NC Energy Policy Council

August 15, 2018
Quantifying North Carolina’s Benefits from Increased Investment in Energy Efficiency

North Carolina Energy Policy Council

August 15, 2018
About NCBPA

North Carolina’s Building Performance Trade Association

Membership information available at www.BuildingNC.org
Energy Efficiency in EPC Report

Energy Policy Council
Biennial Report
May 2018
Building Energy Efficiency
“We’re never going to get to our carbon targets or energy targets just by ramping up our solar production. We need to be efficient and reduce first. A dollar towards efficiency goes a lot farther than a dollar towards production. *That’s what we do.*”

Dylan Buonfrisco, RE Design Build

“That’s the key point of **putting efficiency in front of supply**. I like to call it a demand side strategy. The idea is that you reduce your demand as much as possible before you look to other ways to offset the impact of your supply. The DS strategy is super important because when you save on the demand side there are cascading savings. You invest in your envelope and your HVAC system gets smaller and you need fewer solar panels. You just need less stuff. And there are **cascading savings** for the builder and the homeowner as well as the planet. We’re reducing the amount of energy that we need...”

Recommendations for North Carolina policy makers, regulators and utilities to enable economic development, job creation and building infrastructure resiliency through new and increased investment in energy efficiency.
Why Energy Efficiency?

Total Economic Electricity Savings Potential by State: Residential, Commercial, and Industrial (2016—2035)²

Electricity savings in million megawatt hours
- 0 – 5
- 5 – 10
- 10 – 20
- 20 – 30
- 30 – 40
- 40 – 90

It's equal to reducing the nation's electricity needs by about 16% in 2035.

Energy efficiency is a low-cost option, averaging only 4.6¢ per kWh.

Every state could save with energy efficiency, ranging from 12%–21% savings per state.
Multiple Pathways to Energy Efficiency

Four pathways to savings across the United States are shown below, with darker blues indicating higher savings potential.

**Building Energy Codes**
- Energy codes set minimum efficiency requirements for new and renovated residential and commercial buildings. They are a subset of building codes.

**Combined Heat & Power**
- Combined heat and power is an integrated system that generates electrical energy and efficiently recovers waste heat as useful thermal energy at a customer’s facility, such as a hospital.

12,800 trillion Btu
- Total national energy savings potential (2040)

148,900 MW
- Total national electricity capacity potential (2015)

**Residential Efficiency**
- Existing single-family detached homes can reduce energy waste by installing insulation, sealing air and duct leaks, and upgrading to more efficient lighting and heating/cooling equipment.

245,000 GWh
- Total national electricity savings potential (2042)

**Industrial Efficiency**
- The manufacturing sector can realize energy savings from improved equipment, processes, or organizational strategies.

7,500 trillion Btu
- Total national energy savings potential (2030)
North Carolina Energy Consumption by End-Use Sector, 2016

- Residential: 28.3%
- Commercial: 27.1%
- Industrial: 22.8%
- Transportation: 21.8%

Source: Energy Information Administration, State Energy Data System
Arkansas PSC increases energy efficiency goals for electric utilities

Posted By Max Brantley on Fri, Jul 13, 2018 at 4:24 PM

The Arkansas Public Service Commission today ordered higher energy efficiency goals for electric utilities. The Sierra Club and Audubon Arkansas lauded the PSC decision.
Recent Energy Efficiency Policies

1995:
First Guaranteed Energy Savings Performance Contract completed in the state.
Utility Savings Initiative

- $89 million a year on energy
- $4.7 million invested
- $350,000 in energy savings annually
- Avoided $261 million since 2002
- 29% energy use per ft² since 2003

UNC Wilmington
UNC Chapel Hill

2007: Senate Bill 3 “REPS” requires investor-owned utilities to supply 12.5% clean energy with up to 25% coming from EE through 2021 and up to 40% after.
Energy Savings Potential is Increasing

**2003**
ORNL and NCCETC
6% electricity savings at $400M per year

**2006**
GDS and NCUC
14% electricity savings potential by 2017

**2014**
EPRI and DOE
18.4% electric savings from 2016 - 2035
Energy Efficiency Benefits

BENEFITS OF INCREASED INVESTMENT IN ENERGY EFFICIENCY
Energy Efficiency Sector in NC

RESIDENTIAL RETROITS ANNUAL SAVINGS
$538 MILLION

COMMERCIAL & INDUSTRIAL RETROITS ANNUAL SAVINGS
$508 MILLION

Energy Efficiency
5% REDUCTION POTENTIAL

HOW MUCH is 21.9 MILLION METRIC TONS OF CO2?
IT IS EQUIVALENT TO:

63,789 RELATED JOBS

4.6 MILLION CARS DRIVEN IN ONE YEAR

2.4 BILLION GALLONS OF GASOLINE CONSUMED

$15.8B OF NORTH CAROLINA'S CLEAN ENERGY REVENUE

1,580 FIRMS IN NC

5,486 WIND TURBINES RUNNING FOR ONE YEAR

$4.2 BILLION STATEWIDE ENERGY SAVINGS

$129 MILLION PUBLIC BUILDING RETROITS ANNUAL SAVINGS

$3.0 BILLION BUILDING CODE UPDATES ANNUAL SAVINGS

$26 MILLION ACRES OF US FOREST
To Achieve 5% Energy Savings

<table>
<thead>
<tr>
<th></th>
<th>5% Savings</th>
<th>10% Savings</th>
<th>16.8% Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy Saved (BTU)</strong></td>
<td>99 Trillion</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Energy Code Savings $</strong></td>
<td>$3.0 Billion</td>
<td></td>
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<td>$798 Million</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Net Savings $ / %</strong></td>
<td>$3.4 Billion</td>
<td>526%</td>
<td></td>
</tr>
</tbody>
</table>
Energy Efficiency Sector in NC

- RESIDENTIAL RETROFITS ANNUAL SAVINGS: $1.1 BILLION
- COMMERCIAL & INDUSTRIAL RETROFITS ANNUAL SAVINGS: $1.0 BILLION
- ENERGY EFFICIENCY 10% REDUCTION POTENTIAL
- HOW MUCH is 43.7 MILLION METRIC TONS OF CO₂?
- IT IS EQUIVALENT TO:
  - 79,749 RELATED JOBS
  - 9.3 MILLION CARS DRIVEN IN ONE YEAR
  - 4.9 BILLION GALLONS OF GASOLINE CONSUMED
  - 1,650 FIRMS IN NC
  - 10,972 WIND TURBINES RUNNING FOR ONE YEAR
  - 51 MILLION ACRES OF US FOREST

- $257 MILLION PUBLIC BUILDING RETROFITS ANNUAL SAVINGS
- $6.0 BILLION BUILDING CODE UPDATES ANNUAL SAVINGS
- $16.5B OF NORTH CAROLINA'S CLEAN ENERGY REVENUE
- $8.3 BILLION STATEWIDE ENERGY SAVINGS
## To Achieve 10% Energy Savings

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ENERGY EFFICIENCY
16.8% REDUCTION POTENTIAL

RESIDENTIAL RETROFITS
ANNUAL SAVINGS
$1.8 BILLION

COMMERCIAL & INDUSTRIAL RETROFITS
ANNUAL SAVINGS
$1.7 BILLION

Energy Efficiency Sector in NC

HOW MUCH is 72.9 MILLION METRIC TONS OF CO2?

IT IS EQUIVALENT TO:

101,029 RELATED JOBS

15.5 MILLION CARS DRIVEN IN ONE YEAR

$17.5B OF NORTH CAROLINA'S CLEAN ENERGY REVENUE

8.1 BILLION GALLONS OF GASOLINE CONSUMED

1,750 FIRMS IN NC

18,286 WIND TURBINES RUNNING FOR ONE YEAR

$420 MILLION PUBLIC BUILDING RETROFITS ANNUAL SAVINGS

$10.0 BILLION BUILDING CODE UPDATES ANNUAL SAVINGS

$13.9 BILLION STATEWIDE ENERGY SAVINGS

85 MILLION ACRES OF US FOREST
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<td>$2.7 Billion</td>
</tr>
<tr>
<td>Net Savings $ / %</td>
<td>$3.4 Billion / 526%</td>
<td>$6.7 Billion / 519%</td>
<td>$11.2 Billion / 515%</td>
</tr>
</tbody>
</table>
A Simple Example with Energy Code

**$50M**

**Builder Up-Front Cost $**
- **2018 NC Code (≈2012 IECC)**: $204 - $611 per home
- **Goal NC Code 2015 IECC**: $418 - $611 per home

**Homeowner Mortgage Payment Increase $**
- **2018 NC Code (≈2012 IECC)**: $1 - $3 per month
- **Goal NC Code 2015 IECC**: $2 - $3 per month

**Homeowner Energy Savings $**
- **2018 NC Code (≈2012 IECC)**: $6.75 per month
- **Goal NC Code 2015 IECC**: $9.70 per month
Policy Recommendations

- **Set the tone:** enable legislation that prioritizes saving energy before generating energy.

- **Enable action:** establish funding and directives to prioritize short and long-term energy efficiency investment activities.

- **Take action:** fund and direct stakeholders to take action on the priority recommendations, including:
  - Consumer education
  - EE cost effectiveness
  - Workforce development
  - Research and development
Next Steps for Energy Efficiency Policy

• NCBPA report release

• Comprehensive legislation in 2019

• Adopt an “Energy Efficiency First” strategy

• Enable priority recommendations

The North Carolina ENERGY EFFICIENCY POTENTIAL Report

2018 AUGUST 15

Comprehensive quantitative report that informs policymakers, utilities, consumers and others of the widespread benefits available through an underutilized energy efficiency market in the state.
Prioritizing Energy Efficiency in North Carolina’s Next State Energy Plan

Jennifer Weiss
Nicholas Institute

Energy Policy Council Meeting
August 15, 2018
Nicholas Institute for Environmental Policy Solutions

Our Mission Statement:
To help decision makers create timely, effective, and economically practical solutions to the world’s critical environmental challenges.
Why Energy Efficiency?

• Lower customer bills by saving energy
• Encourages economic growth through more efficient operations
• Increase grid reliability, reduces grid congestion and need for new infrastructure (i.e. power plants, lines)
• EE is a “least cost” resource for state and regional power planning
EE Collaborations in Other States

- Minnesota 2025 Energy Action Plan
- South Carolina Energy in Action Plan
- Virginia 2018 State Energy Plan
- Arkansas Public Service Commission EE Targets
Minnesota’s 2025 Energy Action Plan

“Emphasize consensus-driven strategies with traction to move forward.”

• Project team:
  – Minnesota Department of Commerce
  – Legislative Energy Commission
  – Rocky Mountain Institute
  – Great Plains Institute
  – LHB (local engineering firm)
• Stakeholder advisory committee
• Additional input from over 50 subject matter experts from multiple sectors
Minnesota’s focus on EE

• Enhanced building codes
• Standardized data protocol
• Commercial energy benchmarking
• Retrocommissioning, training and advanced buildings controls
• Promotion of behavioral energy efficiency strategies
South Carolina “Energy in Action”

• Blueprint to build a reliable, resilient, and clean energy system for South Carolina residents and businesses

• Phase I (2016)
  – Five public engagement sessions across the state
  – Three surveys were conducted to solicit input from the public and specific industry sectors.
Phase II: SC Steering Committee

• Conservation Organizations
• Cooperatives
• Investor-owned Utilities
• Large Industrial Companies
• Municipal Systems
• Santee Cooper
• SC Department of Health and Environmental Control
• State Regulation of Public Utilities Review Committee staff
Phase III: Implementation

• Integrated resource planning process
• Natural gas infrastructure
• Building energy codes
• Funding for needed energy upgrades
• Act 236 progression
• Environmental equity assessment
• Lead by example – state transportation
• Facilitation of state agency energy efficiency
Virginia’s Grid Transformation and Security Act of 2018

• Requirement for Dominion and Appalachian Power—Virginia’s two largest utilities—to invest nearly $1.2 billion in energy efficiency projects over the next decade.
Virginia’s 2018 Energy Plan

• A strategic vision for the energy policy of the Commonwealth over the next 10 years

• Stakeholder process includes a 60-day written comment period, in-person public listening sessions and a series of facilitated stakeholder discussions
  – Three facilitated stakeholder discussions for Energy Efficiency
  – Two facilitated discussions for Electric Vehicles
Energy Efficiency in Arkansas

• Since 2013, Arkansas’ PSC has set a statewide energy savings target for all Arkansas investor-owned utilities in 3-year increments
  – Energy savings target of 1% of utility baseline sales by 2019

• On July 13, 2018, the PSC issued an order setting higher energy efficiency goals for Arkansas electric utilities across the state.
  – Set an energy savings target of 1.2% per year from 2020-2022
# Current NC stakeholder EE work

<table>
<thead>
<tr>
<th>Name</th>
<th>Focus Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEC/DEP Quarterly EE Collaborative</td>
<td>Discussion of Duke Energy’s DSM/EE programs</td>
</tr>
<tr>
<td>DEQ Quarterly Residential EE Meetings</td>
<td>Discussion of state and utility residential DSM/EE programs</td>
</tr>
<tr>
<td>Low-Income EE Collaborative</td>
<td>Coordination of utility and state low-income weatherization programs and databases</td>
</tr>
<tr>
<td>Multi-Family EE Collaborative</td>
<td>Strategy for increasing EE in Multifamily units</td>
</tr>
<tr>
<td>Energy Innovation Task Force (Blue Horizons)</td>
<td>Coordination of DSM/EE programs in Asheville/Buncombe County</td>
</tr>
<tr>
<td>NC On-Bill Working Group</td>
<td>Education and technical assistance for using on-bill financing for EE</td>
</tr>
<tr>
<td>Mobile Home Working Group (new group)</td>
<td>Develop programs that combine energy efficiency and disaster resilience to upgrade mobile homes</td>
</tr>
</tbody>
</table>
Prioritizing EE in North Carolina

• Broad and diverse stakeholder group
• A set of shared goals and objectives
• Coordination between working groups and subcommittees
• Focus on the five pillars of EE
# The Five Pillars of EE

## Shared Policy Goals / State Objectives

<table>
<thead>
<tr>
<th>BENEFIT ANALYSIS</th>
<th>REGULATORY REFORM</th>
<th>EDUCATION / OUTREACH</th>
<th>FINANCING MODELS</th>
<th>GRID INTEGRATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Development</td>
<td>Business Model</td>
<td>Regulator</td>
<td>Utility</td>
<td>Demand Side Management</td>
</tr>
<tr>
<td>Work Force Development</td>
<td>Rate Structure</td>
<td>Legislator</td>
<td>State</td>
<td>EE as a Resource</td>
</tr>
<tr>
<td>Health</td>
<td>Cost-effectiveness</td>
<td>Rate-payers</td>
<td>Private</td>
<td>EE Plus Storage</td>
</tr>
<tr>
<td>Environmental</td>
<td>Energy Code</td>
<td>Homeowners</td>
<td>On-Bill</td>
<td>Distributed Energy Resources</td>
</tr>
<tr>
<td>Consumer Savings</td>
<td>Appliance Standards</td>
<td>Renters</td>
<td>PACE</td>
<td>Distributed Grid Technology</td>
</tr>
<tr>
<td>Industrial Savings</td>
<td>Commercial building owners</td>
<td>Commercial building owners</td>
<td>Green Bank</td>
<td></td>
</tr>
<tr>
<td>Technology Innovation</td>
<td>Property managers</td>
<td>Property managers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Equity</td>
<td>Realtors</td>
<td>Realtors</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Industrial Facilities</td>
<td>Industrial Facilities</td>
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</tr>
<tr>
<td></td>
<td>Universities</td>
<td>Universities</td>
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</tbody>
</table>
Thank you!

Jen Weiss
Senior Policy Associate
jen.weiss@duke.edu
919-613-8745 (o)
504-606-8148 (m)
Modernizing North Carolina’s Regulated Utility Energy Efficiency Cost Effectiveness Testing Protocols

Presentation to the North Carolina Energy Policy Council

Joseph Cullen, Home Performance Coalition

August 15, 2018
Raleigh, North Carolina
Released May 2017

- A framework – not a single test that replaces the widely-used California screening tests
- Provides a method to “test your test”
- https://nationalefficiencyscreening.org/
Presentation Overview

1. Context
   • What’s at Stake and Why NSPM developed

2. What’s in the Manual
   • Resource Value Framework Principles
   • Step By Step Process

3. How Other States Are Using the Manual
   • List of Activities in Other States in 2018
   • Arkansas case study example
U.S. Gas and Electric Demand Side Management [both energy efficiency (EE) and demand response (DR) funding] – In 2017, U.S. DSM expenditures totaled $8.2 billion from all sources.

U.S. & Canada Gas and Electric Demand Side Management: In 2017, US and Canadian combined gas and electric DSM program budgets totaled $9.9 billion budgeted from all sources.
Energy Efficiency employed 2.25 million Americans, in whole or in part, in the design, installation, and manufacture of Energy Efficiency products and services, adding 67,000 net jobs in 2017.

Electric Power Generation and Fuels directly employed more than 1.9 million workers in 2017, adding 15,000 jobs in 2017.  
1.1 million, of these worked in traditional coal, oil, and gas  
Solar energy firms employed, in whole or in part, 350,000 individuals  
Wind Energy Firms - 107,000 workers

https://www.usenergyjobs.org/
# The Traditional Cost-Effectiveness Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Perspective</th>
<th>Key Question Answered</th>
<th>Summary Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utility Cost</td>
<td>The utility system</td>
<td>Will utility system costs be reduced?</td>
<td>Includes the costs and benefits experienced by the utility system</td>
</tr>
<tr>
<td>Total Resource Cost</td>
<td>The utility system plus participating customers</td>
<td>Will utility system costs plus program participants’ costs be reduced?</td>
<td>Includes the costs and benefits experienced by the utility system, plus costs and benefits to program participants</td>
</tr>
<tr>
<td>Societal Cost</td>
<td>Society as a whole</td>
<td>Will total costs to society be reduced?</td>
<td>Includes the costs and benefits experienced by society as a whole</td>
</tr>
<tr>
<td>Participant Cost</td>
<td>Customers who participate in an efficiency program</td>
<td>Will program participants’ costs be reduced?</td>
<td>Includes the costs and benefits experienced by the customers who participate in the program</td>
</tr>
<tr>
<td>Rate Impact Measure</td>
<td>Impact on rates paid by all customers</td>
<td>Will utility rates be reduced?</td>
<td>Includes the costs and benefits that will affect utility rates, including utility system costs and benefits plus lost revenues</td>
</tr>
</tbody>
</table>
Current North Carolina Cost Effectiveness Testing

- The evaluation of ratepayer-funded energy efficiency programs in North Carolina relies on regulatory orders (Rule 8-68 and Rule 8-69).
- Evaluations are mainly administered by the utilities.
- North Carolina specifies the Total Resource Cost (TRC) as its primary test, but also uses the Utility/Program Administrator (UCT), Participant (PCT), and Ratepayer Impact Measure (RIM).
- The authority for benefit-cost tests in North Carolina are stated in SB 3-NC GA session law (SL 2007-397).
The Need for a National Standard Practice Manual

- Traditional tests (UCT, TRC, SCT, PCT, RIM) from the 1983 Calif. Manual not meeting states’ needs (35 years old)
  - No underlying principles: 50 states - 50 different cost effectiveness tests
  - Lack of clarity on their conceptual constructs
  - Many states have modified their tests
    - A good thing if done well, but that has only sometimes been the case...
- Efficiency is significantly under-valued in many states
  - Including participant costs, but not participant benefits under TRC/SCT
  - Not accounting for impacts on all key state energy policy objectives
- Lack of transparency on why/how tests were chosen/developed

*Developing the right test is critical to ensuring utility investments are economic.*
NSPM Process

Developing a Cost-Effectiveness Test Using the Resource Value Framework

Universal Principles  RVF 7-step process  Primary Test (RVT)
NSPM Outline

Executive Summary

Introduction

Part 1: Developing Your Test
1. Principles
2. Resource Value Framework
3. Developing Resource Value Test
4. Relationship to Traditional Tests
5. Secondary Tests

Part 2: Developing Test Inputs
6. Efficiency Costs & Benefits
7. Methods to Account for Costs & Benefits
8. Participant Impacts
9. Discount Rates
10. Assessment Level
11. Analysis Period & End Effects
12. Analysis of Early Retirement
13. Free Rider & Spillover Effects

Appendices
A. Summary of Traditional Tests
B. Cost-Effectiveness of Other DERs
C. Accounting for Rate & Bill Impacts
D. Glossary
National Standard Practice Manual Principles

1. Recognize that energy efficiency is a resource.
2. Account for applicable state policy goals.
3. Account for all relevant costs & benefits, even if hard to quantify impacts.
4. Ensure symmetry across all relevant costs and benefits.
5. Conduct a forward-looking, long-term analysis that captures incremental impacts of energy efficiency.
6. Ensure transparency in presenting the analysis and the results.
### 7-Step Resource Value Framework

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Identify and articulate the jurisdiction’s applicable policy goals.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Include all utility system impacts in the test.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Decide which additional <em>non-utility</em> system impacts to include in the test, based on applicable policy goals.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Ensure the test is symmetrical in considering both costs and benefits.</td>
</tr>
<tr>
<td>Step 5</td>
<td>Ensure the analysis is forward-looking, incremental, and long-term.</td>
</tr>
<tr>
<td>Step 6</td>
<td>Develop methodologies and inputs to account for all impacts, including hard-to-quantify impacts.</td>
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<tr>
<td>Step 7</td>
<td>Ensure transparency in presenting the analysis and the results.</td>
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Identify and Articulate Applicable Policy Goals

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<thead>
<tr>
<th>Laws, Regs, Orders:</th>
<th>Policy Goals Reflected in Laws, Regulations, Orders, etc.</th>
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<tbody>
<tr>
<td></td>
<td>Low-Cost</td>
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<tr>
<td>PSC statutory authority</td>
<td>X</td>
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<tr>
<td>Low-income protection</td>
<td></td>
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<tr>
<td>EE or DER law or rules</td>
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</tr>
<tr>
<td>State energy plan</td>
<td>X</td>
</tr>
<tr>
<td>Integrated resource planning</td>
<td></td>
</tr>
<tr>
<td>Renewable portfolio standard</td>
<td>X</td>
</tr>
<tr>
<td>Environmental requirements</td>
<td></td>
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- Each jurisdiction has a constellation of energy policy goals embedded in statutes, regulations, orders, guidelines, etc.
- This table illustrates how those laws, regulations, orders, etc. might establish applicable policy goals.
### Illustrative Non-Utility System Impacts

| Impact                           | Description                                                                                                                                                                                                 |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------************************************************************************|
| Participant impacts             | Impacts on program participants, includes participant portion of measure cost, other fuel savings, water savings, and participant non-energy costs and benefits                                                 |
| Impacts on low-income customers | Impacts on low-income program participants that are different from or incremental to non-low-income participant impacts. Includes reduced foreclosures, reduced mobility, and poverty alleviation |
| Other fuel impacts              | Impacts on fuels that are not provided by the funding utility, for example, electricity (for a gas utility), gas (for an electric utility), oil, propane, and wood                                                   |
| Water impacts                   | Impacts on water consumption and related wastewater treatment                                                                                                                                             |
| Environmental impacts           | Impacts associated with CO2 emissions, criteria pollutant emissions, land use, etc. Includes only those impacts that are not included in the utility cost of compliance with environmental regulations |
| Public health impacts           | Impacts on public health; includes health impacts that are not included in participant impacts or environmental impacts, and includes benefits in terms of reduced healthcare costs                                     |
| Economic development and jobs   | Impacts on economic development and jobs                                                                                                                                                                  |
| Energy security                 | Reduced reliance on fuel imports from outside the jurisdiction, state, region, or country                                                                                                               |

*This table is presented for illustrative purposes, and is not meant to be an exhaustive list.*
Ensure Symmetry Across Benefits and Costs

- Ensure that costs and benefits are accounted for symmetrically
  - If category of cost is included, corresponding benefits should be too
  - e.g., if participant costs included, participant benefits should also be included
- Necessary to avoid bias:
  - If some costs excluded, the framework will be biased in favor of EE;
  - if some benefits excluded, the framework will be biased against EE.
  - Bias in either direction results hurts ratepayers
The Manual Is Being Used by States in a Variety of Ways

- Building new state test from “ground up”
- Comprehensive review of current test
  - What’s included
  - How it is applied
- Review/refine select provisions of current test
<table>
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<th>State / Other</th>
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<th>State/ Other</th>
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<td>13-002-U Order No 40 10-100-R Order No. 27</td>
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<td>15-02-007 14-10-003</td>
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<td>EE Stakeholder Advisory Group Evaluation Plan</td>
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<td>Senate Bill 347 - draft</td>
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* AR Commission order ** WA UTC Staff recommendation
See [NSPM References](#) website page for more details
Examples of States Applying the NSPM to their Cost Effectiveness Testing Approaches


- **Arkansas** – PSC orders Parties Working Collaboratively (PWC) to consider use of NSPM. NSPM presentation to February 2018 PWC and PSC staff meeting. Next steps including inventory of applicable policies and Benefit-Cost Check List.

- **Washington** – Fall 2017, WA UTC staff took first cut at applicable policies to consider for CET analyses. WA UTC process ongoing.

Arkansas Case Study – Key Questions Considered

Test Framework

- Does current AR test include all impacts of policy interest to the state?
  - Any included that maybe should not be?
  - Any not included that maybe should be?
- Is the full range of utility system impacts included?
- How could AR account for any impacts that should be added?
  - What methodologies approach(es) could be used
1. Cataloged/Summarized relevant policy documents (**March 2018**)
2. Assessed alignment of current test w/policy goals (**May 2018**)
   • Most policy goals already addressed by current test
   • A couple of secondary ones that are not
3. Catalog utility system impacts included by each utility (**July 2018**)
4. Review options for quantifying any impacts that should be included, but currently are not (**Sept. 2018**)
   • Avoided future carbon regulation impacts (directed by PUC)
   • Any other utility system impacts missing
   • Non-utility impacts deemed important given policy goals
   • Participant NEBs (given policy goal of including participant impacts)
5. Assess alignment of application principles w/current AR practice
   • One utility not treating free rider costs as Manual suggests (**April 2018**)
   • Other potential issues (discount rate, screening level, etc.) (**Sept. 2018**)
6. Develop plan & timeline for AR test refinement (**Sept/Oct 2018**)
7. Report to AR PUC (**Oct/Nov 2018**)
Thank You and Contact Information

Https://nationalefficiencyscreening.org/

J. Joseph Cullen
Director of Policy and State Outreach
The Home Performance Coalition
jcullen@homeperformance.org
http://www.homeperformance.org/
Are we Missing an Opportunity?

Michael Stowe

Wednesday, August 15, 2018
Question #3: Find x.
Today’s Topics

- Industrial Energy Efficiency Opportunity:
  - The Big Picture
  - Made in NC
  - Optimizing Transformation
  - EE is Affordable

- Order of Magnitude - Two Examples

- A Success Story

- Next Steps
  - Implementation
  - Overcoming Barriers
Estimated U.S. Energy Use in 2014: ~98.3 Quads

Source: LLNL 2015. Data is based on DOE/EIA-0035(2015–03), March, 2014. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant "heat rate." The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential and commercial sectors, 80% for the industrial sector, and 21% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL–MI–410527
Industrial EE: Made in NC
Industrial EE: Optimizing Transformation

[Images of transformation process]

How?
Industrial EE: Optimizing Transformation

- Make MORE with LESS:
  - AND Make MORE!

This is what you pay for

This is adding value
Here are some examples of Energy Intensity:

For a foundry
= kWh/Tons Melted

For a textile mill
= kWh/Linear Yard of Cloth

For a gear plant
= kWh/Gear
How Much Does Energy Efficiency Cost?

Example 1: Compressed Air Leaks

- 27,336,887 MWh
- 10% of 30% of 80%
- 54,600
Example 2: Combustion Waste Heat

- 107,388,000 MMBTUs
- 40% of 20%
- 210,000
A Success Story

BEFORE

1. COATER ONE is used on the first pass

2. COATER TWO is used on the second pass

REPEAT THE PROCESS FOR SIDE TWO

AFTER

1. COATER ONE

2. COATER TWO

NEW IR BOOSTER OVEN
Initiates and kick starts the drying on the FIRST side

DRYING OVEN: Convection Oven completes the drying of both side coating in ONE pass

Total Production Time for 100,000 Yards of Fabric:

BEFORE: 56.06 hrs
AFTER: 31% REDUCTION IN PRODUCTION TIME

Total Production Time for 100,000 Yards of Fabric:

81.25 hrs
Next Steps: Implementation

**Implementation**

- Get into the Plant
- Understand the Processes
- TRANSFORMATION
- Recommend Energy Efficiency Solutions
- Review the Facility
Next Steps: Implementation

I really need some help with all this low hanging fruit!
Next Steps: Overcoming Barriers

**To Do List:**
1. Safety
2. Quality
3. Production
4. Maintenance
5. 100 other things.....
6. 
7. 
105. EE Projects
Next Steps: What and Who?

- **What**
  - Provide policy recommendations and guidance to
  - To develop programs to
  - To help

- **Words**
  - Regulate
  - Legislate
  - Educate
  - Collaborate
  - Innovate
  - Compensate
  - Facilitate
  - Implementation of EE

- **Who**
  - NC EPC
  - NCUC/Public Staff
  - Legislature
  - Utilities
  - Industrials
  - Utilities
  - Energy Engineers
  - Technology Vendors
  - Implementers
Next Steps: Why?

• The Bottom Line:
The governor, the legislature, the NCUC and the utility companies all want to help industrial customers improve their energy efficiency and energy intensity, save money to keep a competitive advantage, and stay, grow and thrive in NC for many years.
The NC industrial energy efficiency potential is tremendous
Finding industrial EE is EASY
Implementation of EE is HARDER
Create an environment to HELP industrial end users improve their implementation rate
Educate
  Collaborate
  Innovate
Compensate
When industrials implement EE, we all win
We know who, what and why, now let’s figure out HOW!
Questions

Michael Stowe
(919) 857-9043 {desk}
(919) 904-0279 {cell}
mstowe@advancedenergy.org
www.advancedenergy.org

Thank You
How do we encourage manufacturers to implement energy efficiency?

Dr. Stephen Terry, PE
Research Assistant Professor
MAE Energy Solutions
Director, NC State University Industrial Assessment Center
Hierarchy of Energy Efficiency

• We propose the following: 
  • Reduce
  • Recover, then use
  • Renewables

• In this way, we address energy efficiency, the issues of carbon pollution and economics.
NC State University Energy Programs

• NCSU Industrial Assessment Center
  • A US Department of Energy Program utilizing students to perform energy assessments for small and medium sized manufacturers (free)
  • Housed in the Department of Mechanical & Aerospace Engineering to leverage our experiences into the engineering curriculum.
  • More than 600 facilities in NC/SC/VA assessed since 1992.

• Mechanical & Aerospace Engineering (MAE) Energy Solutions
  • Was a state funded program, until money was removed to fund policy work.
  • Serves plants the IAC cannot, as well as state buildings, universities, hospitals, and large commercial - again with students.
  • Many surveys are free or low cost.
  • More than 500 surveys conducted in NC since the 1970’s.
Barriers to Implementation – the Problem

• Through Advanced Energy, ESCOs, IAC/EMP, and others there is plenty of technical assistance available for simple ideas through turnkey installed solutions.

• Plants know energy efficiency is economical and the right thing to do.

BUT.....

• The realities of the production environment are:
  1. Limited time to do anything beyond putting out proverbial fires
  2. Limited funding to do anything not directly related to production
  3. The uncertainty of operating next year, next month, or even tomorrow.
Barriers to Implementation – the Issues

• What will motivate a company to act outside of legal constraints is something one plant energy manager recently referred to as OPM:
  
  - **O**ther **P**eople’s **M**oney

• The utility rebate program offered as a result of the REPS law helps by offering rebates, but...

• This program costs the plant ~1/2 cent per kWh, which is more than most companies can get out of it, so...

• Since most manufacturers easily exceed the 1 million kWh per year threshold allowing them to opt out, they do so for financial reasons
Barriers to Implementation – Past Experience

- State tax credits incentivized investment in solar in years past.
  - A 35% tax credit on a project costing $4 per Watt (at the time) was worth $1,400 per kW in credits, in addition to a federal tax credit of $1,200/kW.
  - Since solar only produces equivalent power five hours per day (about 1,800 hrs/yr), the state credits were worth ~$0.03 per kWh produced the first year.
  - North Carolina is #2 in installed solar capacity as a result.
Barriers to Implementation – One Solution

- **Solution**: incentivize energy efficiency projects through the state tax code
  - Example: 1 kW of power reduction in lights is generally worth more than 1 kW of solar panels because the lights operate more hours – many plants operate 24/5 or 24/7
  - Energy efficiency projects keep the electric grid stable because they do not depend heavily on the immediate, local weather. This reduces the need for spinning reserves and slows the need for additional generation to be constructed.
  - In other words – money talks to executives making decisions.
Thank you for your time

- MAE Energy Solutions remains an unbiased resource for the State of North Carolina regarding industrial energy efficiency.
- Contact me with any questions or for additional perspectives.

Dr. Stephen Terry, PE
Research Assistant Professor
NCSU Department of Mechanical & Aerospace Engineering
(919) 515-1878
sdterry@ncsu.edu