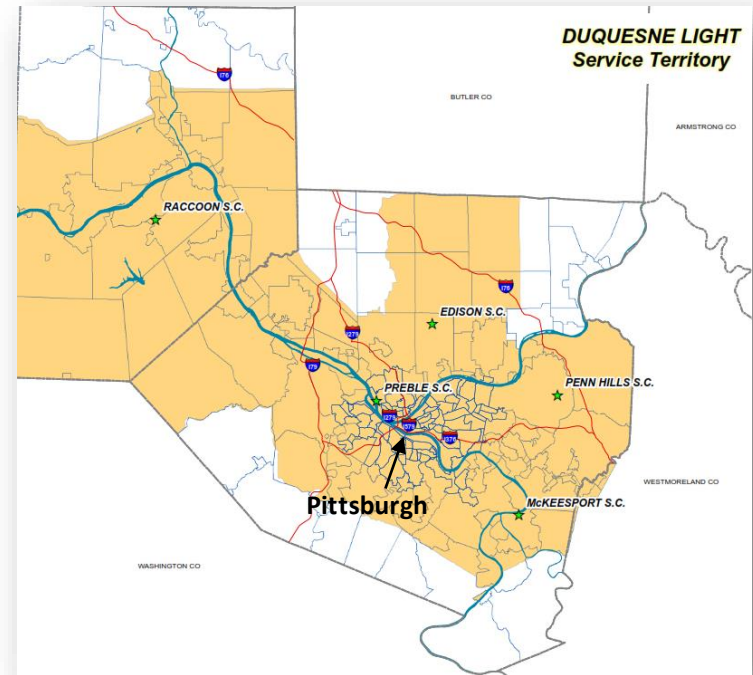
~ 600,000 customer accounts

Approximately:

- 690 miles of high-voltage transmission lines
- 7,200 miles of distribution circuit lines
- 250,000 poles
- 108,000 transformers
- 400 substations

Approximately 1,700 employees

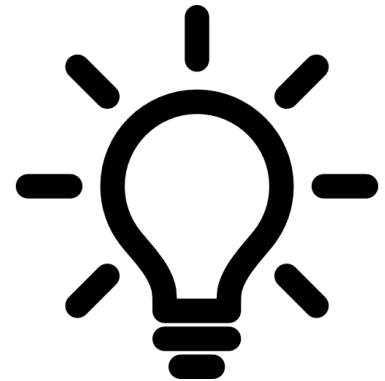
Providing electricity to Greater Pittsburgh since 1880!



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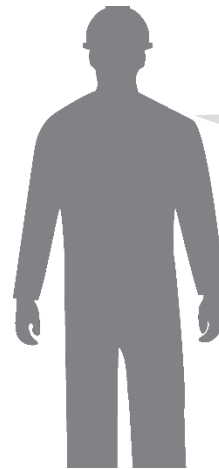
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What are we solving for?

Why improved monitoring of underground cable matters

- **Problem:** Utilities have insufficient or unreliable information about millions of miles of underground electric cable.
- **Impact:** Unexpected cable failures pose risks to safety of employee, contractors, and public as well as reduce reliability, and increase costs by creating dangerous, emergent / unplanned work.
- **Existing solutions insufficient:** IR camera, visual inspections for monitoring are imperfect (at best), cable age often not proxy for health, new sensor-based solutions can be expensive, don't work, and/or not easily applicable to older cable types (e.g., PILC). **There's got to be a better way!**



Line Worker: My IR camera doesn't tell me enough about the cables I'm working on



Supervisor: Visual and IR inspections are imperfect indicators of cable health, failure propensity

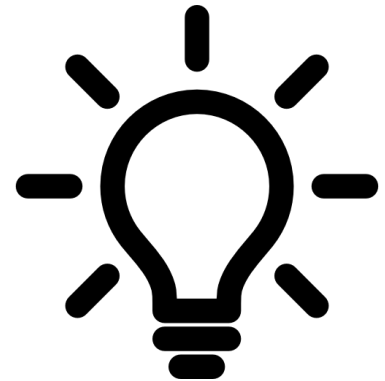


Management: Knowing more about our cable would improve our inspection, maintenance, and circuit repair decisions, improving employee and public safety, and saving O&M

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Monitoring is how we do better

Drives understanding of cable health, precursors to failure

- Our Challenge seeks to answer: *“How might we **better understand cable health, avoid unexpected cable failures to improve employee, public, contractor safety, increase reliability, and save money by avoiding emergent work?**”*
- We looked for something “off the shelf” (see top right)
- But found technology gap for PILC cables especially, and commercial gap for EPR cables (see bottom right)

Research Actions

- Reviewed over 200 academic articles and research papers
- Conference call with EPRI cable monitoring team
- Engaged with 24 experts from: North America, Japan, China, Malaysia, Europe
- Initial analysis of 18 technological solutions
- DLC-internal SMEs consultation: Engineering, Safety, Legal, and more

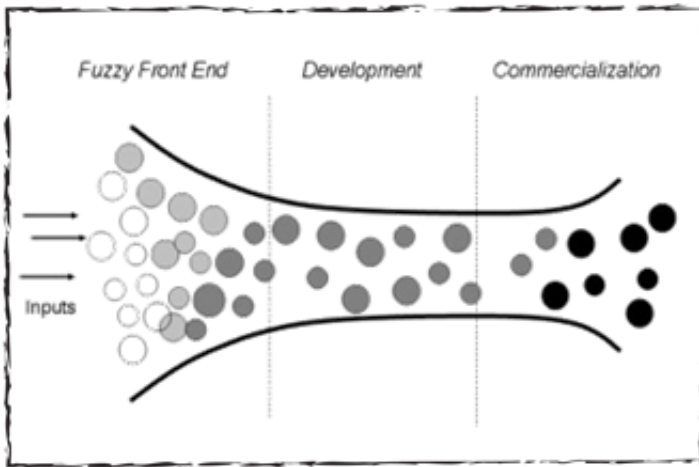
Research Conclusions

- No current single technology available to monitor health of PILC cables in live use
- Most research in PILC cables is about extending cable life
- EPR cable monitoring can be expensive, ineffective

If better monitoring isn't "off the shelf", how do we find it?

Crowdsourcing or open innovation

"Open Innovation is the recognition that not all of the smart people who matter to your business work for you" – Anonymous

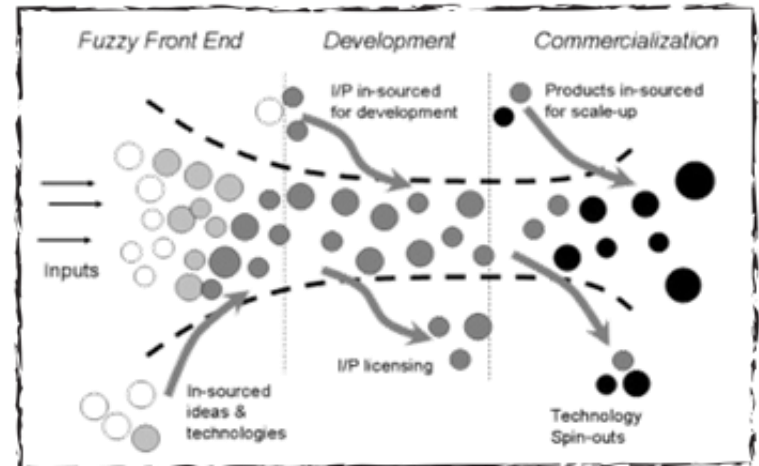


"Closed" innovation model:

- Traditional R&D model
- Internal ideas, developed internally
- Outdated model for today's reality

"Open" innovation model:

- *Outside-in*: ideas, technologies, capabilities
- *Inside-out*: out-licensing, spinouts
- Beyond 'transactions'... building 'relationship-based' networks



Crowdsourcing Platform

DLC Partnered with HeroX to Administer the Challenge



175K+

Recruited Crowd



2.5M+

Connected Heroes on
28 Partner Networks



\$20M+

In Challenges to Date



\$3M+

Largest Challenge



175+

Countries Connecting



3.1M+

Social following



90%

Of all Challenges
are solved

“ Solutions and key insights for many of the world’s challenges are hidden in the minds of people we just haven’t connected with yet. ”

Your Crowd.

HeroX acts as a marketplace for crowdsourcing innovation and human ingenuity. When you post a challenge to HeroX, a flash crowd grows around it to help find solutions and breakthrough insights.

Your Solutions.

HeroX is revolutionizing the way the world accesses and applies human potential. We offer a turn-key, easy to use platform and a range of services to boost your innovation challenges out to the crowd

HeroX is the leading online platform for running incentivized prize competitions and our preferred partner for open innovation projects at DLC

DLC Duquesne Light Company 70,374 Share Follow (59)

Monitoring Electrical Cable Challenge: The Future of Underground Inspection

Solutions for monitoring the health of Paper-insulated and Solid Dielectric based cables for underground electrical networks

Energy, Environment & Resources Infrastructure Technology

Powered by HeroX

Stage: Enter Prize: \$750,000

SOLVE THIS CHALLENGE

Your Crowd. Your Solutions.

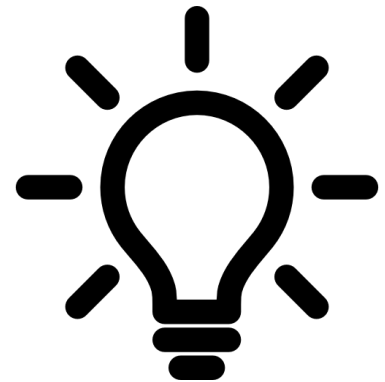
hero^x

DLC DUQUESNE LIGHT CO.

Agenda

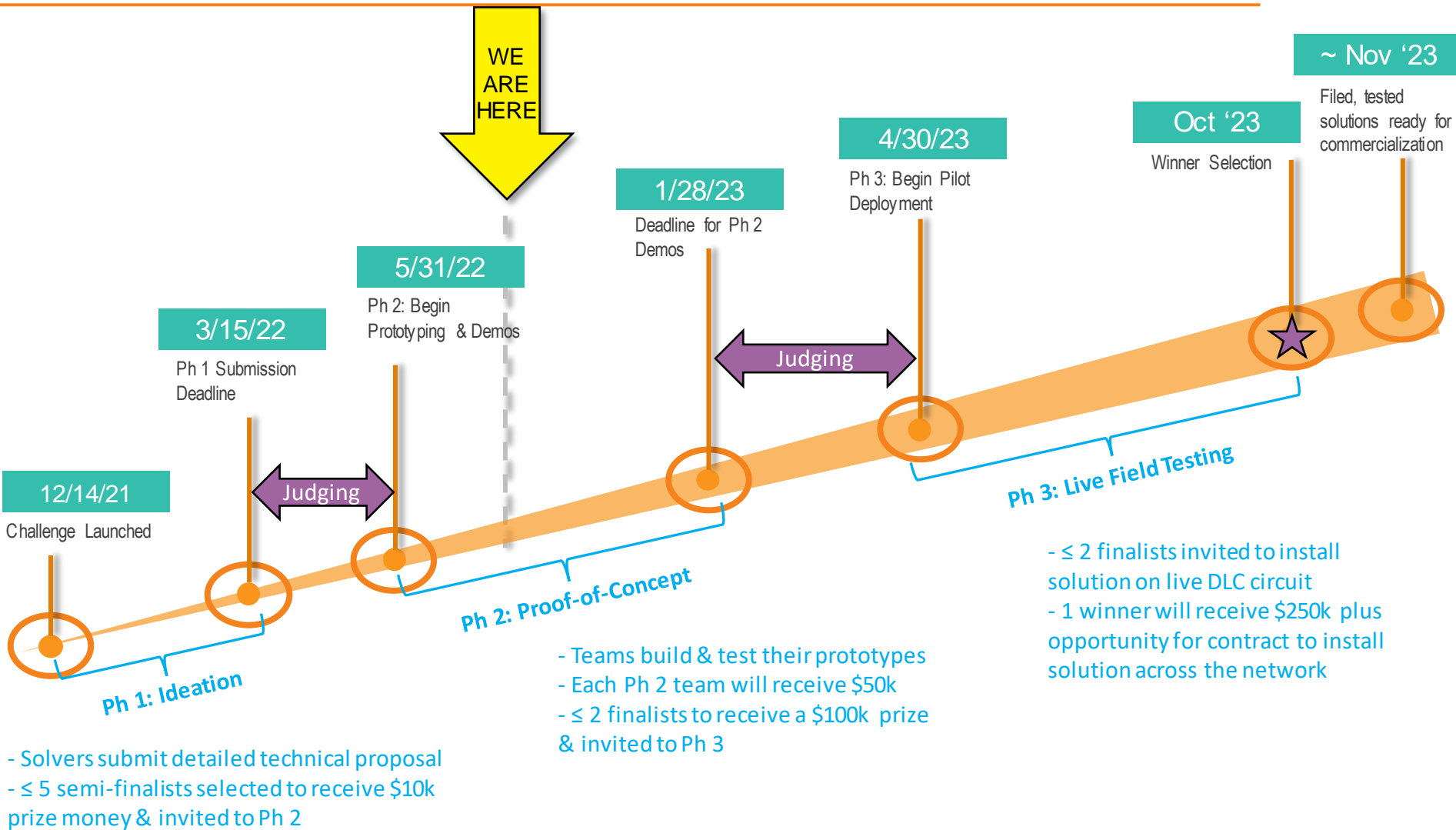
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DLC Innovation Challenge Overall Timeline

Currently in Phase 2; Phase 1 Complete May '22



Utility Challenge Partnerships

PG&E, Exelon participated Phase 1; Exelon in Phase 2



Exelon®



bgeSM

AN EXELON COMPANY



comedSM

AN EXELON COMPANY



pecoSM

AN EXELON COMPANY



pepcoSM

AN EXELON COMPANY

Final Phase 1 Winners

Represent diverse technical solutions



SCG

Continuous monitoring detection via Partial Discharge (PD) using high frequency pulses. Installed at ground/neutral or conductor at both ends of a cable circuit



Hyperion

Fiber optic cable sensors measuring thermal signature along the cable



SENTIR

Array of sensors and imaging for real time monitoring



Kinectrics

Partial discharge applied to thermal clips; uses Radio Frequency (RF) injection to detect wet and thermal deterioration



Top Solvers

Non-contact AI augmented continuously monitoring RF detects live cable degradation due to incipient dielectric failure. Uses grid simulation model to describe generation of RF from PD

Get in touch and find out more

Key contact info

Cable Challenge Promotional Video:

<https://youtu.be/kfM8vPZIRw8>

Duquesne Light Company:

<https://www.duquesnelight.com/>

Innovation Challenge:

<https://www.herox.com/DLCCableChallenge>

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Duquesne Light Innovation Center:

<https://duquesnelight.com/company/about/innovation-center>