NC Energy Policy Council

August 15, 2018

NCBPA

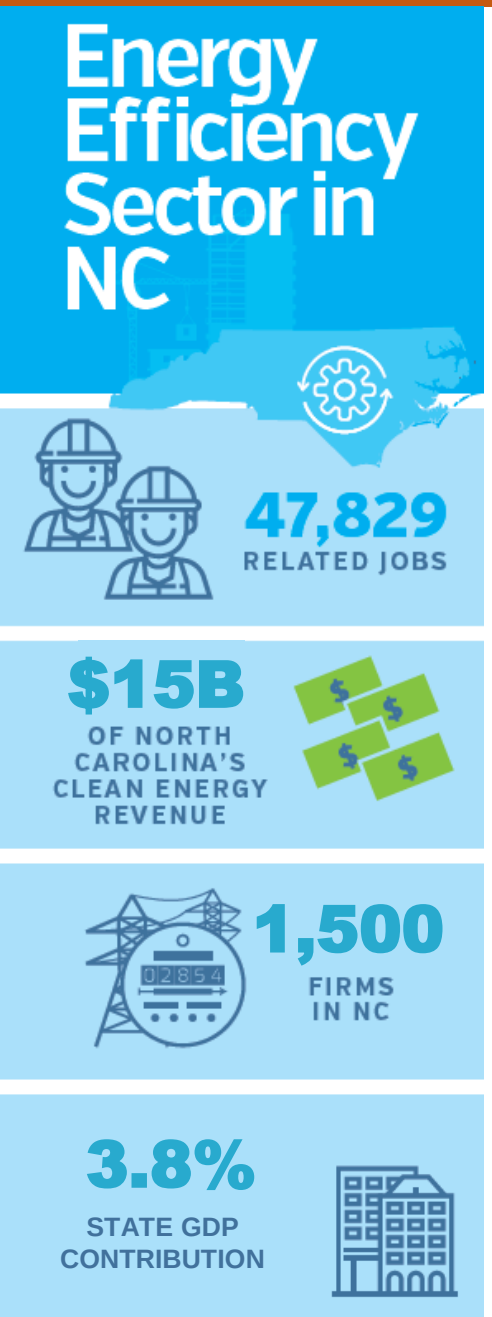
North Carolina Building Performance Association

Quantifying North Carolina's Benefits from Increased Investment in Energy Efficiency

North Carolina Energy Policy Council

August 15, 2018

About NCBPA



NCBPA
North Carolina Building Performance Association

North Carolina's

Building Efficiency Trade Association

Membership information available at
www.BuildingNC.org

Presented By

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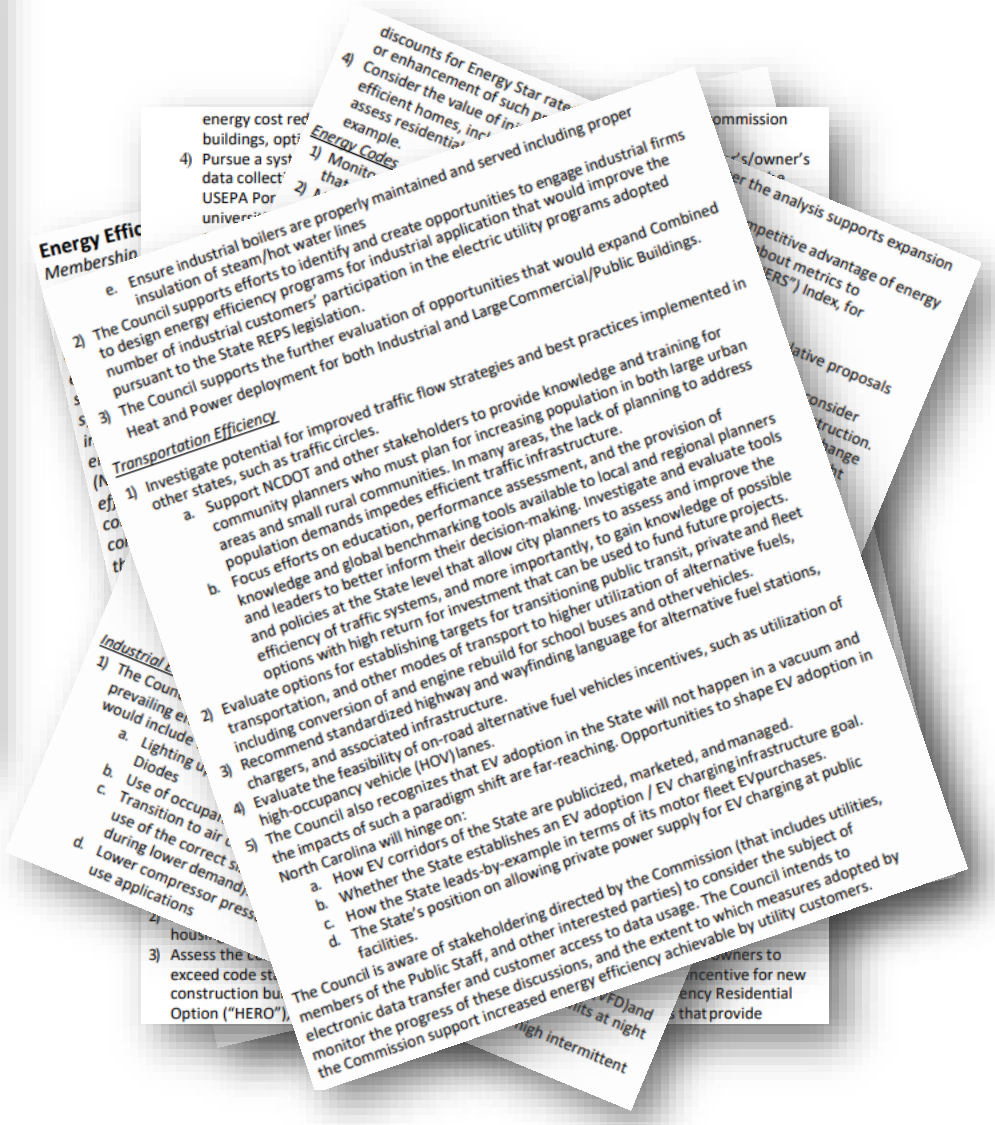
2018 Summer Intern
Senior at UNC Chapel Hill

Energy Efficiency in EPC Report

NORTH CAROLINA
Department of Environmental Quality

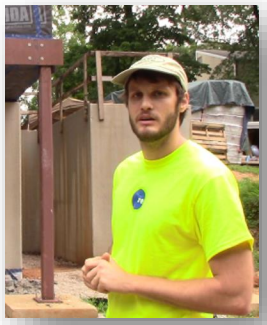
Energy Policy Council
Biennial Report

May 2018



Building Energy Efficiency

Building Energy Efficiency

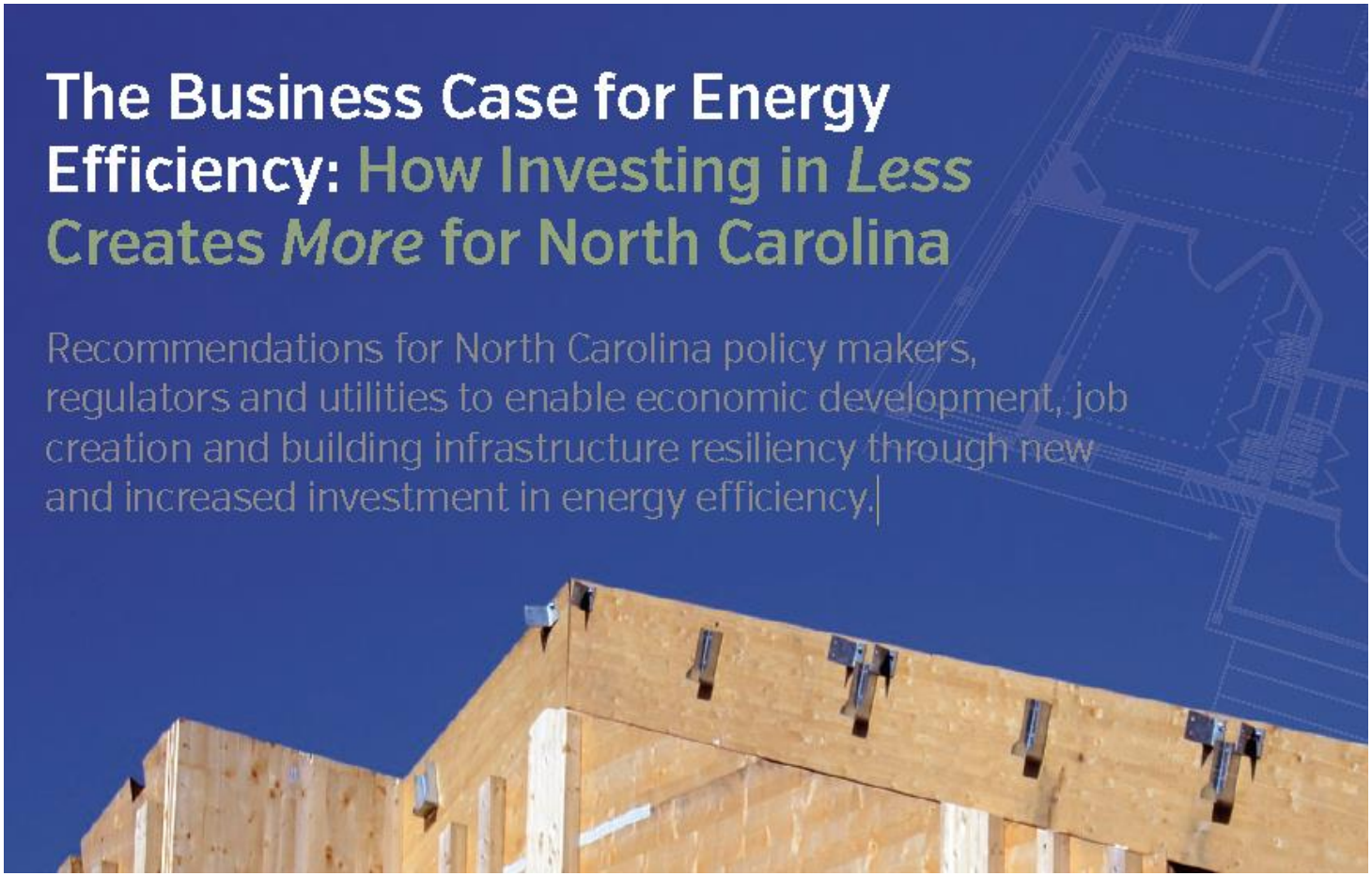


"We're never going to get to our carbon targets or energy targets just by ramping up our solar production. We need to be efficient and reduce first. A dollar towards efficiency goes a lot farther than a dollar towards production. *That's what we do*."

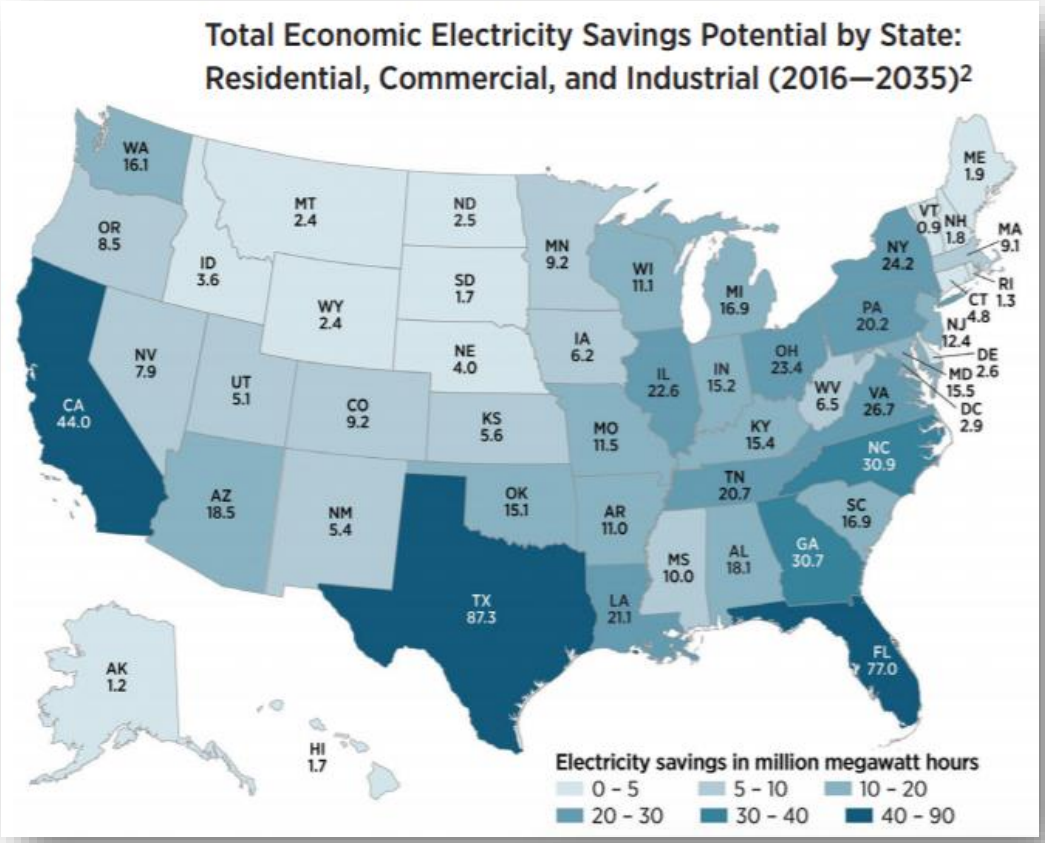
Dylan Buonfrisco, RE Design Build

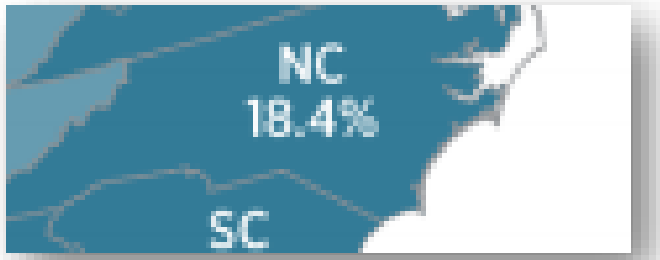
"That's the key point of **putting efficiency in front of supply**. I like to call it a demand side strategy. The idea is that you reduce your demand as much as possible before you look to other ways to offset the impact of your supply. The DS strategy is super important because when you save on the 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…"

What's the Investment?



Why Energy Efficiency?





It's equal to **reducing** the nation's **electricity** needs by about

16%

in 2035

Every state could save with energy efficiency, ranging from

12%–21%

savings per state

Energy efficiency is a **low-cost** option, averaging only

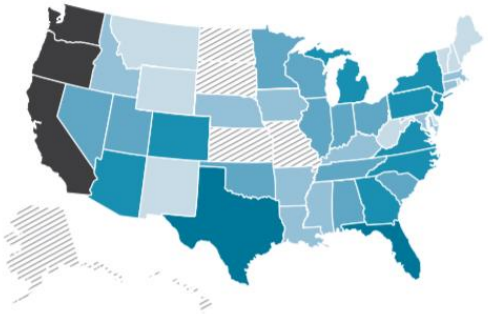
4.6¢ per kWh‡

Multiple Pathways to Energy Efficiency

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

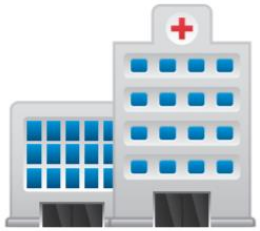
Building Energy Codes

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

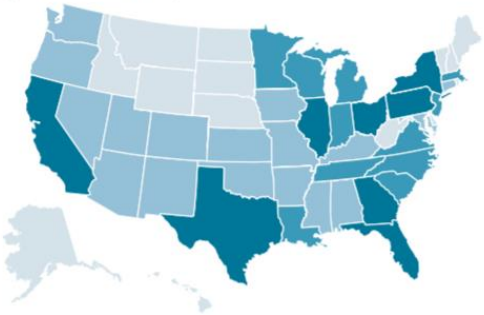


12,800 trillion Btu
total national energy savings potential (2040)

Combined Heat & Power



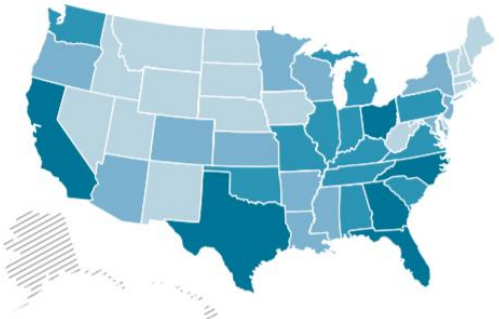
Combined heat and power is an integrated system that **generates electrical energy** and efficiently **recovers waste heat** as useful thermal energy at a customer's facility, such as a hospital.



148,900 MW
total national electricity capacity potential (2015)

Residential Efficiency

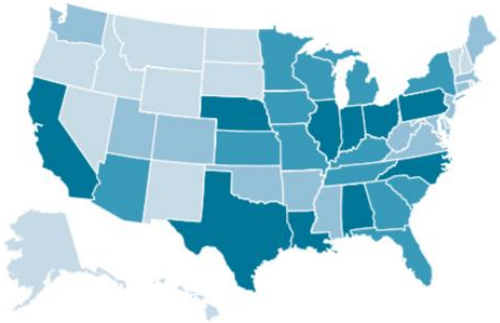
Existing single-family detached homes can **reduce energy waste** by installing insulation, sealing air and duct leaks, and upgrading to more efficient lighting and heating/cooling equipment.



245,000 GWh
total national electricity savings potential (2042)

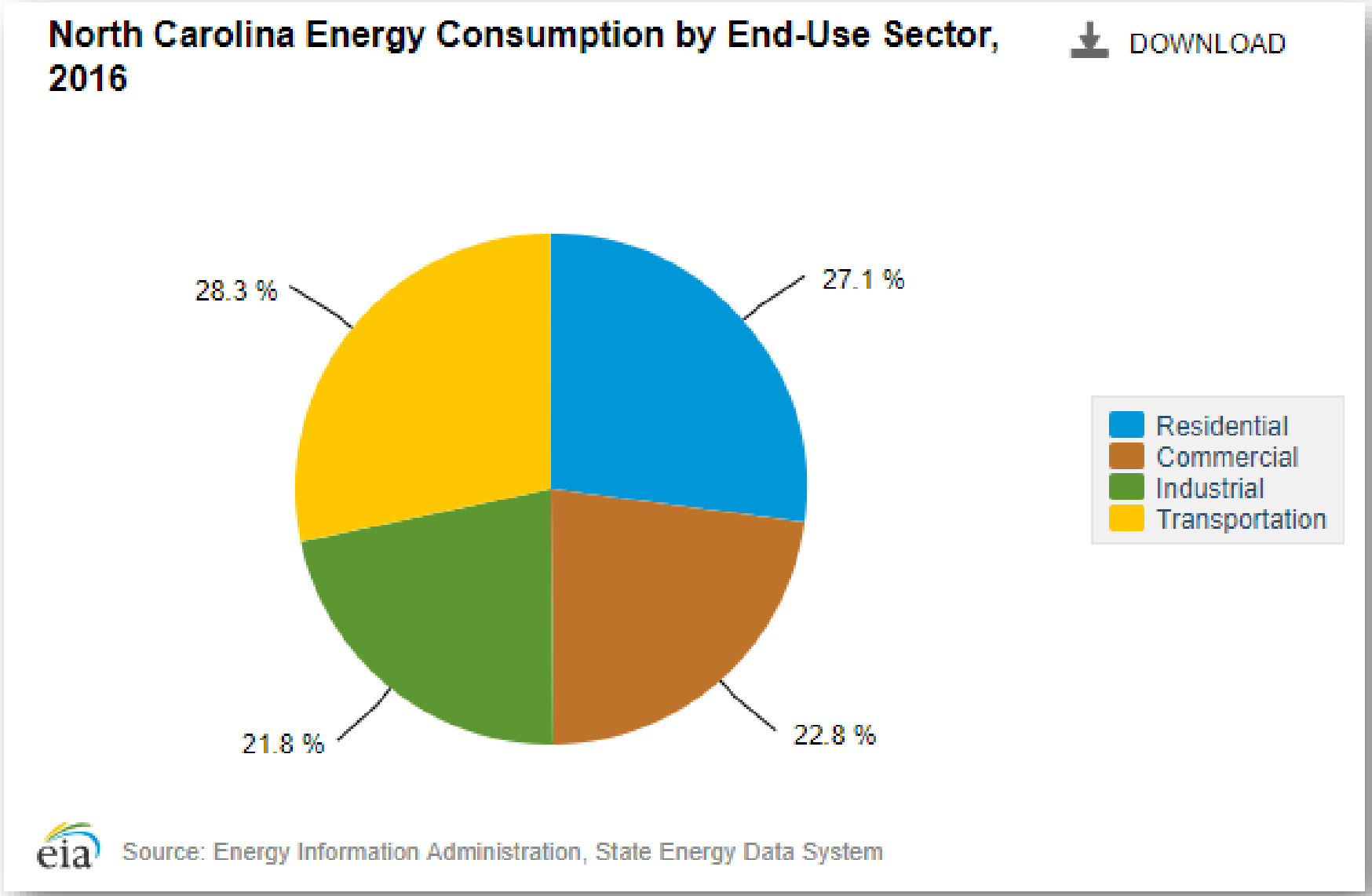
Industrial Efficiency

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

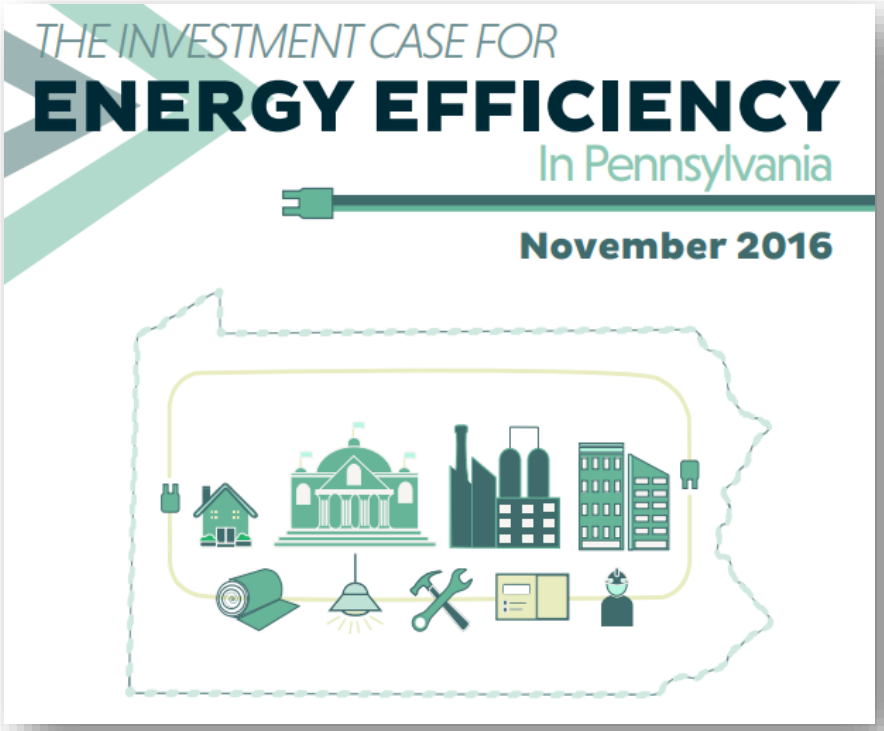


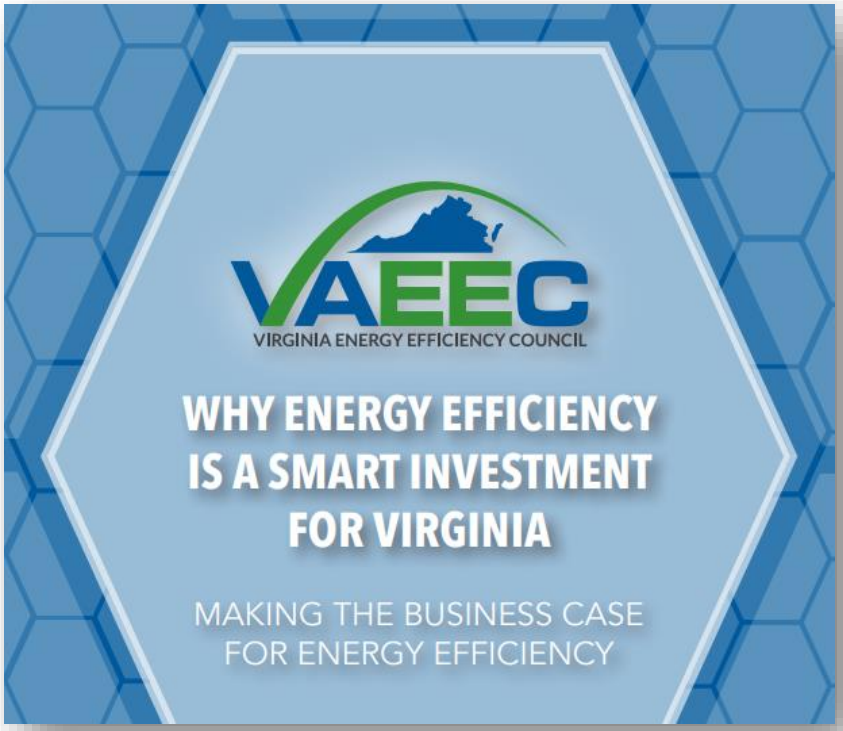
7,500 trillion Btu
total national energy savings potential (2030)

Why Buildings?



Have Other States Done This?



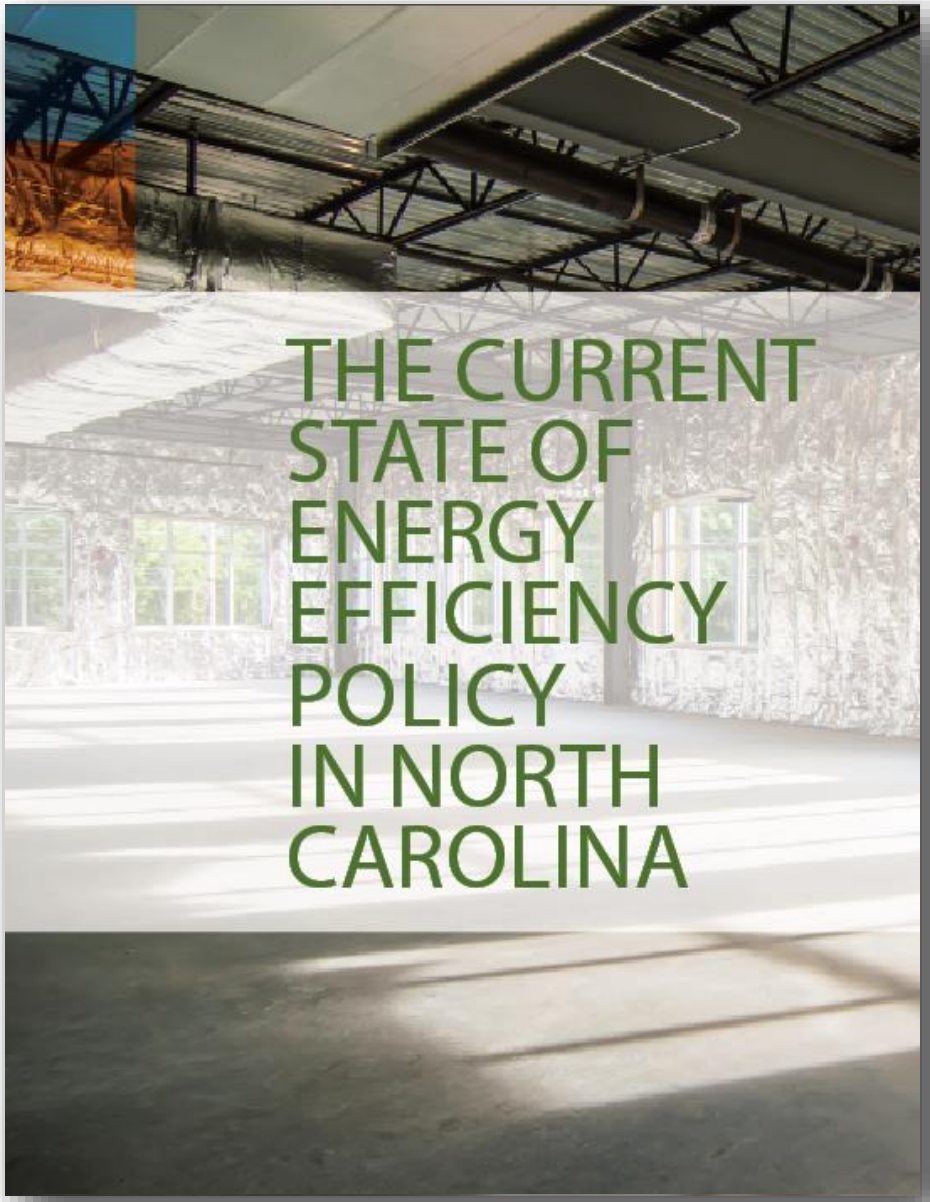


Arkansas PSC increases energy efficiency goals for electric utilities

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

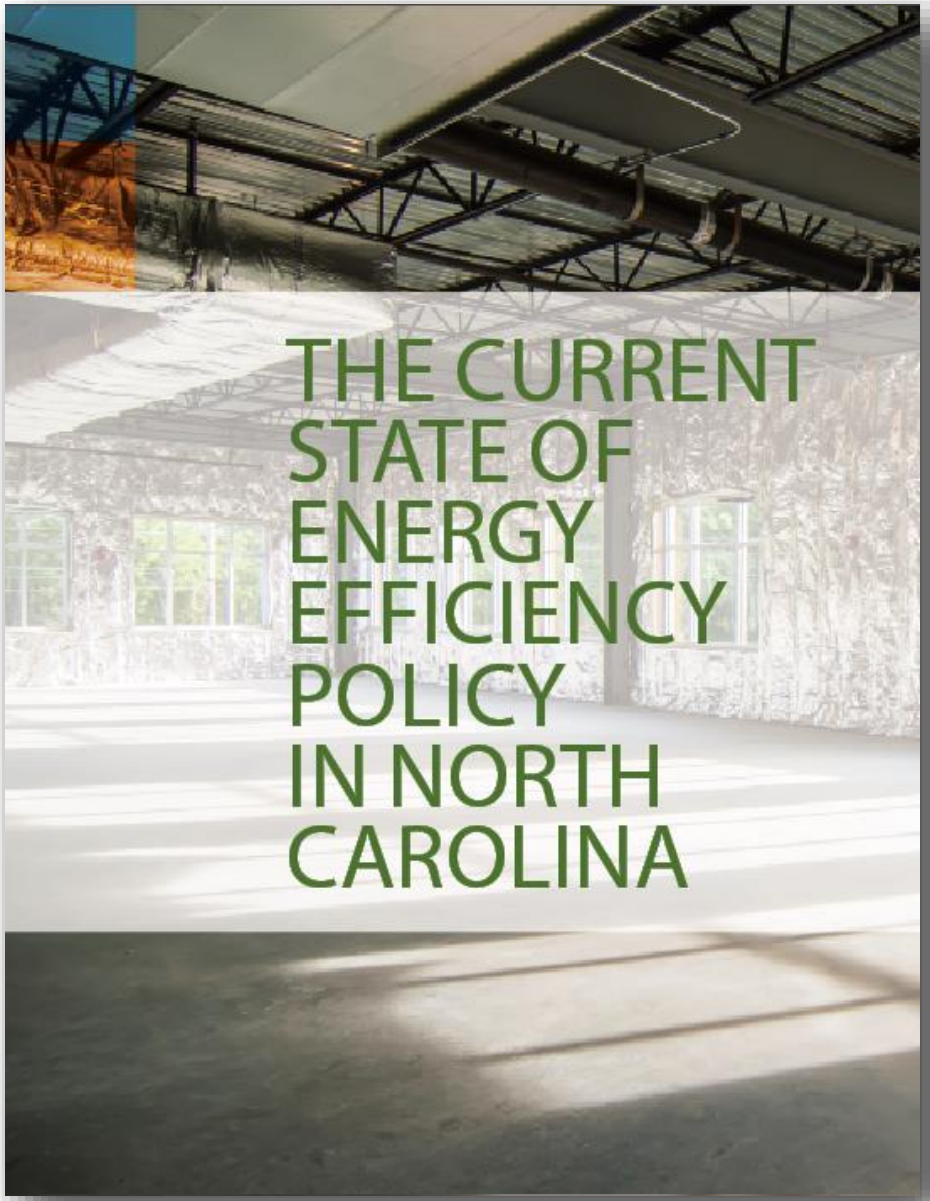
AVOIDED $261 MILLION SINCE 2002

29% ENERGY USE PER FT² SINCE 2003

UNC CHAPEL HILL

UNC WILMINGTON

Recent Energy Efficiency Policies

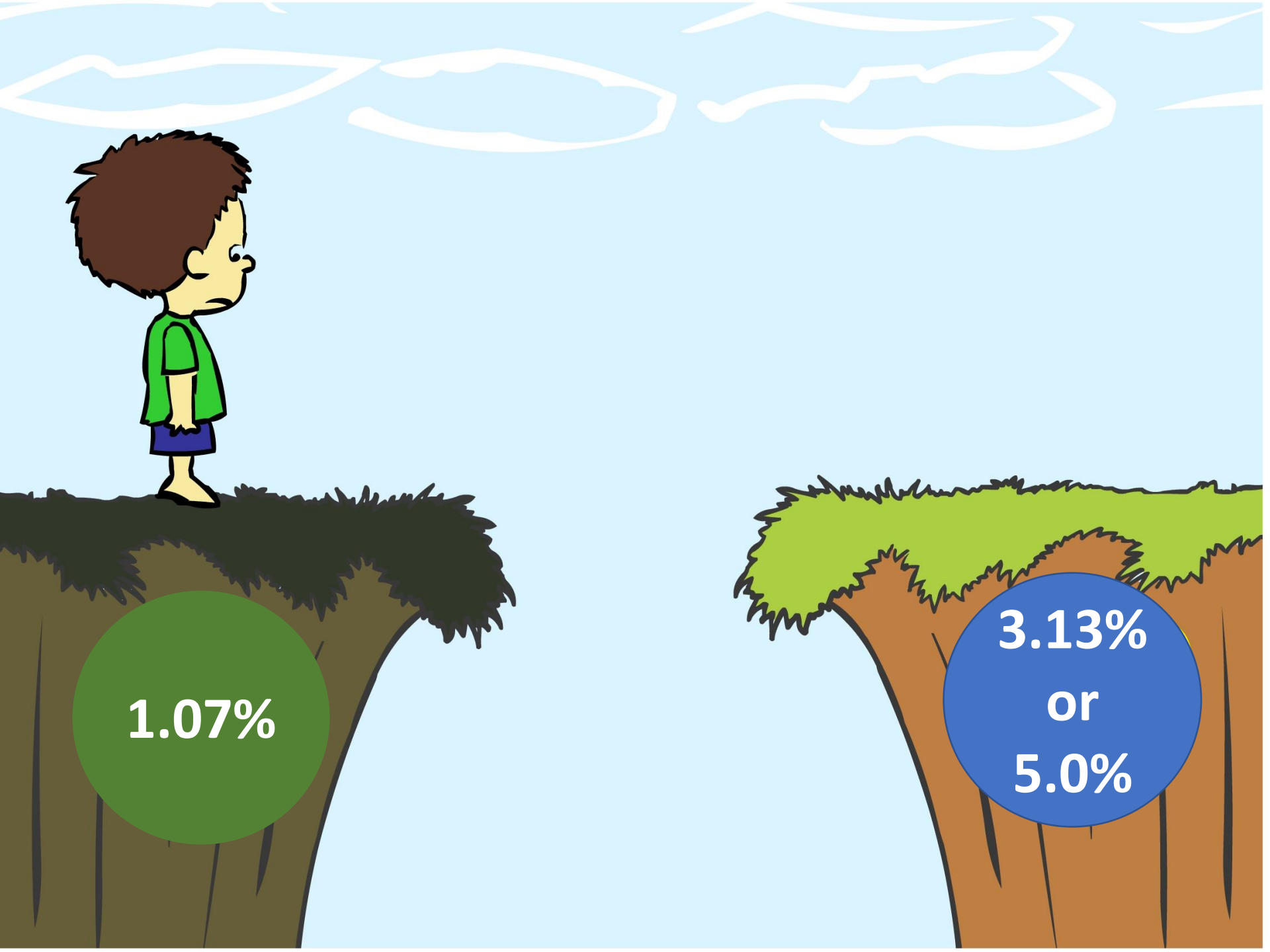


1995:

First Guaranteed Energy Savings Performance Contract completed in the state.

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.


1.07%
3.13%
or
5.0%

Energy Savings Potential is Increasing

2003

ORNL and NCCETC

6% electricity savings at $400M per year

2006

GDS and NCUC

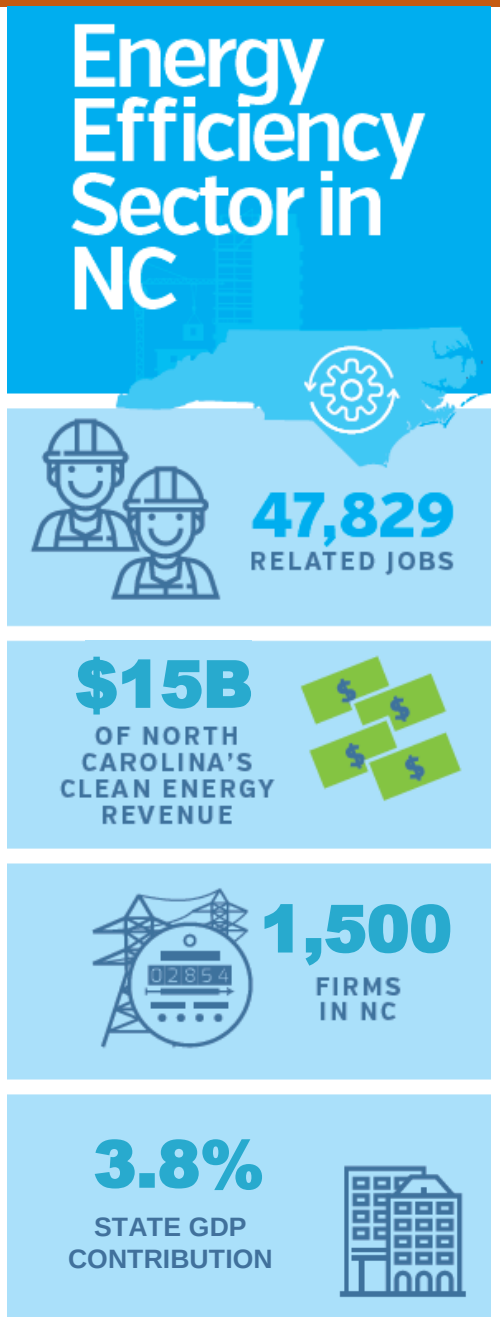
14% electricity savings potential by 2017

2014

EPRI and DOE

18.4% electric savings from 2016 - 2035

Energy Efficiency Benefits



RESIDENTIAL RETROFITS ANNUAL SAVINGS

$538 MILLION

COMMERCIAL & INDUSTRIAL RETROFITS ANNUAL SAVINGS

$508 MILLION

ENERGY EFFICIENCY

5%

REDUCTION

POTENTIAL

$129 MILLION

PUBLIC BUILDING RETROFITS ANNUAL SAVINGS

$3.0 BILLION

BUILDING CODE UPDATES ANNUAL SAVINGS

Energy Efficiency Sector in NC

63,789

RELATED JOBS

$15.8B

OF NORTH CAROLINA'S CLEAN ENERGY REVENUE

1,580

FIRMS IN NC

$4.2 BILLION

STATEWIDE ENERGY SAVINGS

HOW MUCH is 21.9 MILLION METRIC TONS OF CO_2?

IT IS EQUIVALENT TO:

4.6 MILLION

CARS DRIVEN IN ONE YEAR

2.4 BILLION

GALLONS OF GASOLINE CONSUMED

5,486

WIND TURBINES RUNNING FOR ONE YEAR

26 MILLION

ACRES OF US FOREST

To Achieve 5% Energy Savings

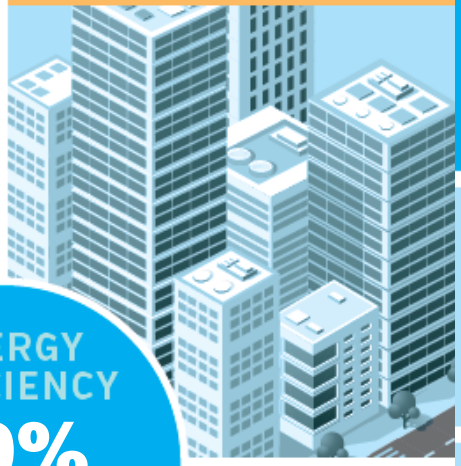
	5% Savings	10% Savings	16.8% Savings
Energy Saved (BTU)	*99 Trillion*		
Energy Code Savings $	$3.0 Billion		
Public Buildings Savings $	$129 Million		
Commercial Buildings Savings $	$508 Million		
Residential Buildings Savings $	$538 Million		
Total Savings $	**$4.2 Billion**		
Total Investment $	**$798 Million**		
Net Savings $ / %	**$3.4 Billion 526%**		

RESIDENTIAL RETROFITS ANNUAL SAVINGS

$1.1 BILLION

COMMERCIAL & INDUSTRIAL RETROFITS ANNUAL SAVINGS

$1.0 BILLION



ENERGY EFFICIENCY

10%

REDUCTION

POTENTIAL

$257 MILLION

PUBLIC BUILDING RETROFITS ANNUAL SAVINGS

$6.0 BILLION

BUILDING CODE UPDATES ANNUAL SAVINGS

Energy Efficiency Sector in NC

79,749

RELATED JOBS

$16.5B

OF NORTH CAROLINA'S CLEAN ENERGY REVENUE

1,650

FIRMS IN NC

$8.3 BILLION

STATEWIDE ENERGY SAVINGS

HOW MUCH is 43.7 MILLION METRIC TONS OF CO_2?

IT IS EQUIVALENT TO:

9.3 MILLION

CARS DRIVEN IN ONE YEAR

4.9 BILLION

GALLONS OF GASOLINE CONSUMED

10,972

WIND TURBINES RUNNING FOR ONE YEAR

51 MILLION

ACRES OF US FOREST

To Achieve 10% Energy Savings

	5% Savings	10% Savings	16.8% Savings
Energy Saved (BTU)	*99 Trillion*	*199 Trillion*	
Energy Code Savings $	$3.0 Billion	$6.0 Billion	
Public Buildings Savings $	$129 Million	$257 Million	
Commercial Buildings Savings $	$508 Million	$1.0 Billion	
Residential Buildings Savings $	$538 Million	$1.1 Billion	
Total Savings $	**$4.2 Billion**	**$8.3 Billion**	
Total Investment $	**$798 Million**	**$1.6 Billion**	
Net Savings $ / %	**$3.4 Billion 526%**	**$6.7 Billion 519%**	

RESIDENTIAL RETROFITS ANNUAL SAVINGS

$1.8 BILLION

COMMERCIAL & INDUSTRIAL RETROFITS ANNUAL SAVINGS

$1.7 BILLION

ENERGY EFFICIENCY

16.8%

REDUCTION POTENTIAL

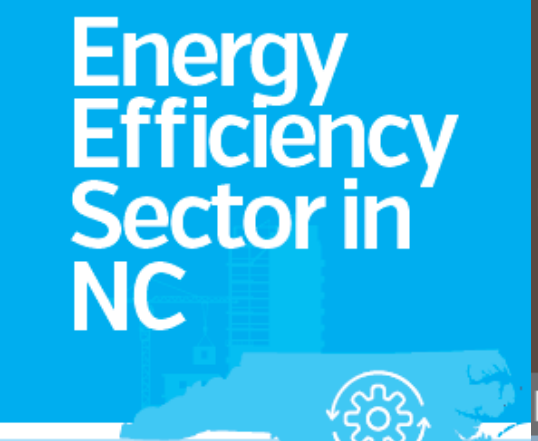
$420 MILLION

PUBLIC BUILDING RETROFITS ANNUAL SAVINGS

$10.0 BILLION

BUILDING CODE UPDATES ANNUAL SAVINGS

Energy Efficiency Sector in NC



101,029

RELATED JOBS

$17.5B

OF NORTH CAROLINA'S CLEAN ENERGY REVENUE

1,750

FIRMS IN NC

$13.9 BILLION

STATEWIDE ENERGY SAVINGS

HOW MUCH is 72.9 MILLION METRIC TONS OF CO_2?

IT IS EQUIVALENT TO:

15.5 MILLION

CARS DRIVEN IN ONE YEAR

8.1 BILLION

GALLONS OF GASOLINE CONSUMED

18,286

WIND TURBINES RUNNING FOR ONE YEAR

85 MILLION

ACRES OF US FOREST

To Achieve 16.8% Energy Savings

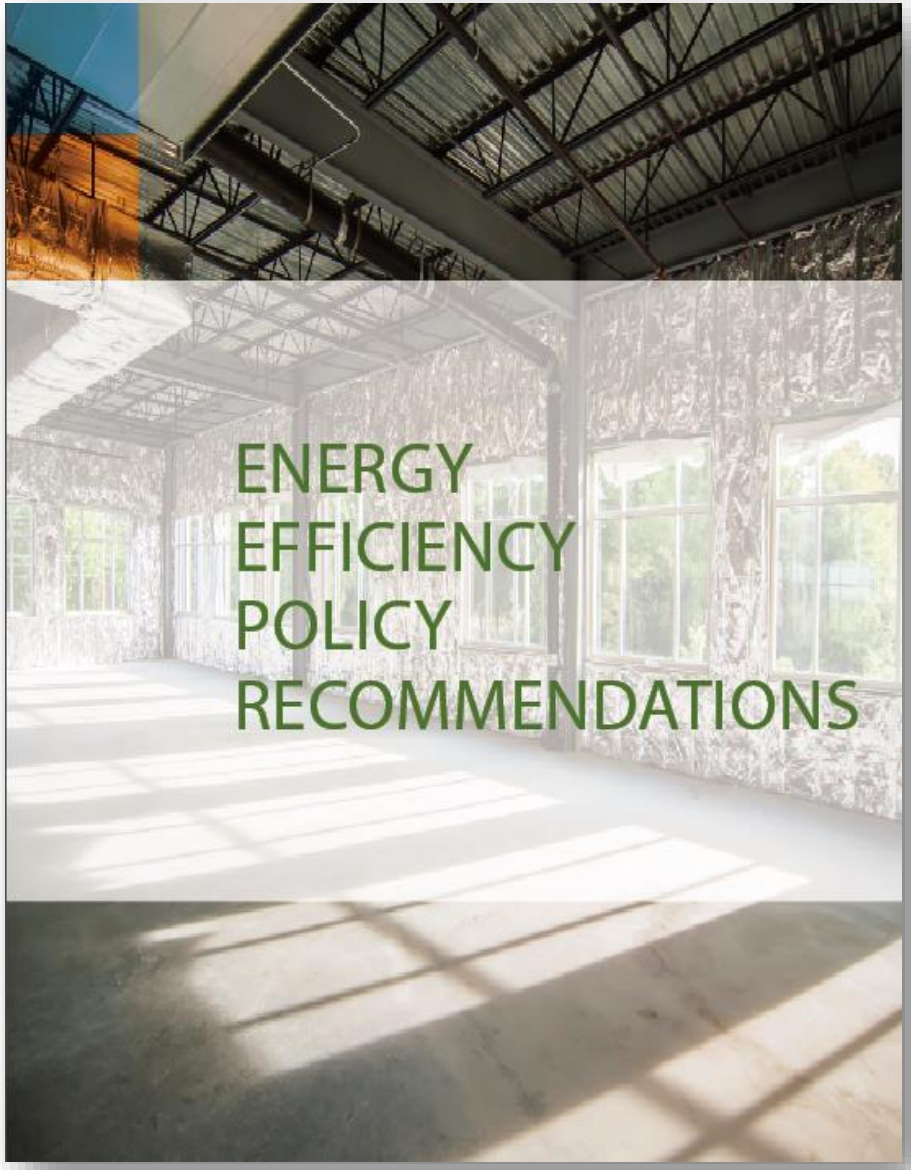
	5% Savings	10% Savings	16.8% Savings
Energy Saved (BTU)	*99 Trillion*	*199 Trillion*	*331 Trillion*
Energy Code Savings $	$3.0 Billion	$6.0 Billion	$10.0 Billion
Public Buildings Savings $	$129 Million	$257 Million	$429 Million
Commercial Buildings Savings $	$508 Million	$1.0 Billion	$1.7 Billion
Residential Buildings Savings $	$538 Million	$1.1 Billion	$1.8 Billion
Total Savings $	**$4.2 Billion**	**$8.3 Billion**	**$13.9 Billion**
Total Investment $	**$798 Million**	**$1.6 Billion**	**$2.7 Billion**
Net Savings $ / %	**$3.4 Billion 526%**	**$6.7 Billion 519%**	**$11.2 Billion 515%**

A Simple Example with Energy Code

$50M

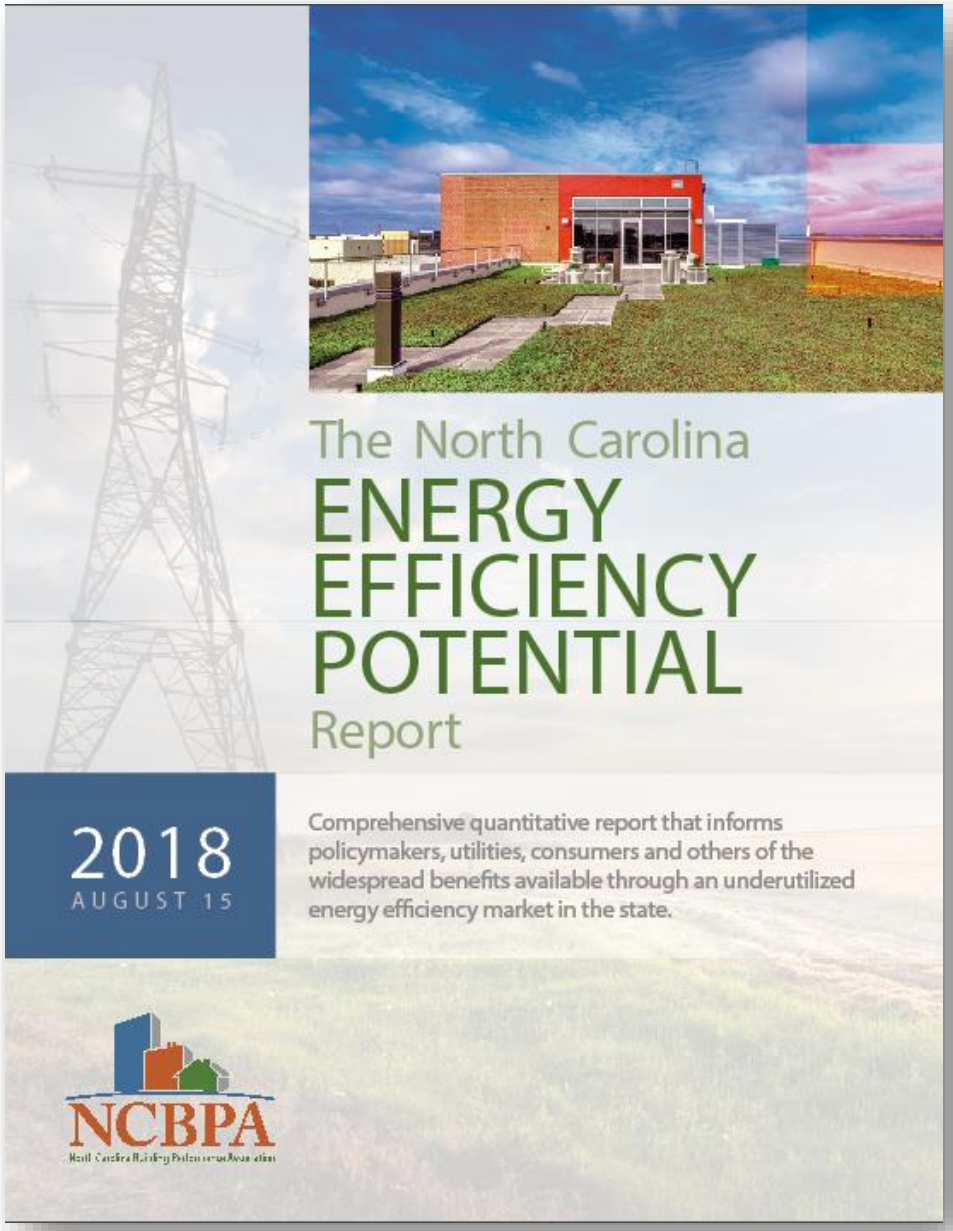
	2018 NC Code (~2012 IECC)	Goal NC Code 2015 IECC
Builder Up-Front Cost $	$204 - $611 per home	$418 - $611 per home
Homeowner Mortgage Payment Increase $	$1 - $3 per month	$2 - $3 per month
Homeowner Energy Savings $	$6.75 per month	$9.70 per month

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

Prioritizing Energy Efficiency in North Carolina's Next State Energy Plan

Jennifer Weiss
Nicholas Institute

Energy Policy Council Meeting
August 15, 2018

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FOR ENVIRONMENTAL POLICY SOLUTIONS

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.

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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

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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

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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

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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

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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.

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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

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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

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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.

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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

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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

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Current NC stakeholder EE work

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

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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

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The Five Pillars of EE

Shared Policy Goals / State Objectives

BENEFIT ANALYSIS

- Economic Development
- Work Force Development
- Health
- Environmental
- Consumer Savings
- Industrial Savings
- Technology Innovation
- Energy Equity

REGULATORY REFORM

- Business Model
- Rate Structure
- Cost-effectiveness
- Energy Code
- Appliance Standards

EDUCATION / OUTREACH

- Regulator
- Legislator
- Rate-payers
- Homeowners
- Renters
- Commercial building owners
- Property managers
- Realtors
- Industrial Facilities
- Universities

FINANCING MODELS

- Utility
- State
- Private
- On-Bill
- PACE
- Green Bank

GRID INTEGRATION

- Demand Side Management
- EE as a Resource
- EE Plus Storage
- Distributed Energy Resources
- Distributed Grid Technology

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Thank you!

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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

National Standard Practice Manual for Assessing Cost-Effectiveness of Energy Efficiency Resources

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

Cost Effectiveness Testing – What's at Stake?

Consortium for Energy Efficiency Annual Industry Report
2017 State of the Efficiency Program Industry

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**.

Cost Effectiveness Testing – What's at Stake?

U.S. Energy and Employment Report - May 2018

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

Test	Perspective	Key Question Answered	Summary Approach
Utility Cost	The utility system	Will utility system costs be reduced?	Includes the costs and benefits experienced by the utility system
Total Resource Cost	The utility system plus participating customers	Will utility system costs plus program participants' costs be reduced?	Includes the costs and benefits experienced by the utility system, plus costs and benefits to program participants
Societal Cost	Society as a whole	Will total costs to society be reduced?	Includes the costs and benefits experienced by society as a whole
Participant Cost	Customers who participate in an efficiency program	Will program participants' costs be reduced?	Includes the costs and benefits experienced by the customers who participate in the program
Rate Impact Measure	Impact on rates paid by all customers	Will utility rates be reduced?	Includes the costs and benefits that will affect utility rates, including utility system costs and benefits plus lost revenues

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).

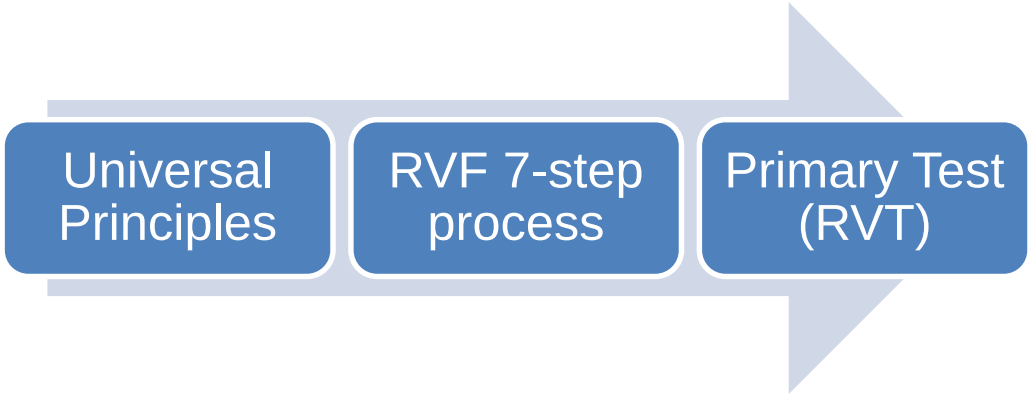
The Need for a National Standard Practice Manual

- 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



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

Step 1	Identify and articulate the jurisdiction's applicable policy goals.
Step 2	Include all utility system impacts in the test.
Step 3	Decide which additional *non-utility* system impacts to include in the test, based on applicable policy goals.
Step 4	Ensure the test is symmetrical in considering both costs and benefits.
Step 5	Ensure the analysis is forward-looking, incremental, and long-term.
Step 6	Develop methodologies and inputs to account for all impacts, including hard-to-quantify impacts.
Step 7	Ensure transparency in presenting the analysis and the results.

STEP 1

Identify and Articulate Applicable Policy Goals

Laws, Regs, Orders:	Policy Goals Reflected in Laws, Regulations, Orders, etc.					
	Low-Cost	Fuel Diversity	Risk	Reliability	Environ-mental	Economic Development
PSC statutory authority	X			X		
Low-income protection						X
EE or DER law or rules	X	X	X	X	X	X
State energy plan	X	X	X	X	X	X
Integrated resource planning		X	X		X	X
Renewable portfolio standard		X	X		X	X
Environmental requirements					X	

- 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.

STEP 3

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.

STEP 4 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

NSPM References to Date

State / Other	Docket/Bill Number	State/ Other	Docket/Bill Number
AR *	13-002-U Order No 40 10-100-R Order No. 27	**NV**	17-08023
CA	15-02-007 14-10-003	**RI**	Least Cost Procurement Standard
CT	2017 Comprehensive Energy Strategy	**SC**	H 4425
IA	RMU-2016-0018	**VA**	PUR-2017-00047
ID	IPC-E-17-13	**WA ****	UE-171087, PSE UE-171091, Avista UE-171092, Pacific Power
IL	EE Stakeholder Advisory Group Evaluation Plan	**WV**	17-0401-E-P
KS	Senate Bill 347 - draft	**US DOE**	SEE Action: EM&V Framework for States
MI	2010-AD-2	**US DOE**	EERE-2017-OT-0056
NH	DE-17-136		

* 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

- **Rhode Island** – Docket No. 4600 – RI PUC adopted *Least Cost Procurement Standards* (as mandated by §39-1-27.7) which incorporated NSPM principles on July 17, 2018.
- **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.
- **Minnesota** – Under MN Dept of Comm grant, Synapse is applying NSPM framework to MN CE testing practices – Report due August 2018. Minn. Energy Office will incorporate recommendations into State Energy Planning Process.

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

Arkansas Case Study – Process

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/

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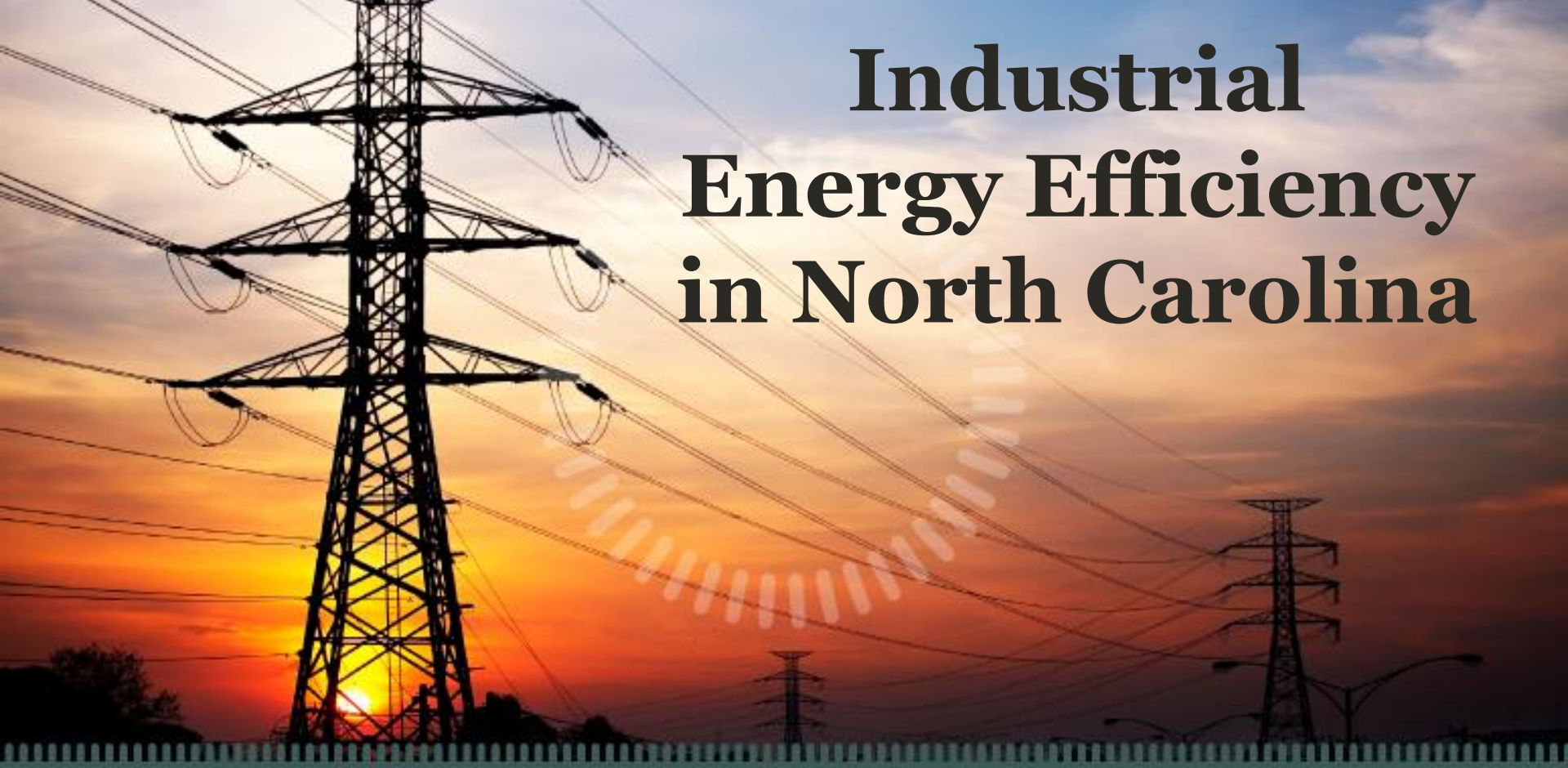


Industrial Energy Efficiency in North Carolina

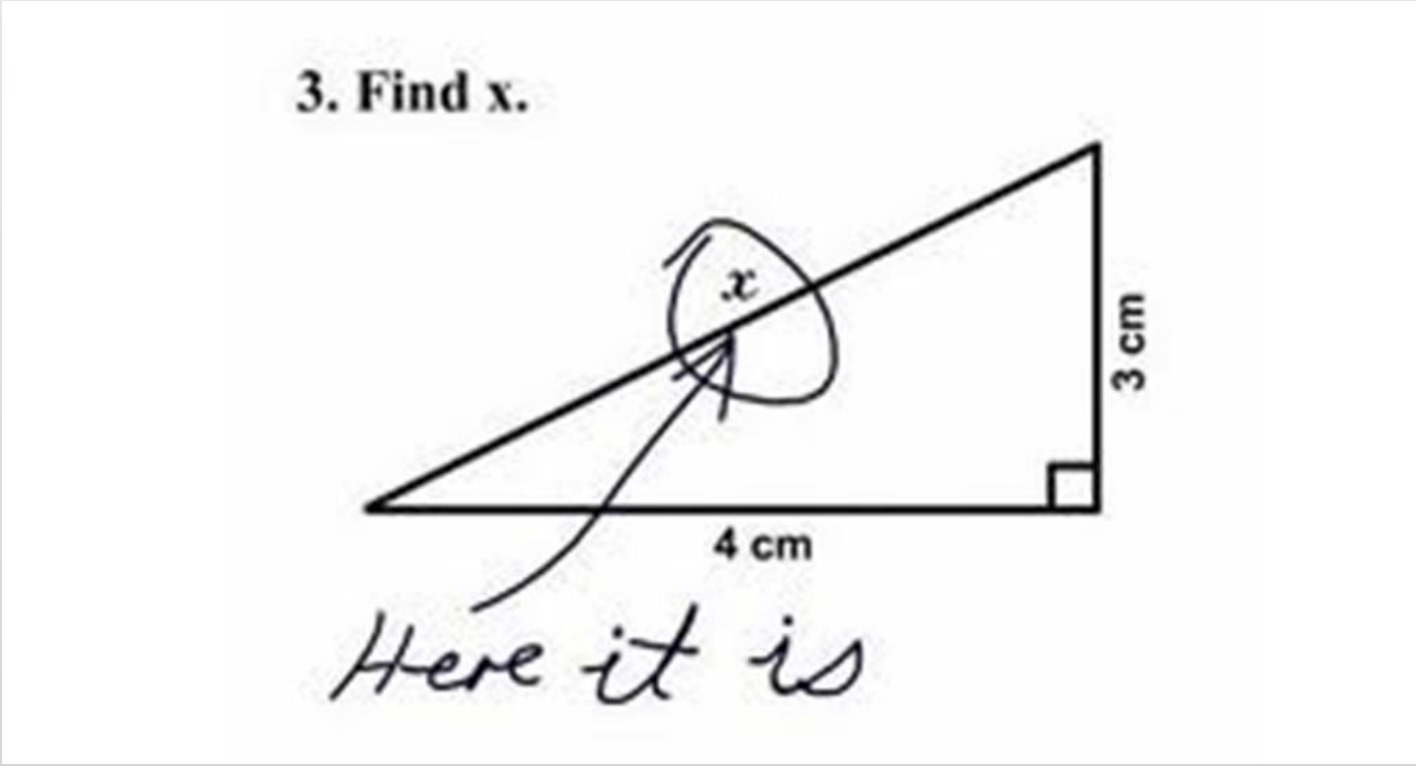
Are we Missing an Opportunity?

Michael Stowe

Wednesday, August 15, 2018

Actual Answer on a Math Test

Question #3: Find x.



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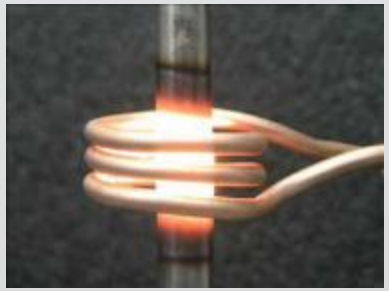
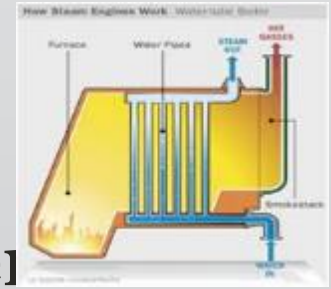
Today's Topics

- 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 Barrier





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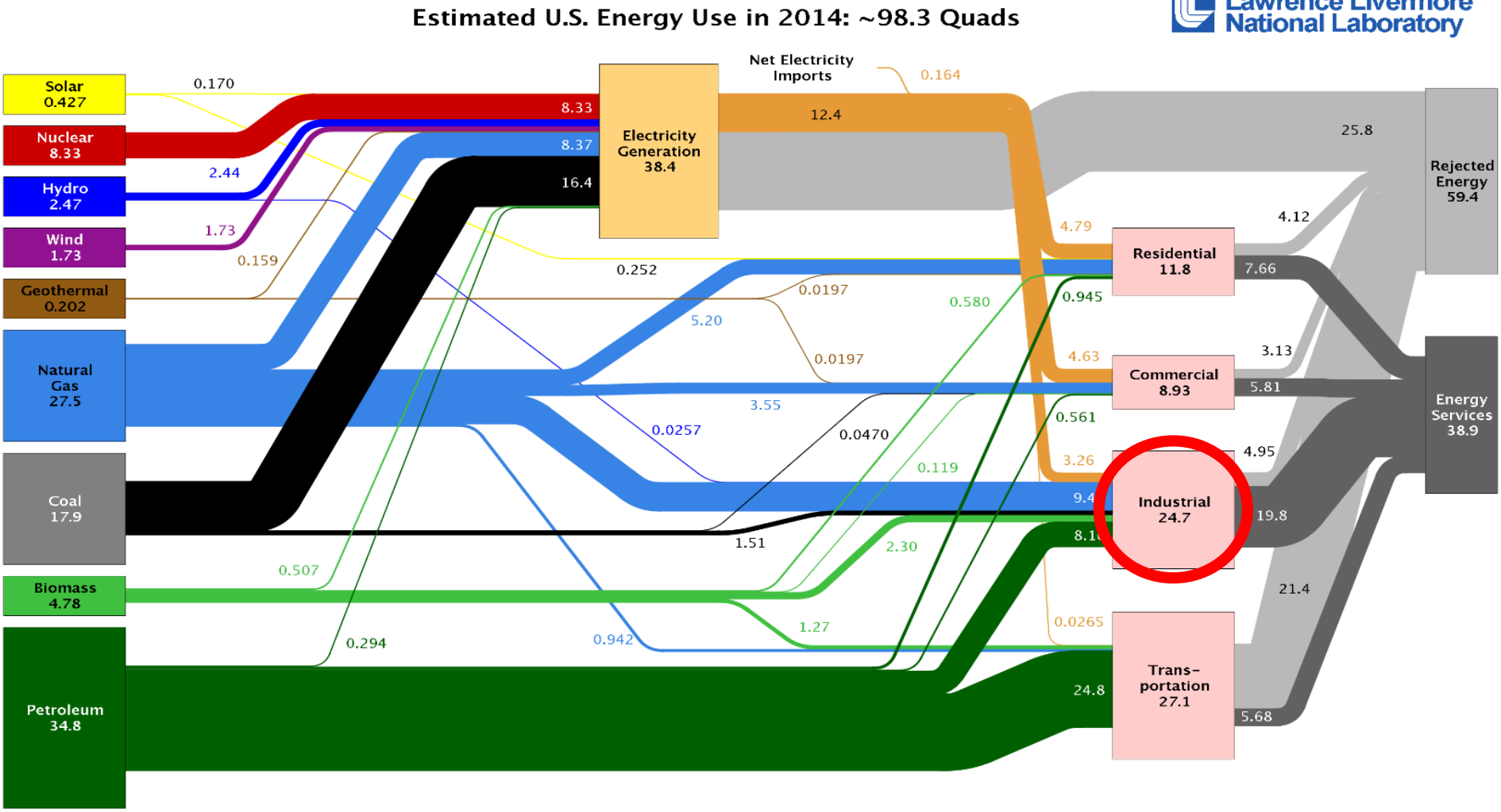
Industrial EE: The Big Picture



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

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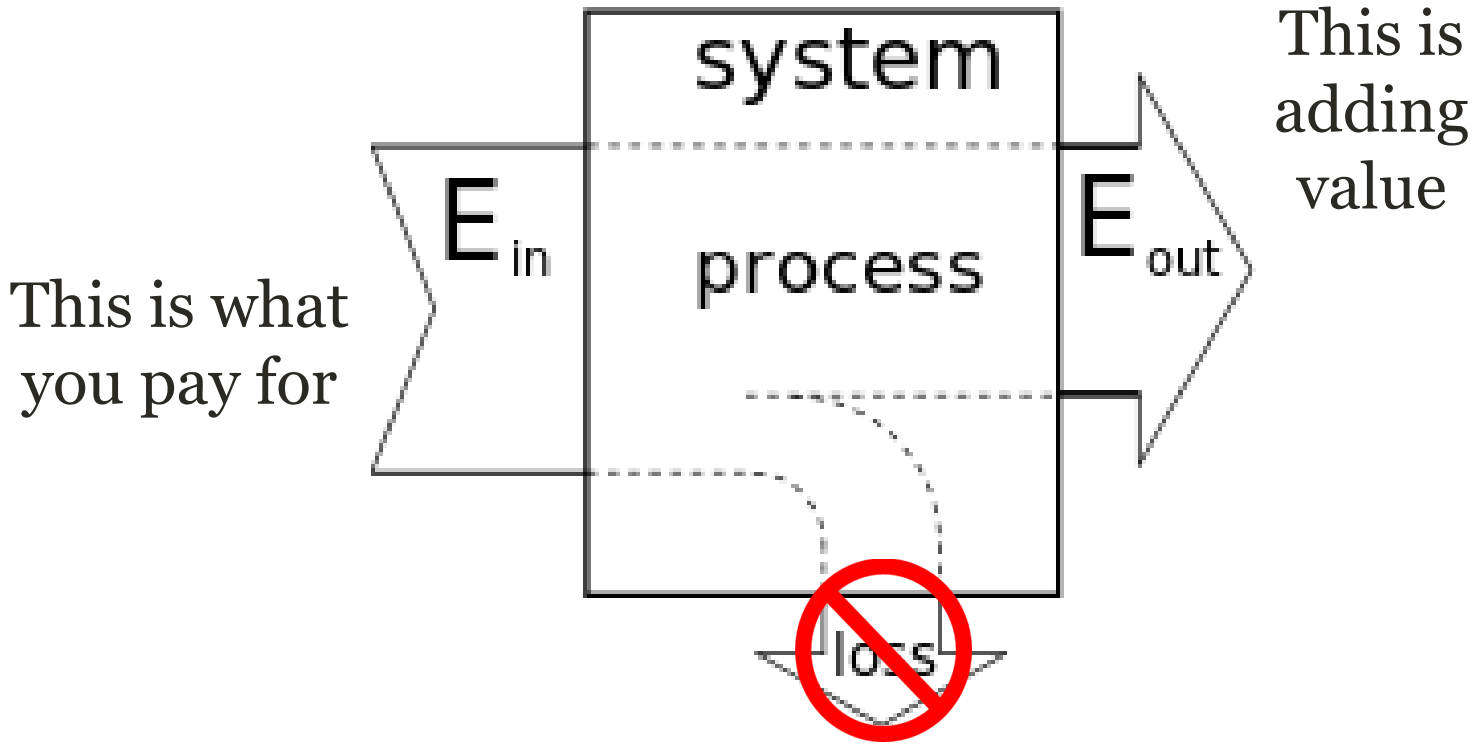
Industrial EE: Optimizing Transformation

Industrial EE: Optimizing Transformation

- Make MORE with LESS:
  - AND Make MORE!



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Industrial EE: Optimizing Transformation

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

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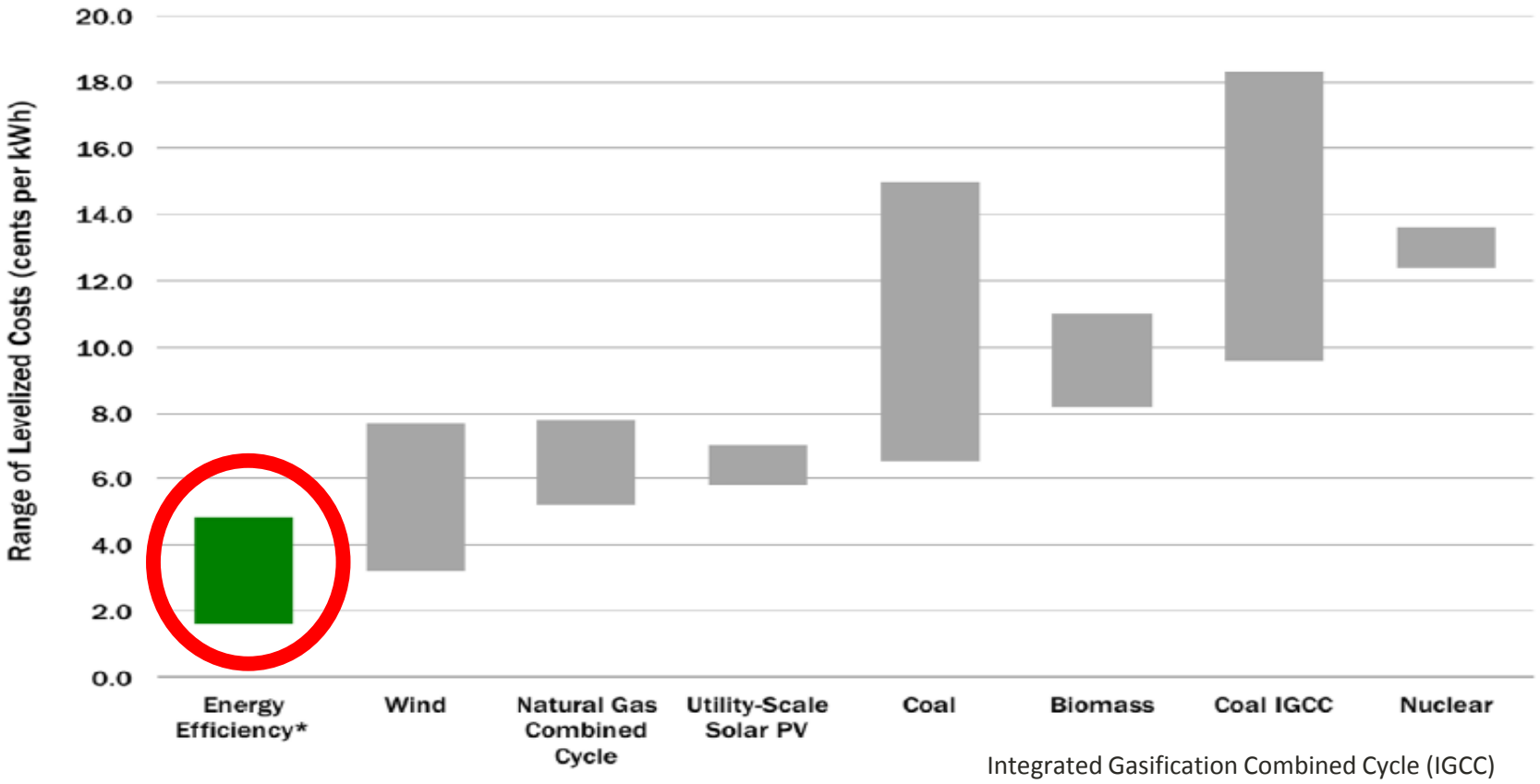
Industrial EE: EE is Affordable

How Much Does Energy Efficiency Cost?



Integrated Gasification Combined Cycle (IGCC)

Source: Energy efficiency program portfolio data from Molina, The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs (Washington, DC: ACEEE, 2014)

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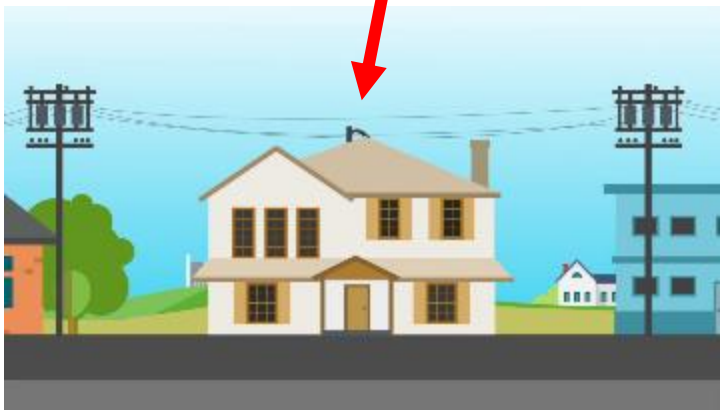
Example 1: Compressed Air Leaks

- 27,336,887 MWh
- 10% of 30% of 80%
- 54,600



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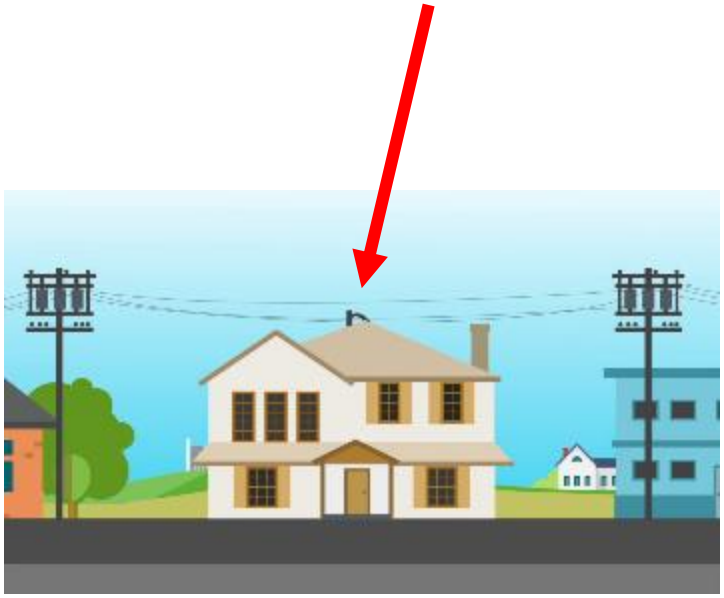
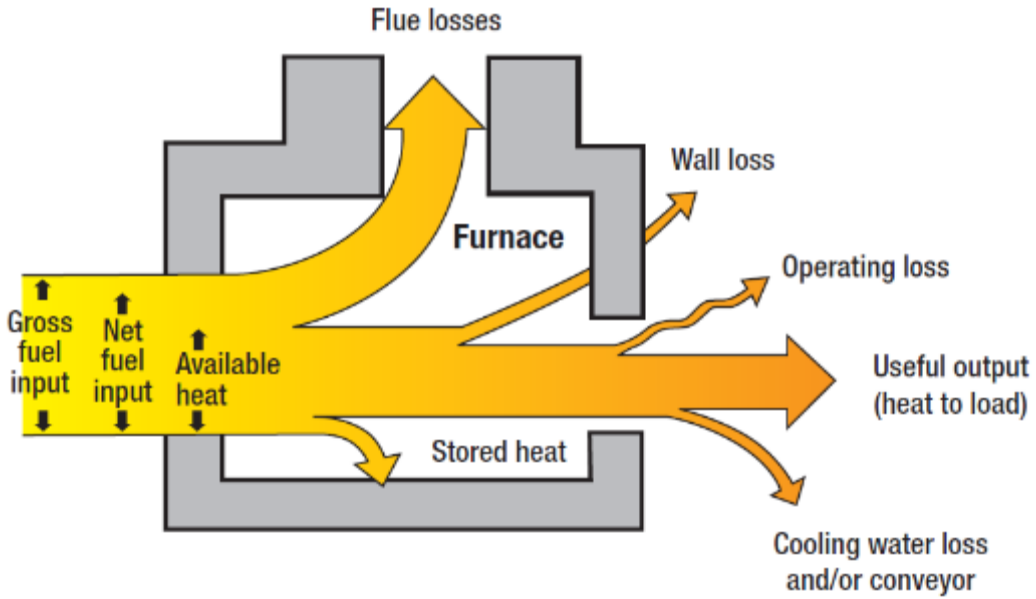
Example 2: Combustion Waste Heat

- 107,388,000 MMBTUs
- 40% of 20%
- 210,000





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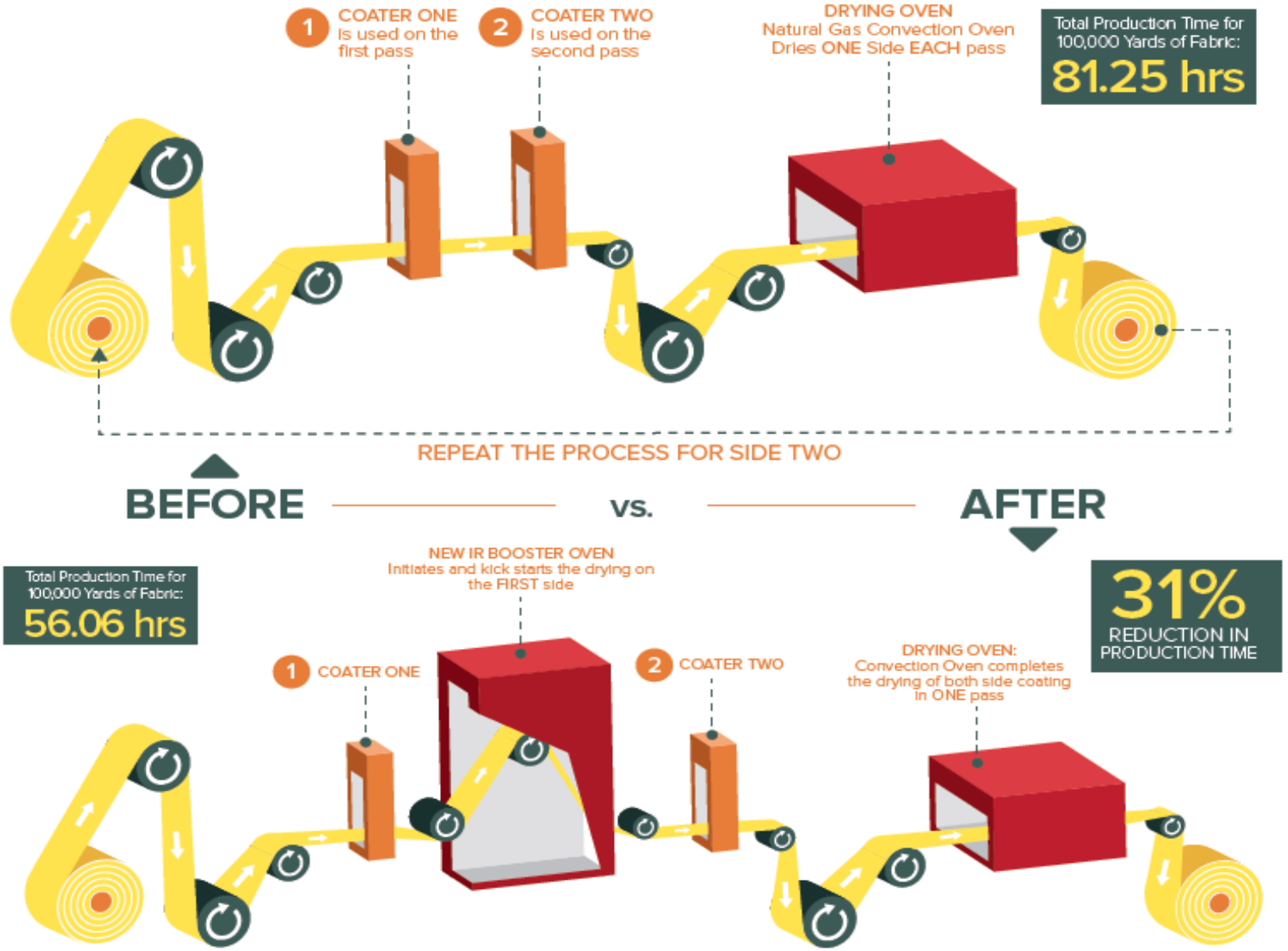
A Success Story



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Next Steps: Implementation

Get into the Plant

Understand the Processes

TRANSFORMATION

Review the Facility

Recommend Energy Efficiency Solutions

****Implementation****

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Next Steps: Implementation

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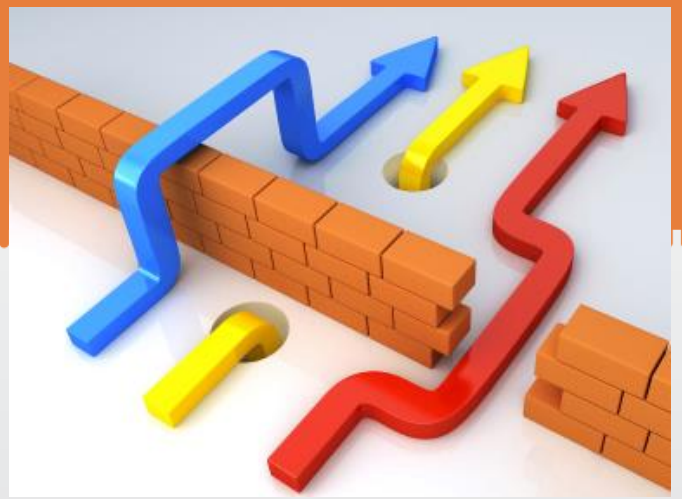
Next Steps: Overcoming Barriers



To Do List:

1. Safety
2. Quality
3. Production
4. Maintenance
5. 100 other things…..
6.
7.

105. EE Projects

Time

Awareness

Money

Technology

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Next Steps: What and Who?

ACTION WORDS

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

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

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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.

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Key Points to Remember

- 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!

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Questions

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Thank You

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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

REDUCE
RECOVER
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.

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