the Energy to Lead

Nicor Gas Emerging Technology Program:
Creating Opportunities in the Face of Challenges

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Nicor Gas™
An AGL Resources Company

Energy Efficiency Program

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GTI Overview

- Not-for-profit (501c3) RD&D organization with 70 year history
- Facilities
  - 18 acre campus near Chicago
  - 200,000 ft^2, 28 specialized labs
  - Other sites in California, D.C., Texas, Alabama,Massachusetts
- Staff
  - Approximately 250
  - 170 engineers, scientists covering all fields

CHP and Renewable Energy Lab

Residential & Commercial Lab

Flex-Fuel Test Facility

Natural Gas Industry Collaboration

Emerging Technology Program

> Gas Technology Institute led, utility supported, **North American collaborative** targeting **residential, commercial,** and **industrial** solutions

> ETP's principle goal is to **accelerate** the **market acceptance** of emerging gas technologies

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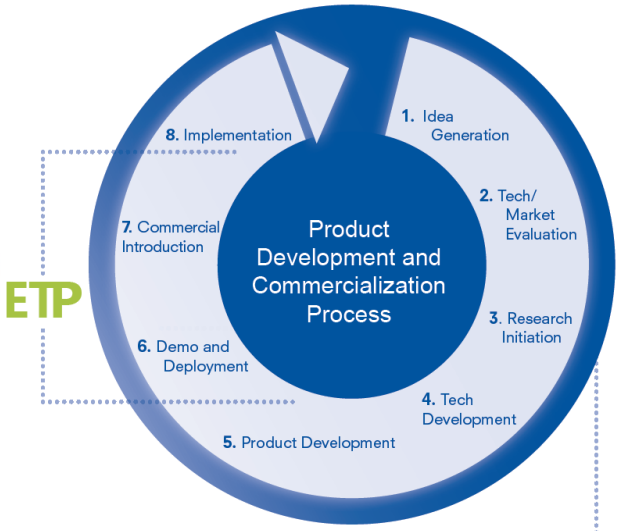

ETP activities are "beyond development" stage: Field Testing, Demonstration, Pilot Programs, and Deployment — a focused effort to ensure market acceptance of next-generation emerging technologies

2013 Members Listed Above

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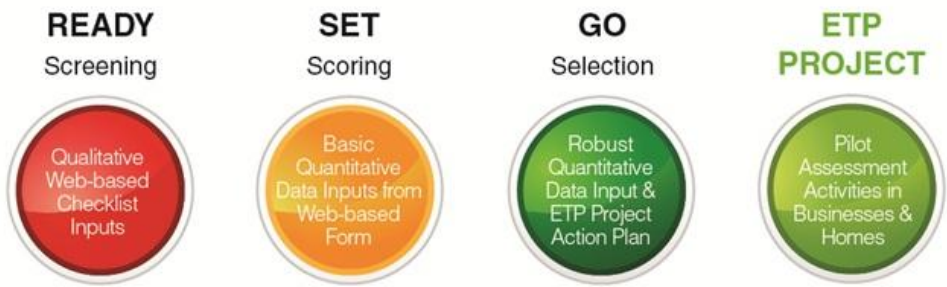
Nicor Gas
Emerging Technology Program

- $50 million/year portfolio, 3% investment in ETP
- GTI selected to implement ETP for Nicor Gas
- Formal, transparent process for project selection

ETP is to EEP as the minor leagues is to the major leagues



- Goal to identify and demonstrate new technologies for EEP
- **Close collaboration with implementation programs**

NICOR GAS EMERGING TECHNOLOGY PROGRAM

Functional Flow Chart

- Revised information flow eliminates information gaps for hand off to implementation team.
- Marketing information is mined and provided to implementation phase.
- Testing, measurement and reporting focuses on core competency.

Applications	Tech. Scoring	Market Viability	Action Plan	Run Pilot	Work Paper	Program Manager	Impl. Contractor
Product	ETP (IC)	Target Market	Opportunity	Site Selection	ICC Document	Channel Management	
Technology	Energy Technology	Target Customer	Tech Background	Installation	Deemed Savings	Contractor Relationship	
Research	Measurement	Customer Need	Adoption	Data Gathering	Custom	Reporting	
Deemed Savings	Tech Screening	Key Benefits	Maturity	Reporting	Prescriptive	Program Management	
	Tech Scoring	Value Proposition	Approach				
		Barriers	Scope				
		Competition	Schedule				

Nicor Gas™
An **AGL Resources** Company

Energy Efficiency Program

Nicor Gas Application/Project Status

- 50+ applications received
  - Mix of residential, commercial, and industrial sector
- 10+ ETP projects underway, each project is different because each technology/program concept has its own set of barriers to EEP entry
  - Data Barriers
    - **Moving from custom to prescriptive (e.g. ozone laundry)**
    - What about gas? (e.g. EcoFactor)
  - Market Barriers
    - Identifying and addressing the impacts of ‘disruptive’ technologies (e.g. condensing HE RTUs)
    - **Awareness and education (boiler heat recovery workshop)**

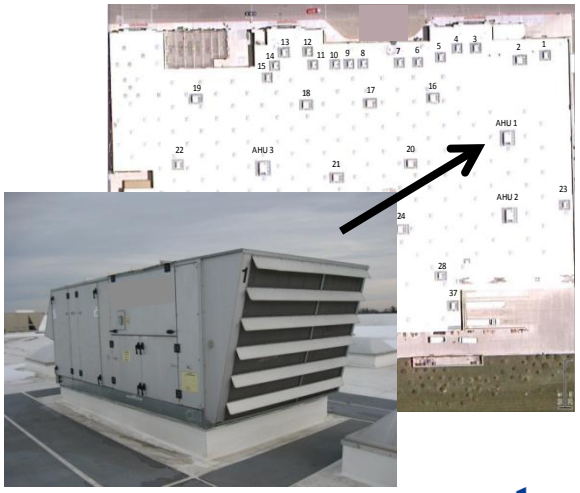
Pilot Evaluation- EcoFactor Home Energy Management

- EcoFactor is based on proprietary software that analyzes and adjusts a home's thermostat to control the HVAC operation based on weather data and other information, including home occupancy status.
- Purported 36% reduction in cost to heat and cool a home
  - 10-20% savings from automated energy efficiency
  - 16% savings from personalized schedules
- Nicor Gas is **partnering with ComEd** to install and monitor over 100 EcoFactor Home Energy Monitoring Systems in over 90 homes
- Two tier modeling validation for heating savings
  - Therm savings based on hourly data of actual indoor temperature and furnace runtime versus increased furnace runtime for higher temperature setpoint
  - Simulation using GTI Building America PARR Team BEOpt models for representative Chicagoland homes

Field Assessment- High Efficiency Gas PACs- RTUs

ETP Emerging Technology Program

- Collaboration with NREL, DOE, **manufacturers**, **national accounts**, and utilities
- Large-scale monitoring shows **diverse runtimes for RTUs** and more therm use than energy models suggested
- **Dedicated outside air systems** (DOAS) **provide** high efficiency **market entry point** application
  - "big box" retail accounts with established DOAS vendors
  - high heating degree day (HDD)/heating load locations
  - 24/7 retail stores
- Retail partner projected $4,400 premium, = 4.1 years ROI @ 90%TE without incentives
- Northern climates see more than 2,500 therm savings/year/unit!

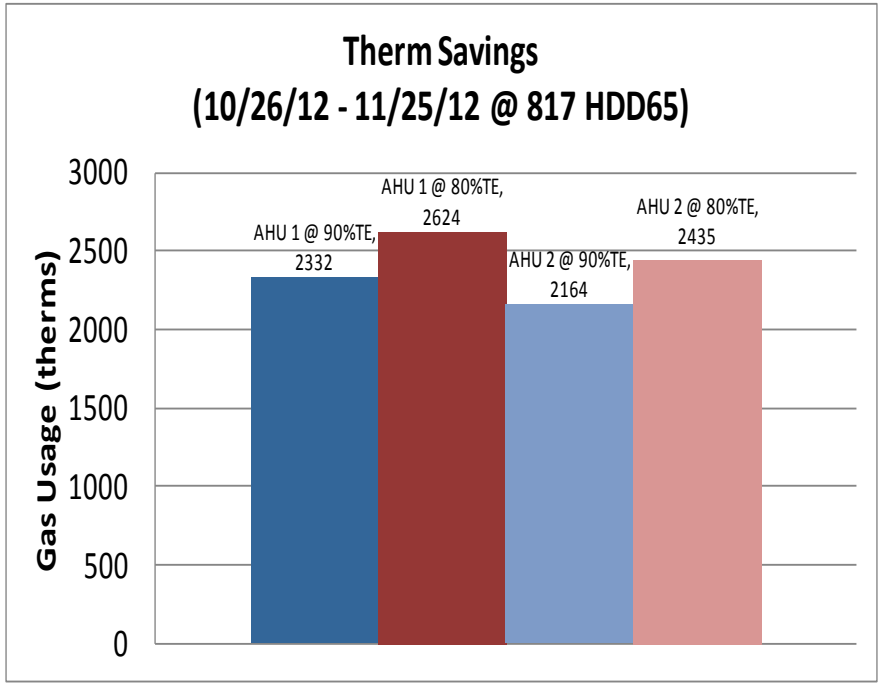


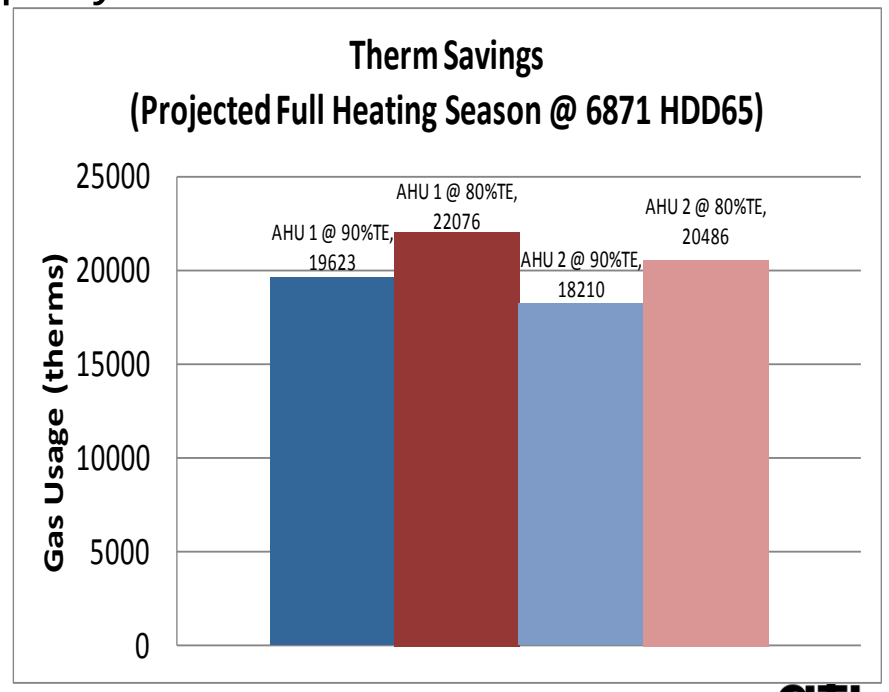
Condensing RTU Retrofit Process

- 3 step condensing heating module retrofit process over late September through mid-October 2012
  1. Installation of condensate piping with neutralizer
  2. Replacement of non-condensing heating modules
  3. Completion of data acquisition system

Nicor Gas Condensing RTU - results to date

- Therm savings to date can be projected with statistical confidence to a full heating season
  - AHU 1 – 2453 therms saved per year
  - AHU 2 – 2276 therms saved per year





Field Assessment- Modulating Gas Dryer Retrofit

- Modulating gas dryer controls allows the firing rate of standard commercial gas-fired dryers to adjust for the changing demand in heat needed to drive off moisture thereby reducing heat generation and gas use.
- 2 year payback period, **$500 cost per *retrofit* system**
- Barriers
  - Making changes to a manufacturer's burner system raises safety and liability issues.
  - It would require the appliance to no longer be in its warranty coverage since this should void any manufacturer's warranty if installed.
- Nicor Gas ETP is evaluating 12 systems in the field with 2 hotel sites, 1 laundromat, 1 healthcare site, and 1 laundry/linen service site.

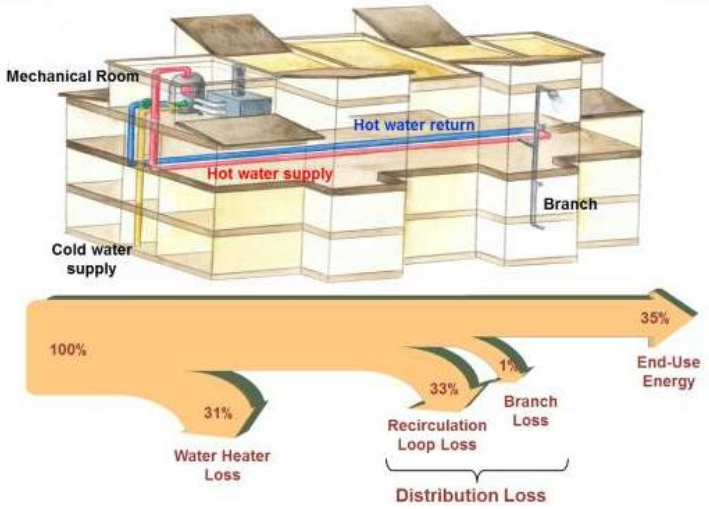
Figure 1: Bio-Therm modulating controls, furnished by EZ Efficiency

Burner on Time	1 Hour	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours
Dryer BTU						
70K	$ 0.264	0.528	0.792	1.056	1.320	1.584
80K	$ 0.300	0.600	0.900	1.200	1.500	1.800
90K	$ 0.339	0.678	1.017	1.356	1.695	2.034
100K	$ 0.375	0.750	1.125	1.500	1.875	2.250
125K	$ 0.468	0.936	1.404	1.872	2.340	2.808
150K	$ 0.567	1.134	1.701	2.268	2.835	3.402
175K	$ 0.657	1.314	1.971	2.628	3.285	3.942
200K	$ 0.750	1.500	2.250	3.000	3.750	4.500
215K	$ 0.807	1.614	2.421	3.228	4.035	4.842
250K	$ 0.939	1.878	2.817	3.756	4.695	5.634

Figure 2: Bio-Therm savings table by drying time and dryer size, furnished by EZ Efficiency

Field Assessment- Multi-family Demand DHW Controls

- Demand pump for central domestic hot water systems
- System operates only when there is demand, energy savings from reduced thermal loses in recirculation loop (**generally 1 - 3 years ROI before rebates**)
- Nicor Gas supporting two demos in Chicago area with complete monitoring, collaborative demos in Michigan and Canada as well
- Initial Nicor Gas results suggest roughly 2,000 therms and 750 kWh per building (roughly 40 units/building), with paybacks well below 2 years
- Project goal is to develop qualitative and quantitative data to support prescriptive program



Comments, Questions

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ETP Emerging Technology Program

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Emerging Technology Program (ETP)

Addressing implementation barriers and associated risks related to market acceptance and adoption of emerging technologies.

Improved energy efficiency is a shared policy goal around the world; it is often the most economic and readily available means of improving energy security and reducing carbon emissions. New technology is essential to further energy efficiency improvements and to move toward a cleaner, more sustainable energy future.

Emerging Technology Program (ETP) —
A newly established collaborative program managed by Gas Technology Institute (GTI) — is focused on accelerating the commercialization and adoption of the latest energy efficient technologies. The program is designed to help companies identify and evaluate the most promising products and integrated solutions and assess their suitability for future use in utility energy efficiency programs.

GTI's industry-leading expertise provides the information and resources required to help advance market acceptance of emerging technologies for near- to mid-term implementation. ETP strives to create market pull by deployment of natural gas solutions at a desired scale, leading to self-sustaining commercial viability and impact.

Effective Industry Collaboration
Collaborative ETP initiatives provide an opportunity for companies to share insights, leverage energy efficiency funds and help increase the transfer of technology between upstream innovations and the marketplace.

ETP also offers access to GTI services and capabilities for energy efficiency program planning, implementation and assessment. GTI and its partners can work with your company to tailor or modify initiatives to address company or regionally specific needs and opportunities. We can also support a regulatory submission for ETP authorization. GTI has a long history of working collaboratively with utility companies, regulatory agencies, local state/federal government, non-government organizations, manufacturers, channel partners, trade allies and other stakeholders to reduce the time and cost of getting new technology to market.

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