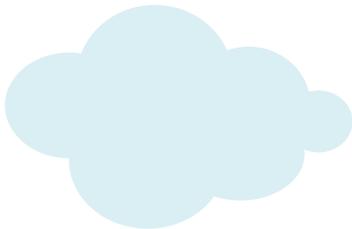
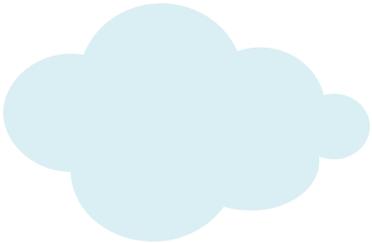


IN²



INNOVATION INCUBATOR (IN²)

2017 ANNUAL REPORT



Founded by:





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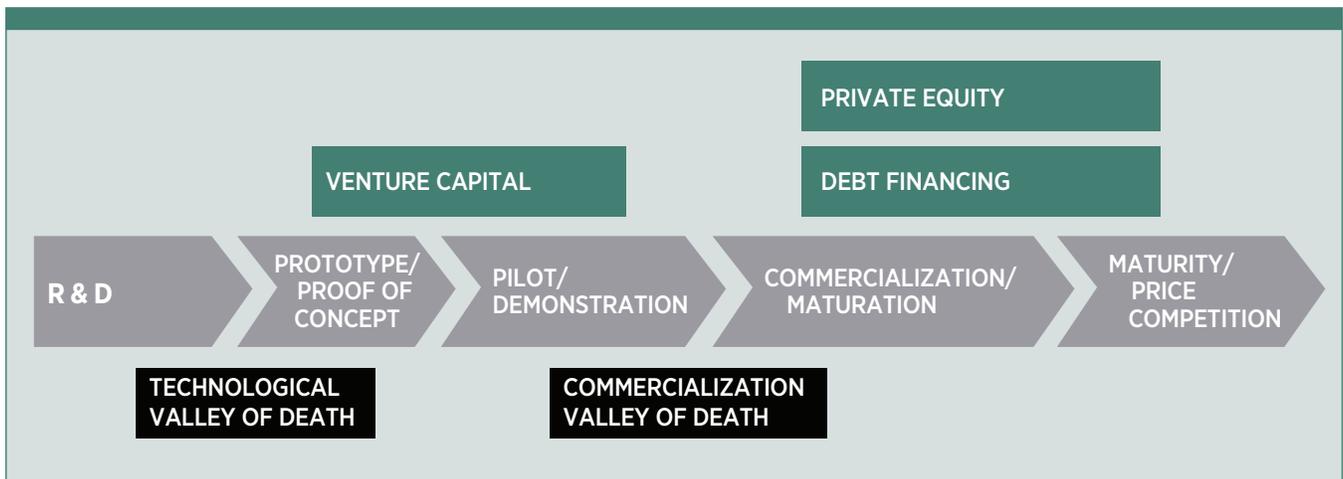
MISSION

With nearly two-thirds of Americans living in urban settings, many of our fundamental challenges—from reliability and resiliency concerns to equitable growth to improved health—will require our cities to be laboratories for innovation. The rapid pace of technological change, from the rise of data science, machine learning, artificial intelligence, and ubiquitous sensor networks to autonomous vehicles, holds significant promise for addressing core local challenges.

Entrepreneurs are the agents of change bringing to market these disruptive solutions. However, critical gaps and challenges often hinder the ability to see these solutions reach their full potential. These gaps include the so-called valleys of death, during which the funding requirements of the developing enterprise are not well matched by available financing resources. The valleys of death have proven especially challenging for energy-related companies that sell into highly capital intensive, project-based markets or to regulated customers that may have a slower rate of new technology adoption.

Enter the Innovation Incubator (IN²). IN² is a unique technology incubator and platform that facilitates commercialization and adoption of clean energy technologies. Funded by the Wells Fargo Foundation and co-administered by the National Renewable Energy Laboratory (NREL), IN² began as a \$10 million program in 2014 with a focus on supporting commercial buildings-related clean technologies and startups. By offering non-dilutive grants, technical expertise and assistance to support technology development, testing and validation, field testing opportunities, and ongoing connections to organizations across value chains, including the investment community, IN² aims to help de-risk technologies and ease their path to market adoption and deployment.

Startup Valleys of Death



The energy innovation cycle and the clean energy valleys of death. Source: Jenkins and Mansur 2011.

Why is Wells Fargo Interested in Initiating and Supporting This Program?

The IN² program started as part of Wells Fargo's 2020 Environmental Commitment that includes providing \$100 million to environmentally-focused nonprofits and universities from 2012 through 2020. One of the drivers to launch IN² was to create an ecosystem that fosters and accelerates the commercialization of promising clean technologies for commercial buildings to provide scalable solutions to reduce the energy impact of buildings.

As a leading financial institution with nearly 100 million square-feet of real estate around the globe and broad geographical footprint, Wells Fargo is well positioned to lead change by embracing innovation and supporting advancements in clean technologies to improve local communities and the environment. This program was developed to advance the commercialization of new sustainable technologies by validating them in the lab and then potentially piloting them in select Wells Fargo locations.

Why NREL?

The transformation of our nation's energy system is creating opportunities for hundreds of thousands of new domestic jobs. 6.4 million U.S. workers are employed in the design, installation, and manufacture of advanced energy products and services. As the U.S. Department of Energy's (DOE) primary national laboratory for renewable energy and energy efficiency research, NREL gives U.S. entrepreneurs a competitive edge in the global energy race. Backed by 40 years of achievement, we bridge the gap from concept to market. As a core part of our mission, NREL is the only national laboratory that regularly links clean energy research and development (R&D) with real-world applications. NREL works with hundreds of partners and currently maintains over 700 active partnerships with small and large businesses, education institutes and non-profits, federal agencies, as well as state and local governments. NREL has developed a unique expertise in conducting incubation programs that accelerate the technology commercialization process, reduce technology risk and most importantly, utilize deployment and testing of technology in real world operating situations with end use customers to ensure a reduction in market risk. We have established systems and methodologies, and leverage our extensive network of early stage technology companies, investors, incubators, accelerators and industry contacts to ensure a successful advanced energy technology development and deployment program.



WHAT IS THE IN²

Launched in 2014 with an initial \$10 million commitment by the Wells Fargo Foundation, and expanded in 2017, IN² is now a \$30 million program supporting innovative technologies and innovators. Unlike traditional incubator and accelerator programs, IN² is positioned to help companies think about their end customer, providing technical assistance that leverages the capabilities, facilities, equipment and most importantly, the deep expertise that exists at NREL and other national laboratories. When appropriate, program participants, upon successful completion of lab-project milestones, are able to utilize the buildings portfolio of Wells Fargo to help accomplish meaningful real-life technology testing. By offering customizable arrangements of services combining strong technical support, business/product verification, flexible financing, and commercial validation, IN² is aiming to shorten technology development cycles.

Additionally, through the IN² Channel Partner Awards Program, IN² provides additional grant funding to the clean energy ecosystem including accelerators, incubators, universities and other key stakeholders to programmatically expand, and strategically direct funds to support a more comprehensive approach to growing the ecosystem.

Selection Process

IN² operates highly selective and competitive application and selection rounds to invite new cohorts into the program. Since 2014, three cohorts have been invited to the program on an annual basis, totaling 20 companies.

2014 Round 1	2015 Round 2	2016 Round 3
Energy Storage Systems	7AC Technologies	APANA
LiquidCool Solutions	Go Electric	EdgePower
VG SmartGlass (formerly SmartShade)	Heliotrope	Geli
Whisker Labs	NETenergy	Ibis Networks
	Polyceed	J2 Innovations
	ThermoLift	Maalka
		PowerFlex
		simuwatt
		SMC
		Transformative Wave

Call for Best and Brightest Applications; Invitation-only Process

IN² fosters a network of Channel Partners to identify and refer companies to the program. IN² Channel Partners, consisting of incubators, accelerators and universities across the country, serve as ambassadors to the program and help their portfolio companies determine if IN² is a good fit for their current needs. If applying to the program is deemed appropriate, applicants are requested to provide information addressing their company profile, business plan, technology development status and future plans. Since launching IN², over 350 companies have been referred to the program, with 20 ultimately selected to participate.

Review and Down Selection Process

IN² applications are first screened by NREL technical experts to determine the viability of the technology and energy impact, as well as program fit. After scoring technologies on their impact, a down-selected list is then reviewed and screened by the Wells Fargo IN² Board of Directors. This Board, representative of diverse lines of business and perspective within Wells Fargo, assesses applicants on their go-to-market strategy and value proposition. The IN² External Advisory Board, consisting of industry experts and professionals, performs the final screening and ultimately selects companies to invite to the program. The entire review and selection process from start to finish is typically completed within a three month time period.

Program Offering

Companies invited to participate in IN² are required to visit NREL for an onboarding event to learn more about the program structure and what to expect as an IN² company.

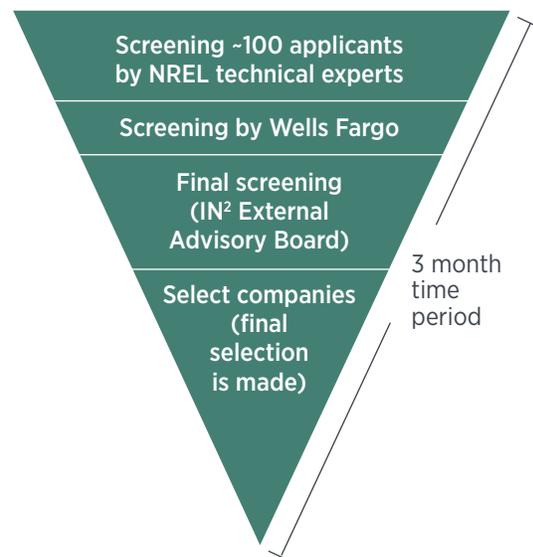
Over the course of 12 to 18 months, participating companies have access to NREL's world-class facilities and researchers, who will test, validate, and incubate the companies' technologies to help them meet critical validation milestones on the path to commercialization.

Once a technology is tested and validated through NREL, if it is applicable to Wells Fargo and meets internal criteria, a beta may be pursued. This beta test provides a startup with critical understanding of how their technology performs in a real world environment. Real world testing helps to inform further technical development and prove out the technology, two crucial elements on their path to market.

IN² VALUE PROPOSITION TO STARTUPS:

- Up to \$250,000 non-dilutive award; including technical assistance from NREL and funding to company
- Opportunity to request follow-on funding for additional project work and funding
- Opportunity to beta test within the Wells Fargo buildings portfolio, NREL, and other available sites
- Networking and introductions to end users, customers, industry and the investor community

Review-Down Selection Process



WHERE WE ARE

Three Application and Selection Rounds

2014

July: Launch IN²

Sept: Launched Round 1 Call for Applications

Review and Down-selection

- NREL down-selection
- Wells Fargo IN² Board of Directors down-selection
- IN² External Advisory Board final selection

Dec: Selected 4 companies to participate in Cohort 1

2015

July: Launched Round 2 Call for Applications

Nov: Selected 6 companies to participate in Cohort 2

2016

June: Launched Round 3 Call for Applications

Dec: Selected 10 companies to participate in Cohort 3

2017

April: Announce \$20 million expansion of IN² program at NREL Industry Growth Forum

Aug: Host IN² Summit at NREL to convene ecosystem and discuss program direction to best support smart and connected communities vision



Round 1 portfolio companies



Energy Storage Systems all-iron redox flow battery has the potential for safe and cost-effective energy storage at 30% of current costs.



LiquidCool Solutions total immersion electronics cooling technology for computer servers offers 40% energy savings relative to air-cooled systems.



VG SmartGlass develops a polarizing film-based shading solution with the potential to control both heat and glare with a simple design and low cost.

Whisker Labs

Whisker Labs peel and stick submetering technology enables cost-effective insight into whole-building energy performance.

Round 2 portfolio companies



7AC Technology's liquid desiccant air conditioning system reduces typical HVAC electricity and water consumption by as much as 40%.

Go Electric

Go Electric provides a microgrid and demand response power system that can enable up to a 50% reduction in typical building energy costs.



Heliotrope is developing a neutral-colored dynamic glass solution with a target of achieving cost neutrality with conventional window solutions.



NETenergy's thermal battery for HVAC systems enables up to a 30% reduction in typical cooling energy costs by shifting peak demand.



Polyceed is developing a low-cost controllable material for dynamic windows that requires no external wiring.



ThermoLift's natural gas driven heat pump combines heating, cooling, and hot water supply- reducing primary building energy use by as much as 50%.

Round 3 portfolio companies



APANA builds cloud-based analytic solutions to scan, pinpoint, and guide resolution of water waste by instantly alerting frontline staff with actionable guidance.



EdgePower sells and deploys building energy management controls hardware and software.



Geli provides a software platform to design, automate, and manage energy storage systems.



Ibis Networks addresses plug load management with its patented IntelliNetwork system, enabling customers to save up to 40% of energy cost on managed equipment.

J2 INNOVATIONS

J2 Innovations empowers companies with a building automation and operating system for connecting and controlling devices.



Maalka's modeling platform reduces the time and cost of accurately modeling and simulating large portfolios of buildings by over 90%.



PowerFlex adaptive EV charging technology provides a target charging capacity at 40% lower infrastructure and operating costs and reduces carbon footprint.

simuwatt®

simuwatt is a web and tablet-based application for conducting rapid energy audits and analysis.



SMC is building the world's highest efficiency Internet-enabled motor for HVAC applications.

transformativewave

Transformative Wave is developing a battery storage retrofit kit for commercial buildings that optimizes on-going revenue with 15-30% energy savings and 20-40% peak demand reduction.

IN² Companies

Round 1



SOLVING THE PROBLEM

The all-iron redox flow battery (IFB) from Energy Storage Systems, Inc. (ESS) has the potential to provide energy storage at a lower cost relative to typical battery options. The ESS battery uses three main electrolyte components—iron, salt, and water. Unlike other flow battery chemistries, such as vanadium, the electrolyte components in the ESS battery are abundant and cost-effective. According to ESS, the IFB can maintain high round-trip efficiency with negligible degradation for thousands of deep charge/discharge cycles. Combined, these factors create the potential for cost-effective, long-duration energy storage.



THE IMPACT:

Energy storage is a game changer for intermittent renewable energy technologies—and holds substantial promise to transform commercial buildings' relationship with the grid. Coupling on-site photovoltaic (PV) generation with energy storage, for example, can provide a smoother, more dispatchable resource than solar alone. Building owners can use the stored energy to take advantage of time-based utility rates and demand-response opportunities, providing new value streams for themselves and the utility. Stored energy can also be used to power essential operations or facilities during extreme weather events and other power outages. Batteries are one way to store energy for these types of applications. Currently, however, high costs and reliability issues create barriers to widespread adoption of building-integrated batteries.

HOW IN² IS HELPING:

ESS is in need of real-world demonstrations to validate key facets of the technology under a variety of conditions, and assistance developing battery sizing and control strategies for integrated building applications in order to optimize customer payback.

TIER 1: Bench Scale

- Concept development stage
- Develop plans for prototyping & testing
- 3 – 5 years to market

TIER 2: Prototype

- Available for testing & validation
- Plans for development of final product
- Less than 2 years to market

TIER 3: Commercially Ready

- Models available in limited quantity
- Integrated demonstration
- Less than 18 months to market testing



SOLVING THE PROBLEM

LiquidCool Solutions (LCS) is developing a total immersion electronics cooling technology with the potential to offer 40% energy savings and significant cost savings compared with air-cooling technologies. A safe and easy-to-maintain dielectric fluid is pumped directly into the server enclosure to cool electronic components while protecting them from environmental contaminants. Liquid has more than 1,400 times the heat-carrying capacity of air by volume and enables heat produced by the servers to be used elsewhere in the connected building.



THE IMPACT:

Worldwide, data centers now consume more energy annually than a small country. More than 90% of that energy is consumed by building-connected data centers rather than Internet and cloud service facilities. The continued growth of digital activity paired with the conventional design and operation practices of these mid- to small-sized data centers could contribute to a projected doubling of worldwide data center energy use by 2020 relative to 2013 use. A disruptive energy-saving solution is needed.

HOW IN² IS HELPING:

At the time of IN² project commencement, LCS was in need of field testing to demonstrate the advantages of their technology. NREL supported the request by first testing and mapping the performance of LCS's Liquid Submerged Server in a laboratory environment. After successful laboratory evaluation and development of the LCS prototype, NREL performed a field demonstration to evaluate the installation, maintenance, and computing performance of a live server rack. Specifically, the unit is installed at the Energy Systems Integration Facility (ESIF) on the NREL campus.

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SOLVING THE PROBLEM

VG SmartGlass is developing a film-based light and heat control window insert called INVISIBLIND that could reduce the energy required to light and cool perimeter spaces by 30% compared with spaces without heat and glare control. A potential advantage of INVISIBLIND is a 75% cost reduction relative to other solutions on the market, along with ease of retrofit into existing buildings. In addition, the technology offers other value propositions in the privacy and window branding markets.



THE IMPACT:

Heating, cooling, and lighting represent the three largest energy end uses in commercial buildings. Next-generation windows and building envelope technologies can provide substantial energy savings, but current solutions such as electrochromic glass face barriers to adoption, notably high cost. There is a need for cost-effective commercial building window technologies to provide tunable heat control while ensuring visual comfort for occupants.

HOW IN² IS HELPING:

VG SmartGlass requested design assistance to optimize INVISIBLIND performance, and test and validate the product through demonstration. Additionally, the company sought guidance integrating their system with commercial building facades and lighting control systems. NREL support took the form of a product feasibility assessment. First, simulation using Radiance and OpenStudio software determined the energy impact potential of the current product version across a variety of buildings types and climates. Guidance on strategic applications given future design improvements was provided. In parallel, the NREL campus served as a demonstration location for the INVISIBLIND unit, enabling VG SmartGlass to evaluate product fabrication, installation, and ongoing maintenance in multiple window types and for different use cases.

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Whisker Labs



SOLVING THE PROBLEM

Whisker Labs develops peel-and-stick energy submetering technology that could reduce energy metering costs by 90%. The sensor is applied directly to the outside of a circuit breaker, allowing for simple, non-invasive installation by non-technical staff. Information collected through the sensors and the Whisker Labs data management system can be used by third-party energy information systems, providing building owners with real-time insight into energy consumption to drive proactive building management decision.



THE IMPACT:

The ability to measure the energy consumption of individual building systems provides a wealth of information allowing building owners and operators to track and improve whole-building energy performance. Existing submetering systems are costly and require skilled technicians to install and monitor. The commercial building market, particularly in small- to medium-sized buildings, needs reliable, cost-effective submetering solutions.

HOW IN² IS HELPING:

For its IN² project, Whisker Labs requested support evaluating their technology in real applications. Following the completion of a laboratory evaluation of the sensors under real loads, Whisker Labs was presented with the opportunity to test and demonstrate their product in a real world environment within Wells Fargo's commercial real estate portfolio. In June 2016, NREL researchers installed Whisker Lab's pilot product at a Wells Fargo Branch facility in Aurora, Colorado, to allow NREL to evaluate the technology's performance and demonstrate the benefit of this less-invasive submetering technology in a commercial building.

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IN² Companies

Round 2



SOLVING THE PROBLEM

The explosive growth of air conditioning across the globe represents one of the biggest climate challenges, with HVAC representing nearly 50 percent of total energy consumption in commercial buildings. 7AC Technologies offers a new approach to air conditioning technology, delivering extreme energy savings and the ability to maximize climate-friendly refrigerants.



THE IMPACT:

7AC Technologies' single-step, liquid desiccant technology offers the efficiency improvements needed to manage the increased greenhouse gas emissions expected from the rapid growth of air conditioning. The company's liquid desiccant air conditioning system reduces typical HVAC electricity and water consumption by as much as 40 percent compared to existing best-in-class solutions. 7AC offers building operators and owners the opportunity to dramatically lower energy costs and protect real estate investments by correctly maintaining humidity levels.

HOW IN² IS HELPING:

7AC Technologies is in need of research, development and reliability testing of components for existing and new applications. NREL will perform laboratory experiments to help 7AC improve their liquid desiccant heat exchanger design and accelerate their product's time to market. NREL will also model, help develop, and test product application solutions across a wide range of climate conditions, which will allow 7AC's OEM partners to increase production series and reduce costs significantly.

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Go Electric



SOLVING THE PROBLEM

Go Electric provides the first integrated solution for uninterruptible power, energy storage, energy efficiency, and automated energy asset synchronization and optimization. The company is developing a customer side of the meter microgrid solution, LYNC DR[®], which is based on an uninterruptible power supply (UPS) technology that automatically and instantly synchronizes with the grid, providing continuous power and automatic demand response (DR) functionality to a commercial building.

THE IMPACT:

Go Electric provides a microgrid and demand response power system that can enable up to a 50 percent reduction in typical building energy costs. LYNC DR[®] ensures energy resiliency for buildings and sustains grid stability. At scale, LYNC DR[®] systems will ensure energy sustainability for the communities in which they reside. Go Electric's solutions assure energy security, reduce energy costs and enhance grid stability by integrating renewable energy, advanced batteries and generators into a plug-and-play energy resiliency system.

HOW IN² IS HELPING:

Go Electric is in need of technical assistance and services from NREL's laboratory facilities for measurement and validation of LYNC performance and capabilities. Specifically, LYNC DR[®] is installed at the Energy Systems Integration Facility (ESIF) to measure and validate a number of LYNC capabilities focusing on grid connection and islanding.

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SOLVING THE PROBLEM

Heliotrope is developing a neutral-colored dynamic glass solution that independently controls light and heat with a target of achieving cost neutrality with conventional window solutions. Heliotrope's solution-based manufacturing process will significantly reduce the costs of smart windows, while adding a new functionality that does not currently exist in the marketplace. The company's vision is to achieve the required cost of goods sold (COGS) to capture a significant portion of the architectural glass market, without sacrificing performance.



THE IMPACT:

Heliotrope allows building managers to independently control light and heat, unlocking significant energy savings. To reduce their carbon footprint and drastically improve sustainability, buildings must begin to support dynamic glass solutions. In order for building owners to consider them, these dynamic solutions need to be both cost effective and functional.

HOW IN² IS HELPING:

Heliotrope is in need of measurement techniques for their products edge seal performance, as well as feedback on material/approach selection for their prototypes. Heliotrope requires assistance in advanced cycling and durability testing of their prototype products.

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SOLVING THE PROBLEM

Thermal Energy Storage (TES) company, NETenergy, has created a thermal battery that stores energy to help commercial buildings control cooling costs and utilities balance the growing time-of-day disparity in energy supply and demand. NETenergy addresses the problems by providing a buffer of stored cool energy that can be charged during off-peak energy prices or during high PV generation periods. The stored energy can help meet thermal comfort requirements efficiently by reducing the traditionally required compressor size and cycling, and improve electric grid integrity by shaving electric load or shifting it to mid or off-peak periods.



THE IMPACT:

By utilizing NETenergy's thermal battery to store cold energy, it is estimated that building owners can save 30 percent or more on their energy usage and reduce carbon emissions by 50 percent. Additionally, this technology can save utilities from spending billions of dollars per year building and maintaining "peaker" power plants that are only used a few times per year.

HOW IN² IS HELPING:

NETenergy is in need of laboratory testing to validate performance and optimization based on temperatures, coolant types, flow rates, pressures, thermal profiles and specifications. NREL's experts and facilities will assist with system integration, design and control of NETenergy's thermal battery to existing building AC systems in an effort to build a prototype system for a commercial building.

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SOLVING THE PROBLEM

Polyceed will deliver low-cost, wirelessly controlled, and multi-functional plug-and-play dynamic electrochromic (EC) window systems. EC window systems change light transmission properties in response to voltage, allowing control over the amount of light and heat passing through, enabling greater energy efficiency.



THE IMPACT:

Today's EC products are expensive to manufacture, complex to install, and require external wiring. Polyceed is developing a low-cost, controllable material for dynamic windows that requires no external wiring. The projected impact on commercial building energy efficiency includes broader deployment of dynamic glass and improving heat control at building fenestration, due to low-cost technology fabrication and installation.

HOW IN² IS HELPING:

Polyceed is in need of feedback on its current layering approach in order to build its first commercial prototype. Polyceed plans to take advantage of NREL's state-of-the-art laboratory facilities as well as the organization's market penetration assessment service. Through the IN² program, Polyceed will be able to further develop the dynamic glass, verify energy savings, and analyze how the EC window systems impact buildings.

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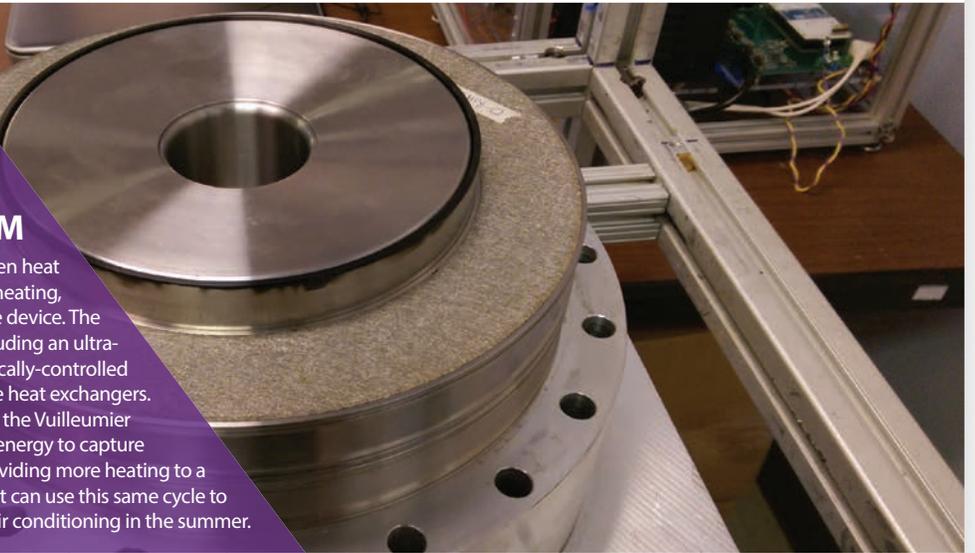
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SOLVING THE PROBLEM

ThermoLift is developing a natural gas-driven heat pump and air conditioner that will replace heating, cooling and hot water systems with a single device. The first prototype has several innovations, including an ultra-low-emission combustion burner, electronically-controlled actuators for cycle efficiency and innovative heat exchangers. Their core technology is a heat pump using the Vuilleumier thermodynamic cycle, which uses thermal energy to capture ambient energy from the environment, providing more heating to a building than is input with the natural gas. It can use this same cycle to reject heat to the environment, providing air conditioning in the summer.



THE IMPACT:

ThermoLift expects to reduce commercial and residential energy consumption by up to 50 percent with its proven technology. ThermoLift also reduces environmental concerns, including ozone depletion and greenhouse effects, by replacing traditional heating, cooling and hot water systems, which represent the largest portion of electricity consumed in a home.

HOW IN² IS HELPING:

ThermoLift is in need of NREL's system and building modeling expertise. NREL modeling will help bound the performance potential of various product development scenarios. ThermoLift will also benefit from NREL's relationships with global manufacturing entities and large portfolio managers to help with the development of distribution channels.

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IN² Companies

Round 3



SOLVING THE PROBLEM

The APANA™ System offers an innovative smart water management system to reduce water waste. Their cloud-based analytic technology scans, pinpoints and guides resolution of water waste by instantly alerting frontline staff and providing actionable guidance. APANA uses sensors and IoT devices to capture high-resolution data for constant analysis of when water waste is occurring.



THE IMPACT:

Buildings have hundreds of mechanical and human failure points, including valves in walls, vaults and equipment such as cooling towers, running sinks, etc. Leaks often go undetected and can last for years. Effective sub-monitoring of plumbing has traditionally been difficult and expensive, leading 99 percent of building owners to use water bills to manage gross waste. APANA's end-to-end solution attacks waste when it starts — immediately capturing savings and reducing risk.

HOW IN² IS HELPING:

APANA is in need of third party validation and test sites for continued new product development and research. One of the challenges APANA is faced with is finding credible case studies to describe the relationship between water waste and its impact on energy. Another goal for APANA is to learn more about BAS systems and other technologies in order to better explore commercialization and strategic opportunities. The IN² program is providing research assistance, test sites and marketing exposure to further expand APANA's growth.

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SOLVING THE PROBLEM

EdgePower sells and deploys lighting and HVAC energy management hardware and software. Designed to tackle the most challenging behind-the-meter energy issues for large commercial energy consumers, the company's products include an on-site energy management gateway, site control software, a web-based user interface and customer site support services. EdgePower's stand-alone energy management controls system is currently installed at over 400 commercial sites in North America for customers such as Costco Wholesaler and Iron Mountain.

THE IMPACT:

EdgePower's web-based energy management tools assist in managing energy consumption by making utility data visible, ultimately eliminating wasted utility spending. Additionally, EdgePower's patented EnFlex Energy Management system can interface with existing equipment to deliver optimal building performance. EdgePower's extensive experience in both solar and building energy management allows them to assist large commercial building owners and operators in getting the most out of their facilities. Active load control, predictive load management, and real-time monitoring of energy flows in a building unlock utility bill savings above and beyond basic kWh savings.

HOW IN² IS HELPING:

EdgePower aspires to become an integrator of energy services and distributed energy generation. The company is in need of expanding their dynamic load control solution and refining future iterations of their demand response product. Through the IN² program, EdgePower will be able to verify energy savings, confirm demand reduction efforts, analyze the impact these strategies have on buildings, and assess system cyber security. Another goal for EdgePower is to expand their business development resources in order to focus on new host sites for their product.

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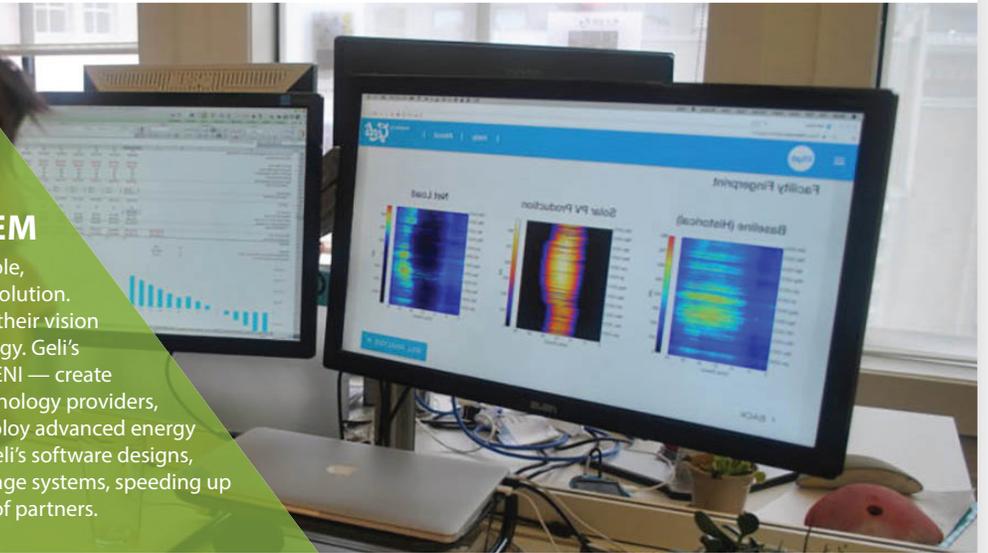
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SOLVING THE PROBLEM

Geli provides the industry's first scalable, end-to-end energy storage software solution. Their platform is designed to achieve their vision of a world running on renewable energy. Geli's suite of products — ESyst, EOS and GENI — create an ecosystem where developers, technology providers, financiers and project owners can deploy advanced energy projects using a seamless platform. Geli's software designs, automates, and manages energy storage systems, speeding up the path to market for a wide variety of partners.



THE IMPACT:

Geli allows project developers to combine the energy technology best suited to meet the needs of a project with the energy applications that save the customer the most money. Their end-to-end solution ensures that projects are designed and operated to deliver reliable performance and savings from day one. A key aspect for Geli is equipping financial institutions with the ability to independently assess distributed energy storage projects. This transparency will help make projects bankable, allowing them to attract the financing necessary to rapidly scale the industry.

HOW IN² IS HELPING:

Geli is in need of minimizing investment risk in ESS through third-party verification of their software platform, as current estimates are too uncertain to gain financing. Additionally, the IN² program may provide support such as API integration of their ESyst product or battery lifetime performance modeling.

TIER 1: Bench Scale

- Concept development stage
- Develop plans for prototyping & testing
- 3 – 5 years to market

TIER 2: Prototype

- Available for testing & validation
- Plans for development of final product
- Less than 2 years to market

TIER 3: Commercially Ready

- Models available in limited quantity
- Integrated demonstration
- Less than 18 months to market testing



SOLVING THE PROBLEM

Ibis Networks addresses plug load management with its patented IntelliNetwork System, enabling customers to save on energy costs related to managed equipment. Commercial buildings in the U.S. alone consume over \$135 billion in electricity each year, with plug loads accounting for up to 40 percent of that amount. Ibis Network's IntelliNetwork solution uses patented IntelliSockets, which sit between wall sockets and electrical devices, to measure and control energy usage.



THE IMPACT:

Plug loads can account for 35-40 percent of a building's energy use, yet managers currently have zero visibility or control over it. Ibis Networks addresses this, enabling customers to save about 10 percent of overall building energy. Specifically developed for commercial markets, the IntelliNetwork system is scalable, secure and integrated. By cutting out wasted usage, Ibis Networks demonstrates savings up to 10 percent of overall electricity usage – dramatically lowering demand without affecting operations.

HOW IN² IS HELPING:

Ibis Networks is in need of resources and facilities for testing and evaluation of advanced systems and energy efficiency strategies. With the expertise and guidance of the IN² program, their goal is to accelerate the pace of development, as well as gain invaluable validation of the resulting tools and strategies. In the future, Ibis Networks would also benefit from potential beta testing.

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SOLVING THE PROBLEM

J2 Innovations empowers companies to derive value from the connected world. Their FIN (Fluid INtegration) Framework software combines the core functionality of a Building Automation System (BAS) for connecting and controlling devices, with the added benefits of a Building Operating System (BOS) to manage and leverage data. The technology requires 75 percent less labor to deploy solutions through the innovative use of tagging and data modeling.



THE IMPACT:

Buildings today are more connected than ever before and have an increasing number of smart devices, unfortunately much of the data exists as islands of information. Customers want to leverage this big data but find it too difficult and costly. The FIN Framework brings together all systems in the building, making it faster and easier to implement energy reduction strategies in commercial buildings. Through continuous Fault Detection and Diagnostics routines, FIN software optimizes the BAS to reduce the energy impact on the built environment.

HOW IN² IS HELPING:

J2 Innovations is in need of a critical component to the FIN Framework to meet an immediate market need for retro commissioning with the associated visualization to show energy and cost savings opportunities. This module would greatly complement the existing functionality and enable virtual demonstration of the new functionality.

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SOLVING THE PROBLEM

Maalka enables cities and organizations to set cost-effective EE investment strategies and leverage powerful real-time Measurement and Verification to track the impacts of these investments across large portfolios of buildings. The open, scalable platform enables optimized portfolio-level improvement strategies and continuous tracking of the impacts of investments on efficiency, health, and finances over time. Fully virtualized portfolios will revolutionize how commercial building portfolio owners, utilities, investors and public sustainability programs manage assets, teams, operations and investments.



THE IMPACT:

Historically, physical energy audits that cost between 10 and 15 cents per square foot have been used to recommend energy conservation actions. Maalka's technology automatically generates accurate building energy models for macro-scale management of resources like energy, water and waste. This technology enables building owners to rapidly deploy customized improvement strategies and develop frameworks based on empirical projections and real-time monitoring. The ability to manage such strategies at scale will result in the broad financing and adoption of the most energy efficient technologies across the United States.

HOW IN² IS HELPING:

Maalka is in need of completing development and testing of their technology platform to ensure stability, scalability and security. Through the IN² program, Maalka has the opportunity to bring this extremely valuable technology that stands to transform commercial buildings into virtual resources for improving energy efficiency to the next level. The IN² program provides a unique opportunity to accelerate their Portfolio Level Energy-Efficiency Strategy (PLES) development, deployment and validation.

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SOLVING THE PROBLEM

PowerFlex is a service company that develops, deploys and manages large-scale adaptive charging networks that enable mass charging and a greener building. Their adaptive electric vehicle (EV) charging technology provides a target charging capacity at 40 percent lower infrastructure and operating costs, reducing the carbon footprint of a building by tracking renewable generation and demand response signals from the grid.



THE IMPACT:

To reduce their carbon footprint and drastically improve sustainability, buildings must support renewable generation and EV charging. Electricity generation and transportation combined constitute two-thirds of all energy consumed and emits more than one-half of greenhouse gases in the United States. PowerFlex minimizes peak power demand, thus capital and operating costs are reduced. Additionally, it enables mass charging and helps integrate renewables, allowing negative carbon footprint.

HOW IN² IS HELPING:

PowerFlex Systems is in need of funding for product development, for both hardware and software. The company is seeking help in testing joint optimization of EV charging and grid operation. PowerFlex Systems will also utilize NREL's expertise in executing strategies.

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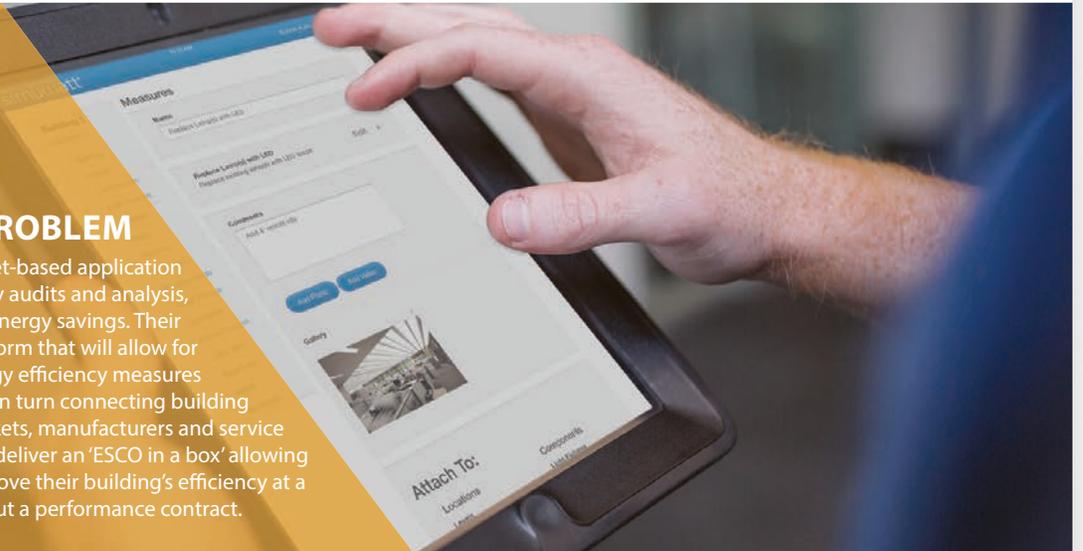
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SOLVING THE PROBLEM

simuwatt is a web and tablet-based application for conducting rapid energy audits and analysis, resulting in 20-40 percent energy savings. Their technology includes a platform that will allow for rapid identification of energy efficiency measures through energy modeling, in turn connecting building managers with capital markets, manufacturers and service providers. Their vision is to deliver an 'ESCO in a box' allowing any building owner to improve their building's efficiency at a lower cost — with or without a performance contract.



THE IMPACT:

simuwatt puts the power of identifying and completing building retrofits in the building owner's hands. Approximately 70 percent of all building audits lead to zero retrofit work in the built environment. With an expected commercial retrofit market in excess of \$100 billion by 2025, tools must be available to capture energy savings potential. simuwatt will provide building owners and portfolio managers with the tools to make informed decisions on best retrofit opportunities rapidly, on their own, and at a lower cost.

HOW IN² IS HELPING:

simuwatt is in need of a catalyst to augment the number of commercial building energy efficiency retrofits using their technology. The IN² program will provide simuwatt commercial validation — beyond the lab, offering a platform for them to deliver their enhanced auditing product with energy modeling, along with financing energy efficiency measures and retrofits. Financial assistance will allow simuwatt to further develop and prove its capabilities.

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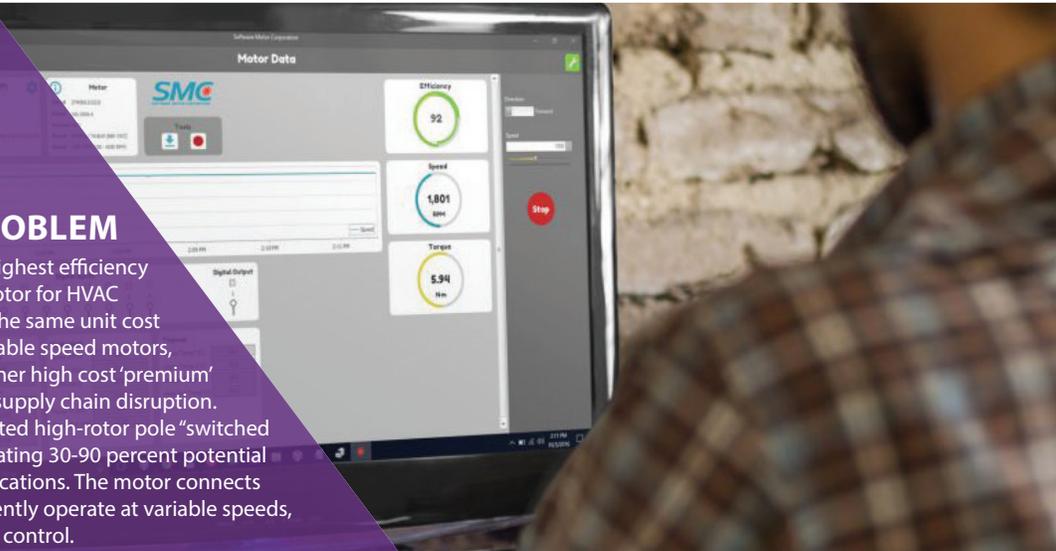
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SOLVING THE PROBLEM

SMC is building the world's highest efficiency internet-connected smart motor for HVAC applications. The motor has the same unit cost as current low-efficiency variable speed motors, and has no rare-earth and other high cost 'premium' materials that are subject to supply chain disruption. This technology uses a patented high-rotor pole "switched reluctance" design demonstrating 30-90 percent potential energy savings in HVAC applications. The motor connects to the internet and can efficiently operate at variable speeds, allowing fine grained remote control.



THE IMPACT:

SMC's motor is revolutionary for two reasons; its low-cost design is over 30 percent more efficient than inductance-type motors, saving on electricity. If this was installed in just one percent of currently available applications in the U.S., it would result in \$500 million in electricity savings and one million tons per year of carbon savings. Additionally, it is an internet-connected smart motor, allowing building owners to change the motor operating characteristics in real-time.

HOW IN² IS HELPING:

SMC is in need of independent validation that the motor provides the energy savings benefits established in lab settings. Through the IN² program, SMC will be able to test and demonstrate their technology in a range of operational environments. The IN² program will provide SMC with high-fidelity independent verification of the energy savings their motor represents compared to other motor designs and associated cost savings.

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SOLVING THE PROBLEM

Transformative Wave's technology and solutions become an all-seeing-eye for fault detection, diagnostics and asset management. The company is developing a turnkey retrofit kit for commercial buildings featuring advanced HVAC and lighting control, battery storage and micro-grid capabilities. Transformative Wave will optimize on-going revenue from 15-30 percent energy savings, 20-40 percent peak demand reduction, energy arbitrage, auto-DR and grid services.



THE IMPACT:

Transformative Wave focuses on grocery, convenience stores and retail space, a target market composed of 46 percent of the nation's commercial floorspace. Battery round-trip efficiency translates to a market average savings of 18 percent kWh. Transformative Wave will initially focus on regions with healthy incentives including California, Texas, Hawaii and the Northeast. Assuming 40 percent penetration in these regions, annual savings will be 17 billion kWh.

HOW IN² IS HELPING:

Transformative Wave is in need of support to develop a model predictive controller, and conduct third-party laboratory testing and field demonstrations. Testing will focus on how to optimize passive thermal storage with active battery storage to maximize parallel revenue streams. The IN² program will provide necessary domain knowledge, EnergyPlus building simulation and hardware-in-the-loop testing expertise to validate their technology solution.

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Awardee Accomplishments to Date

Betas

Whisker Labs

For its IN² project, Whisker Labs requested support evaluating their technology in real applications. Following the completion of a laboratory evaluation of submeters under real loads, Whisker Labs was presented with the opportunity to test and demonstrate their product in a real world environment within Wells Fargo's commercial real estate portfolio. In June 2016, NREL researchers installed Whisker Lab's pilot product at a Wells Fargo Branch facility in Aurora, Colorado, to allow NREL to evaluate the technology's performance and demonstrate the benefit of this less-invasive submetering technology in a commercial building.

LiquidCool Solutions

At the time of IN² project commencement, LCS was in need of field-testing to demonstrate the advantages of their technology. NREL supported the request by first testing and mapping the performance of LCS's Liquid Submerged Server in a laboratory environment. After successful laboratory evaluation and development of the LCS prototype, NREL performed a field demonstration to evaluate the installation, maintenance, and computing performance of a live server rack. Specifically, the unit is installed at the Energy Systems Integration Facility (ESIF) on the NREL campus.

Upcoming Planned Pilot Demonstrations

The following companies will be participating in upcoming planned pilot demonstrations in the near future:

- Ibis Networks
- PowerFlex
- APANA

Exits

VG Smartglass

VG Smartglass performed a feasibility test of their product at the Research Support Facility (RSF) on NREL's main campus. VG SmartGlass requested design assistance to optimize INVISIBLIND performance, and test and validate the product through demonstration. Additionally, the company sought guidance integrating their system with commercial building facades and lighting control systems. NREL support took the form of a product feasibility assessment. First, simulation using Radiance and OpenStudio software determined the energy impact potential of the current product version across a variety of buildings types and climates. Guidance on strategic applications given future design improvements was provided. In parallel, the NREL campus served as a demonstration location for the INVISIBLIND unit, enabling VG SmartGlass to evaluate product fabrication, installation, and ongoing maintenance in multiple window types and for different use cases. Through their IN² project and successful exit, VG Smartglass gained tremendous knowledge on product design, component sourcing, and fabrication.

Whisker Labs

While still working in the IN² program, Whisker Labs was acquired by Earth Networks, as announced in December 2016. Earth Networks, which operates the world's largest weather observation networks, will create a new division for the energy-sensing hardware and software infrastructure developed by Whisker Labs. According to Earth Networks, the new home energy monitoring device will be available to business partners such as utilities, solar and energy companies, home automation providers, and insurance companies in early 2017. It will be made available to consumers later in 2017.



Follow on funding

Whisker Labs - \$100,000

Whisker Labs delivered system prototypes for multiple rounds of testing and evaluation in the Electrical Systems Integration Facility (ESIF), improved their system characteristics and performance based on ESIF testing and results, and successfully delivered and installed a prototype system for Beta installation at a Wells Fargo branch building. Their follow on funding was to support a single large-scale pilot deployment.

Polyceed - \$150,000

Polyceed's follow on funding entailed continuing materials support through processing and testing, including durability characterization. This project will help Polyceed complete a demonstration device and obtain preliminary results related to assessing product durability to demonstrate to investors.

NETenergy - \$250,000

Following a successful HVAC integration strategy with NREL, allowing their system to be optimized for a variety of building types, cooling requirements, utility tariffs, and climate zones, NETenergy's next main challenge is the commercialization of their product. Using their follow on funding NETenergy will simulate the performance of their system in a variety of building configurations, climate zones, and geographic regions, and ascertain the performance of POC in a controlled environment testing facility.



WHO WE ARE

Program Management Team

- **Ashley Grosh** – Vice President and Business Initiatives Manager, Environmental Affairs at Wells Fargo
- **Jeff Austin** – Senior Vice President, Operational Sustainability Strategy, Environmental Affairs at Wells Fargo
- **Richard Adams** – Director, Innovation and Entrepreneurship Center at NREL
- **Kate Cheesbrough** – Assistant Director, Innovation and Entrepreneurship Center at NREL
- **Meghan Bader** – Program Manager, Innovation and Entrepreneurship Center at NREL
- **Domi Colegrove** – Program Management Team, Innovation and Entrepreneurship Center at NREL
- **Brendan Scott** – Technical Program Manager

Wells Fargo IN² Board of Directors

This strategic board is comprised of executives and senior managers from Wells Fargo, representing more than a dozen lines of business, guiding the strategic elements of the program. Board members provide applicant feedback as well as subject matter expertise related to commercial buildings, sustainability, clean tech and environmental finance, legal, supply chain, government relations, and much more.

The establishment of the IN² Wells Fargo Board of Directors was to bring specific Wells Fargo product and practices expertise as well as general industry knowledge of sustainable buildings technologies in order to provide strategic direction to the development of the overall program as well as provide strategic feedback to selected entrepreneurs that will be awardees under IN². The Wells Fargo Board of Directors consists of senior leaders across the company including but not limited to: Cleantech Regional Commercial Banking Office (RCBO); Commercial Real Estate (CRE); Community Lending & Investing (CLI); Corporate Properties Group (CPG)/Technology & Operations Group (TOG); Environmental Finance Team; Legal Department; Supplier Diversity (Supply Chain Management); Wells Fargo Foundation/Government & Community Relations (GCR) including:

- **Puon Penn** – Executive Vice President and Cohead of Wells Fargo Commercial Banking Service's Technology and Venture Banking Group
- **Matt Servatius** – Senior Vice President and Head of Wells Fargo CleanTech Banking
- **Sean Barlas** – Executive Vice President, Head of Real Estate Merchant Banking Group at Wells Fargo
- **Tim Rafalovich** – Senior Vice President, Community Lending and Investment; Capital Markets Manager, Alternative Equity Group at Wells Fargo
- **Richard Henderson** – Executive Vice President, Head of Corporate Properties at Wells Fargo
- **Curt Radkin** – Senior Vice President of Corporate Properties at Wells Fargo
- **Kevin Dabney** – Executive Vice President of Enterprise Technology Services at Wells Fargo (former IN² Wells Fargo BoD member)
- **Tali Bray** – Senior Vice President, Head of Innovation Technology at Wells Fargo (former IN² Wells Fargo BoD member)
- **Mary Wenzel** – Senior Vice President and Director of Environmental Affairs at Wells Fargo
- **Jon Previtali** – Vice President of Environmental Finance at Wells Fargo
- **Barry Neal** – Executive Vice President, Cohead of Renewable Energy and Environmental Finance at Wells Fargo
- **Molly Porter** – Senior Counsel, Wells Fargo Law Department (former IN² Wells Fargo BoD member)
- **Regina Heyward** – Senior Vice President, Head of Supplier Diversity at Wells Fargo
- **Julie Slocum** – Senior Vice President, Government Relations at Wells Fargo (former IN² Wells Fargo BoD member)



IN² External Advisory Board

The external advisory board is made up of industry subject matter experts and professionals that provide perspective to the technology selection process for the IN² program. The IN² Advisory Board plays a significant role in the IN² program, as it ultimately determines the technologies that are accepted into the IN² program.

The Advisory Board consists of industry and academic experts in the built environment space and they are expected to provide insights and expertise in sector trends, challenges and opportunities in the buildings space, and some level of technical understanding around building technologies, both traditional and emerging.

The Advisory Board is presented with top scoring applications following each application round and will collectively determine the technologies to be accepted into the IN² program. The Advisory Board includes:

- **Cara Carmichael** – Manager, Buildings, Rocky Mountain Institute (RMI)
- **AJ Dye** – Strategic Energy and Technology Investor, Delta Electronics Capital
- **Brian Dunbar** – M. Arch, Leadership in Energy and Environmental Design (LEED) Fellow, Executive Director & Professor Emeritus, Institute for the Built Environment, Colorado State University
- **Michael Groppi** – PE, CEM, LEED Green Associate Vice President, Energy & Sustainability Implementation, CBRE
- **Holley Henderson** – LEED Fellow, Author / Speaker / Consultant, H2 EcoDesign
- **Heidi Lubin** – Co-Founder, Modula S
- **Kevin Powell** – Green Proving Ground Program Manager, General Services Administration
- **Meital Stavinsky, Esq.** – Partner Holland & Knight
- **Brian Steel** – Co-Director, Cleantech to Market Program, Energy Institute at Haas, University of California, Berkeley
- **Mathew Robinson** – Program Engineer, Colorado Energy Office
- **Susan Allen** – US Pan Asian American Chamber of Education Foundation (former EAB member)

Channel Partners

Channel Partners are a critical part of the IN² model. These Cleantech focused universities, incubators, and accelerators act as a pipeline for companies to enter the IN² program. In addition to referring companies to the program, these Channel Partners provide critical business mentoring and support to companies. The Channel Partners include:

- ACRE
- Advanced Research Projects Agency – Energy (ARPA-E)
- Caltech, Flow Program
- Carnegie Mellon University
- Case Western Reserve University
- Clean Energy Trust
- Cleantech Group
- Cleantech Open
- Coachella Valley Economic Partnership
- Colorado State University Energy Institute
- Elemental Exclerator
- Fraunhofer CSE TechBridge Program
- Green Town Labs
- Imagine H2O, Inc.
- Innosphere
- Los Angeles Cleantech Incubator
- Mass Challenge
- MIT Energy Club
- NextEnergy Center
- Northeast Clean Energy Council (NECEC) Institute
- Northwestern University
- Oregon BEST
- Portland State University
- Prospect SV
- Purdue University
- Rice University Rice Alliance for Technology and Entrepreneurship
- Stanford, TomKat Center for Sustainable Energy
- Sustainable Startups
- Telluride Venture Accelerator
- Texas A&M University, Research Valley Partnership
- Texas State University
- The Water Council
- UC Berkeley, Cleantech 2 Market (C2M)
- UC Davis Energy Efficiency Center (EEC)
- UC Irvine
- UC San Diego
- University of Colorado
- University of Denver
- University of Michigan
- UNC Charlotte
- UT Austin, Austin Technology Incubator (ATI)
- UT Austin, McCombs Business School Texas Venture Labs
- University of Washington Foster School of Business
- University of Wisconsin – Madison

Fostering a Cleantech Ecosystem



WHERE WE'RE GOING

Based on the success of the IN² model to date, in 2017, IN² received an additional \$20 million from the Wells Fargo Foundation enabling the program to expand its focus and grow its ability to support innovations and partnerships aligned with supporting **clean and connected communities** that are more inhabitable, cleaner, and more equitable. Commercial buildings will remain the cornerstone of the program, but IN² will expand to support innovations in new verticals, such as transportation, residential, and food/energy/water nexus. We have decided to focus on these areas given their energy and sustainability impact, the potential for innovative solutions, and our ecosystem ability to affect change within these technology areas.

Transportation

- Roughly 28% of all the energy that people in the United States consume goes to transporting people and goods from one place to another¹
- The total amount of time that American rush-hour commuters in 2014 spent stuck in traffic was about 6.9 billion hours, up from 6.4 billion in 2010
- Increasing gas consumption by 3.1 billion gallons
- Resulting in:
 - A congestion cost of \$160 billion dollars²
 - America sending other countries almost \$1 billion each day for oil to power our cars, trucks, planes, trains, and ships³
 - Emissions cause more than \$55 billion per year in health and other damages.⁴

Residential

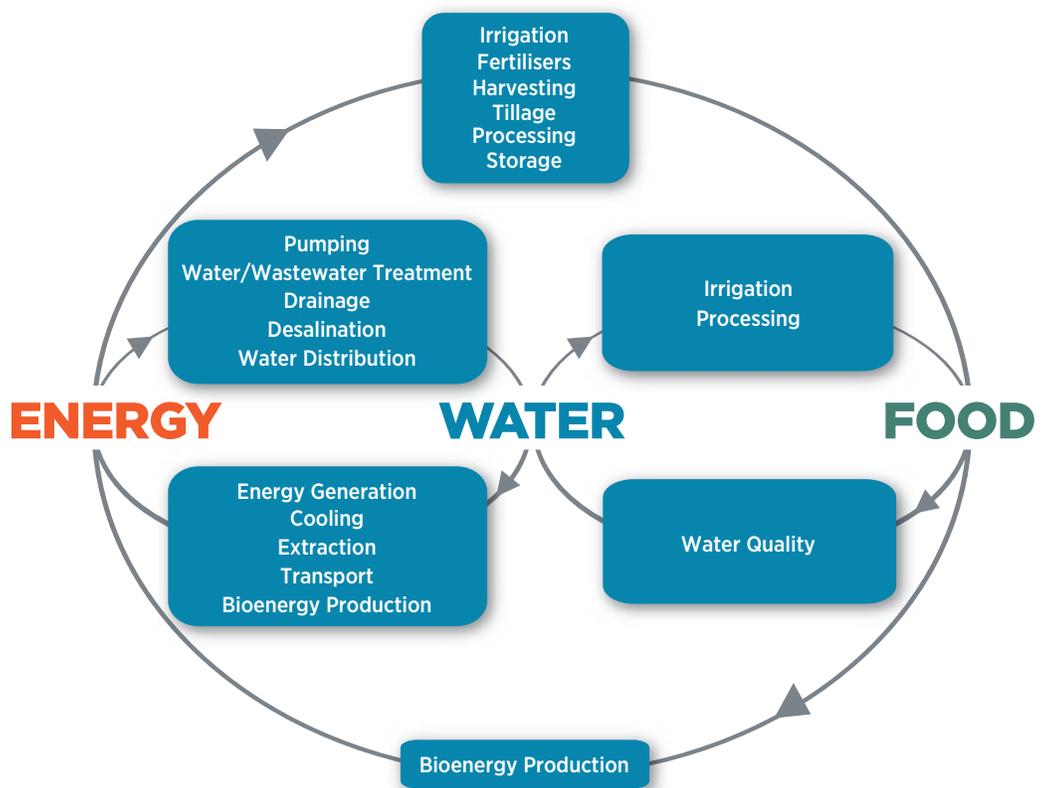
Energy use in the residential sector represents a significant energy cost savings potential, and a forefront opportunity for new clean energy and energy efficient technology solutions.

- Americans spend 90% of their time indoors, working, living, shopping, and entertaining in buildings that consume a large majority of the Nation's energy.⁵
- Overall, residential homes and commercial buildings account for 40% of the energy used in the United States, with over half of that (22%) being consumed by residential homes.
- The average homeowner spends approximately \$2,250-\$2,500 per year on household energy, to power comfort (heating and cooling, hot water), lighting, appliances, and other miscellaneous uses (televisions, etc.).⁶
- The single largest end-users in residential buildings are space heating (32%), followed by air conditioning or space cooling (13%), water heating (13%) and lighting (12%).⁷ These household uses add up to 2,348 trillion Btu's of energy.⁸

Food/Energy/ Water Nexus

Water, energy and food are inextricably linked. Water is an input for producing agricultural goods in the fields and along the entire agro-food supply chain. Energy is required to produce and distribute water and food: to pump water from groundwater or surface water sources, to power tractors and irrigation machinery, and to process and transport agricultural goods.

- Agriculture is currently the largest user of water at the global level, accounting for 70% of total withdrawal.
- The food production and supply chain accounts for about 30% of total global energy consumption.⁹



Schematic illustration of various elements of the water-energy-food nexus¹⁰

1. U.S. Energy Information Administration, Monthly Energy Review, Table 2.1. preliminary data. April 2016
2. Texas A&M Transportation Institute 2015 Urban Mobility Scorecard (<https://static.tti.tamu.edu/tti.tamu.edu/documents/mobility-scorecard-2015.pdf>)
3. Nerurkar, Neelesh. "U.S. Oil Imports and Exports." Congressional Research Service, April 4, 2012. <http://www.fas.org/sgp/crs/misc/R42465.pdf>.
4. Texas A&M Transportation Institute 2015 Urban Mobility Scorecard (<https://static.tti.tamu.edu/tti.tamu.edu/documents/mobility-scorecard-2015.pdf>)
5. <http://www.aps.org/energyefficiencyreport/objectives/buildings.cfm>
6. <http://www.nrel.gov/docs/fy13osti/58018.pdf>
7. <https://www.aps.org/energyefficiencyreport/report/energy-bldgs.pdf>
8. <https://www.eia.gov/consumption/>
9. <http://www.unwater.org/topics/water-food-and-energy-nexus/en/>
10. http://www.irena.org/documentdownloads/publications/irena_water_energy_food_nexus_2015.pdf

Channel Partner Awards

In addition to growing the technology incubator, \$5 million of the new funding announced in 2017 will also be used to develop an IN² Channel Partner program to provide financial support to IN²'s 40+ Channel Partners, made up of universities, business plan competitions, incubators, and accelerators that maintain a pipeline of their best and brightest startups to be considered for participation in the program. These Channel Partners play a critical role in the IN² program and this program serves to support the cleantech ecosystem by funding sustainability-focused incubators, accelerators, and university programs as key stakeholders in the clean energy economy. In addition to supporting the ecosystem financially, the program aims to further the ecosystem through promotion of a sustainable, robust network. The community will be convened and strengthened through activities and events that will provide opportunities for funded members to share learnings, discuss strategic objectives, and network in an effort to strengthen the cleantech community.

Funding will be distributed to Channel Partners in order to engage with their communities, attend IN² events, and play an active role in the program. Additionally, strategic funding awards will be given to Channel Partners to execute on specific programs aimed at supporting clean energy startups and the greater IN² ecosystem.

To date, more than \$210,000 in funding has been distributed to Channel Partners, with a goal of more than \$1 million in 2017.

Summary

Thank you for your interest in the IN² program. We are proud of our success to date and eager to continue to grow and share more successes. Sign up for our newsletter at <http://in2ecosystem.com/> to keep up on IN² program happenings.







IN²

Founded by:



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