the Energy to Lead

Emerging Technology Programs
Expanding Opportunity for Energy Efficiency

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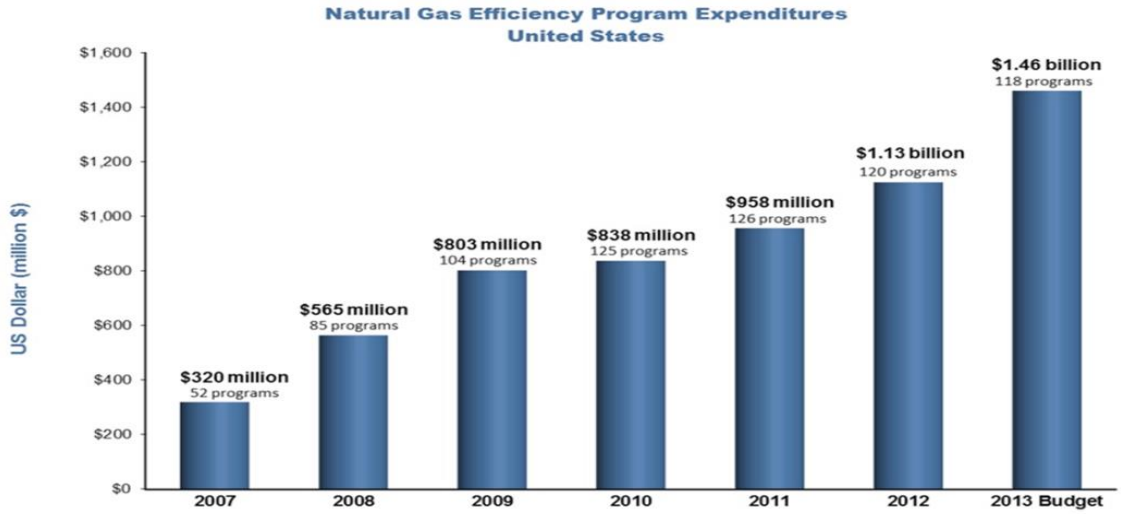
Energy Efficiency Programs



Source: American Gas Association

- As energy efficiency programs, codes & standards, and markets mature, low hanging fruit disappears. (e.g. CFLs)
- Low natural gas prices make paybacks longer and efficiency gains more challenging.
- High capital cost efficiency 'upgrades' present adoption barriers across all market sectors.
- Higher measure costs during initial program launch discourage the inclusion of new measures or concepts which may provide meaningful value to ratepayers and the program.

What Can ETPs Accomplish? What is the Process?

ETP
As energy efficiency programs, regulations, and markets mature, low hanging fruit disappears. ETP helps **deliver a pipeline of new technologies and program solutions** enabling programs to meet tomorrow's energy efficiency goals with **less risk and more certainty**.

1. Identification and review of technologies and program concepts using criteria such as market readiness, market and technical potential, potential for cost-effective energy savings, and enabling market infrastructure such as distribution and service network.
2. Deployment of assessments and scaled field placements that expand technical and market understanding of performance, reliability, and serviceability help to reduce risk to energy efficiency programs and consumers.
3. Market transformation—information and infrastructure—including training guidelines, delivery challenges, contractor relationships—needed to remove market barriers.

Improving Hot Water Systems

- **Demand Controller for Central Domestic Hot Water Systems**
  - Provides real-time demand throughout a multi-family building, while maintaining hot water availability for users, leading to increased energy efficiency and cost savings through reduction in use of natural gas and electricity.
  - An ETP project demonstrated controller savings of approximately 1,500 therms and 1,250 kWh savings per pump annually, or 35 therms and 30 kWh per dwelling unit. At an installed cost of under $1,800, the measure pays back in less than two years before incentives.
  - Building on ETP project success, SoCal Gas launched a direct install program for the controller which yielded 3,000+ installations since 2008.
  - A large scale evaluation of 300 installed units determined a total annual savings of 458,000 therms, which nearly matched the projected savings of 474,900 therms, as established through the ETP project.
  - Demand controllers are now code, included in both the 2013 California Title 24 building code and the 2015 ICC building code.

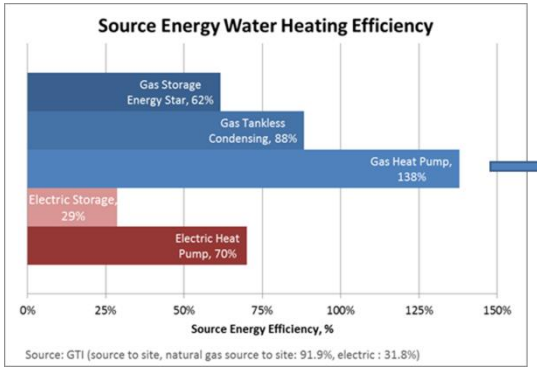
*Source: GTI White Paper: On-Demand Controls for Central Hot Water Systems, 2014

More Efficient Combined Space and Water Heating for Residential Buildings

- Coordinated demonstrations and pilots identified key barriers and gaps that need to be addressed before large-scale inclusion in energy efficiency programs.
  - Equipment, system specification, operation, and load profiles all have significant impact on energy savings potential.
  - Key next steps include contractor training and education and development of enhanced air handler unit for optimized condensing performance.
- Without ETP project activities, combined space and water heat systems may have been deployed to energy efficiency programs with poor results.

Potential Market Impact

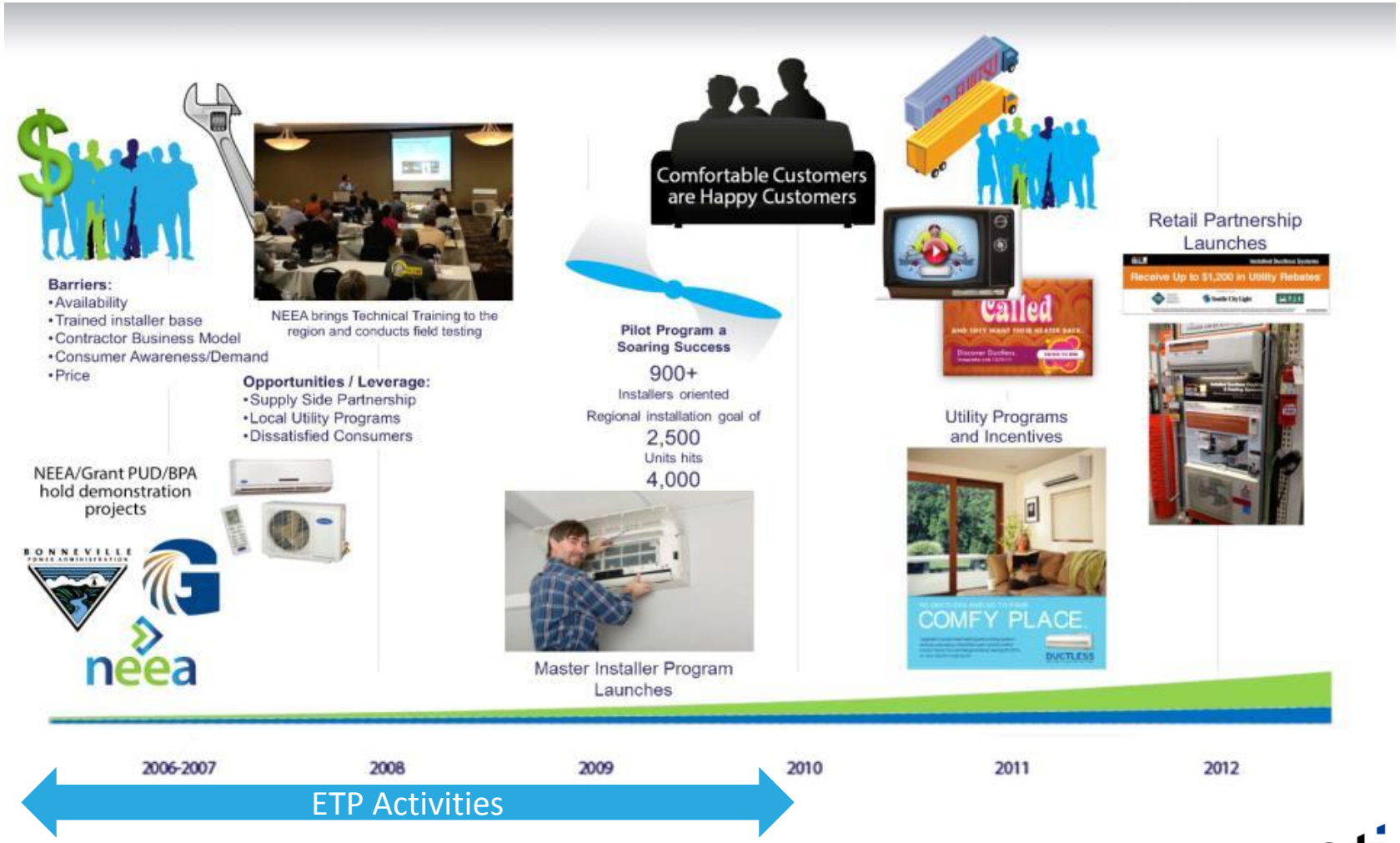
- Gas heat pump water heaters can provide substantial benefits
  - New technology offers opportunity to cut domestic hot water energy use in half. The projected Energy Factor (EF) for new gas heat pump is 1.3, compared to baseline technology at 0.6-0.65 EF.
  - Over 62 million households in U.S. have natural gas water heat*
- Keys to success
  - Coordinated approach with R&D community to demonstrate pre-commercial units in the field to identify remaining installation, reliability, code, and performance issues.
  - Utility, regional, and national ETPs working together with major original equipment manufacturers (OEMs) to demonstrate market potential and adapt systems for large scale production.
  - Key market transformation activities can include scaled field placements for first generation equipment, hybrid incentive strategies, and stakeholder outreach with contractors, distributors, retailers, and energy efficiency programs.



"Market Transformation is the strategic process of identifying barriers and overcoming them or exploiting opportunities to accelerate the adoption of cost-effective energy efficiency as a matter of standard practice."

*Source: US Census Bureau, American Housing Survey

Market Impact Success: Ductless Heat Pumps



*Source: Northwest Energy Efficiency Alliance, 2015 GTI ETP Winter Meeting

ETPs Growing

Many States with long-running energy efficiency programs are recognizing the value of ETP and direct a portion of their EE rate payer funding towards ETPs.

ETP Envisioned and Enabled in EEP Legislation

In 2009, IL SB 1918, an amendment to Illinois Power Agency Act, allowed **Illinois** energy efficiency programs to allocate up to 3% of EEP revenue for 'demonstration of breakthrough equipment and devices.'

ETP Added to Existing EEP During EEP Plan Filing

California stakeholders, including IOUs and the CPUC, identified the need for ETPs. Based on multi-lateral discussions, it was decided that IOUs, with their lead role in energy efficiency program administration, were best positioned to address the ET function.
Beginning in late 1990s, IOUs included an ET function within their overall energy efficiency program filing. California's ETPs have grown and matured ever since.

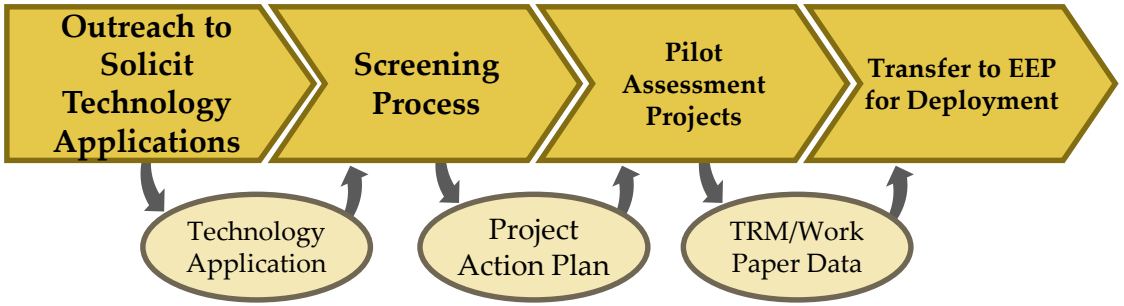
ETP Administered by the State, For EEPs

In States like **New York** and **Minnesota**, ETPs are administered by state agencies for the benefit of energy efficiency programs, often administered by IOUs.

Selected States with ETP-Type Approval
• California
• Illinois
• Massachusetts
• Michigan
• Minnesota
• New York
• Oregon
• Rhode Island
• Washington
• Wisconsin

ETPs Across the Country: *Best Practices Emerge*

While there are different models for designing and implementing an ETP, successful programs have several common elements.



- **Design:** ETPs serve programs. Each ETP should be designed to optimally address long-term portfolio goals in a straightforward, timely, and transparent manner.
- **Delivery:** ETPs core function is to identify, evaluate, and deliver new measures and program concepts. To be successful, assessments and pilots must be developed and executed in partnership with relevant stakeholders. A coordinated approach will ensure ETP project outcomes are relevant to and appropriate for their intended market and market actors.
- **Evaluation**: ETPs require the ability to think long-term. Traditional program evaluation, measurement, and verification (EM&V) focuses on near-term energy savings and cost-effectiveness, this is incongruent with ETP's core mission. ETPs should be considered 'non-resource' programs, and rather be evaluated based on their processes and long-term impact.

Expanding the Benefits of ETP

- Realizing the potential of successful innovation in the marketplace requires an effective and continuous link between upstream R&D and downstream energy efficiency programs.
- While ETPs are growing in number across the U.S., many energy efficiency portfolios lack an ETP element.
- ETP helps deliver a pipeline of new technologies and program solutions enabling programs to meet tomorrow's energy efficiency goals with less risk and more certainty.

ETPs have a unique role to play within an energy efficiency portfolio, bridging the gap between research and development (R&D) and program implementation.