STATEWIDE EMISSIONS REDUCTION, ELECTRICITY AND DEMAND SAVINGS FROM THE IMPLEMENTATION OF BUILDING-ENERGY-CODES IN TEXAS

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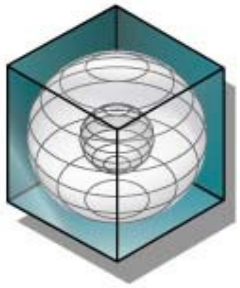
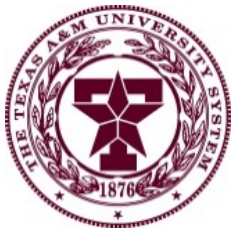
12th International Conference for Enhanced Building Operations
Manchester, UK, Oct 23-26, 2012



Energy Systems Laboratory

Texas A&M Engineering Experiment Station



The Texas A&M University System

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Energy Systems Laboratory (ESL)

The Energy Systems Laboratory (ESL) conducts research and deploys a wide variety of energy efficient and renewable technologies to meet the needs of clients worldwide.

Continuous Commissioning® (CC®)

- Improves comfort and increases energy efficiency in existing buildings
- Optimizes facility performance based on current use
- Implemented in over 300 buildings

Industrial Assessment Center (IAC)

- 25 years of continuous funding from the DOE
- Trains undergraduate & graduate students to conduct no-cost energy audits for regional manufacturing facilities
- Performed over 600 audits
- Recommendations made of over $59 million in annual savings

Riverside Energy Efficiency Laboratory (REEL)

- The official testing laboratory for the Home Ventilating Institute
- An ISO 17025 (Laboratory Quality) certified laboratory
- Serves global HVAC manufacturers

Texas Emissions Reduction Plan (TERP)

- Assists the state in calculating emissions reduction benefits and in implementation of building energy standards
- Dedicated to building energy modeling; building energy efficiency; review, assistance and training of energy codes; emissions reduction
- Developed the International Code Compliance Calculator (IC3), an online energy-performance software tool
- Produced over 4,000 publications

Texas Emissions Reduction Plan (TERP)

- **In 2001, the 77th Texas Legislature passed Senate Bill 5 (SB5) defining the Texas Emissions Reduction Plan (TERP)**

- **The TERP Objectives**
  - Ensure that the air in Texas meets the Federal Clean Air Act requirements (US EPA Page)
  - Designated 43 counties as non-attainment and near non-attainment
  - Reduce Nitrous Oxides (aka NOx) emissions in non-attainment and near-non-attainment counties through mandatory and voluntary programs, including the implementation of energy efficiency and renewable energy programs (EE/RE)

Texas Emissions Reduction Plan (TERP)

- **TERP Key Provisions**
  - A diesel emissions reduction incentive program
  - A motor vehicle purchase or lease incentive program
  - A new technology research and development program
  - An energy efficiency grant program
  - A statewide Texas Building Energy Performance Standard (TBEPS) for all residential and commercial buildings
  - A goal of 5% per year reduction in electrical consumption for facilities of political subdivisions in non-attainment and near-non-attainment counties from 2002 through 2008

ESL's Role in TERP

- **Analyze the impact of several of the TERP programs for consideration in the State Implementation Plan (SIP). Programs include:**
  - green power purchases, including wind and other renewable energy resources
  - the Public Utility Commission of Texas (PUC) energy efficiency programs
  - the State Energy Conservation Office (SECO) program for state agencies, political subdivisions and institutions of higher education
  - retrofits to federal buildings
  - furnace pilot light retrofits
  - residential air conditioner retrofits
  - residential and commercial construction

- **Analysis focuses on:**
  - Energy savings
  - Creditable emissions reductions
  - Statewide / By county

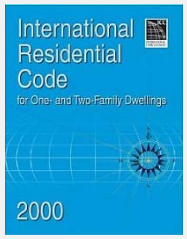
ESL has been named A National Center of Excellence on Displaced Emission Reductions for the US EPA

ESL's Role in TERP | continued...

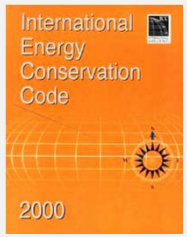
- **Provide statewide building energy-code implementation assistance:**
  - Review new building energy code, analyze their stringency and recommending their adoption to the State Energy Conservation Office (SECO) as part of the rule making process
  - Analyze local code amendments for stringency
  - Measure the impacts of energy codes statewide
  - Conduct outreach & provide energy code training to municipal inspectors
  - Provide technical assistance to municipalities, councils of governments and state agencies
  - Developed & regularly upgrade the IC3 International Code Compliance Calculator, a web-based, code-compliance energy simulation tool, used by builders and building officials statewide

Texas Building Energy Performance Standards (TBEPS)

In 2001, the Texas Building Energy Performance Standards (TBEPS) were set:



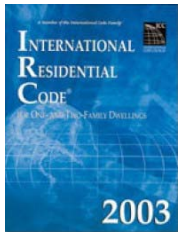
2000 IRC, EE Chapter:
For single-family residences

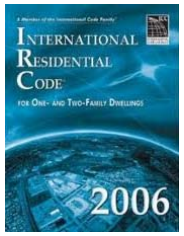


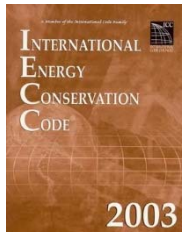
2000 IECC w/2001 Supplement:
For commercial, industrial & residential over three stories

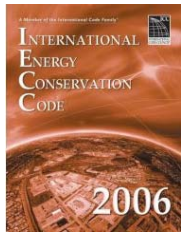
During **2002-2009**, **newer versions of IRC & IECC** have been published.

- ESL reviewed their stringency
- Texas did not update the TBEPS
- Some jurisdictions adopted the newer codes





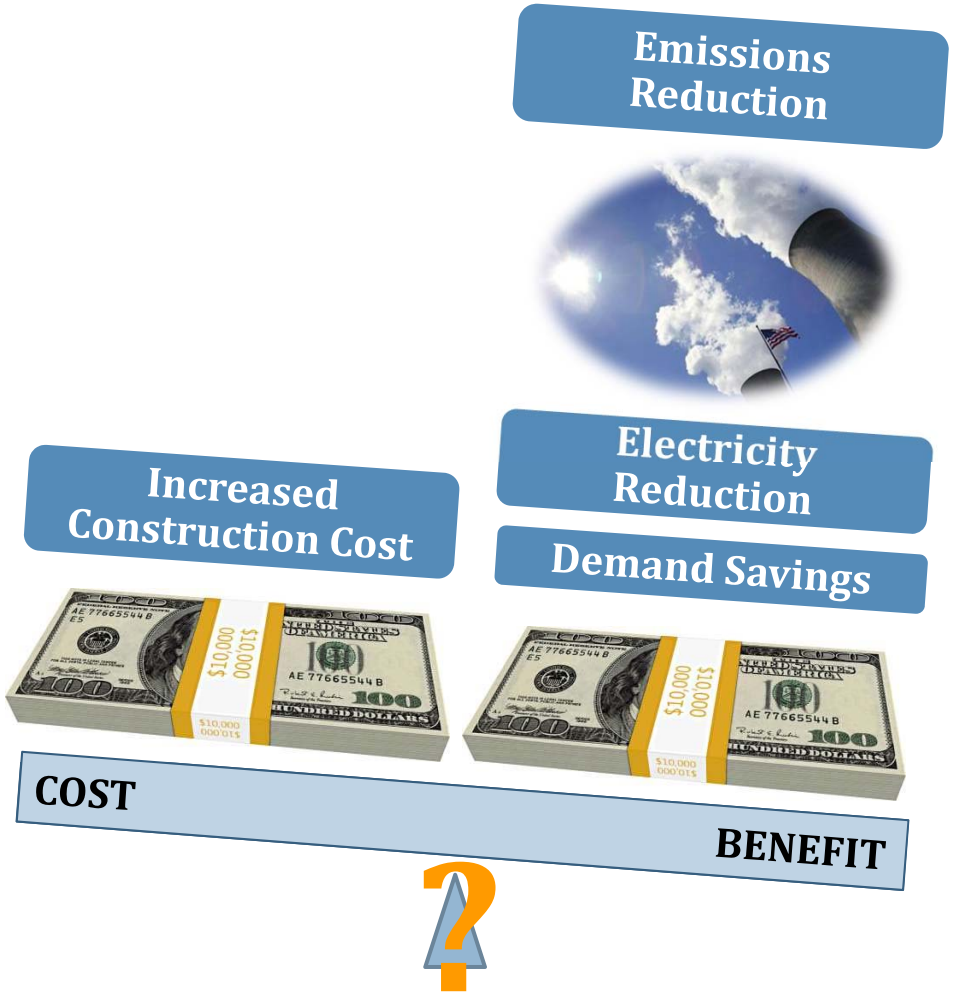




This Paper

This paper focuses on:

- **Estimates of electricity reduction and electric demand savings from the adoption of energy codes for single-family residences in Texas, 2002-2009**
- **Corresponding increase in construction costs**
- **Estimates of the statewide emissions reduction**



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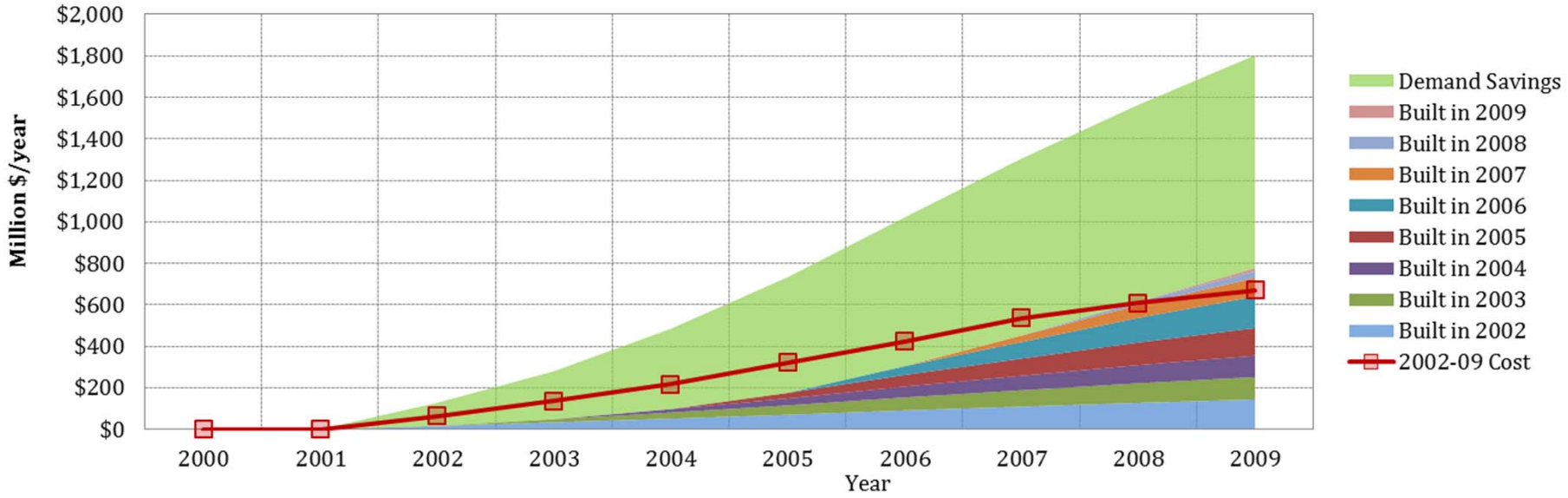
Results: Statewide Electricity & Cost Savings

Cumulative Increased Costs, Statewide Electricity Savings, and Electric Demand Savings Associated with the Adoption of Energy Codes for New Single-Family Residences in Texas: 2002-2009



	Electricity savings	Electric demand savings	Total Savings	Increased construction costs
Statewide (2002 -2009)	$776 million	$929 million OR (summer reductions) $1,027 million (winter reductions)	**$1,705 million OR** **$1,803 million**	**$670 million**

Results: Building Level - Electricity & Cost Savings

A typical Single-Family Residence in Texas

	Electricity savings	Electric demand savings	Increased construction costs
2001 IECC	$111 ~ $313	0 ~ 0.6 kW for summer 2.4 ~ 4 kW for winter	$600 ~ $1215
2006 IECC	$424 ~ $838	1.9 ~ 2.0 kW for summer 3.5 ~5.6 kW for winter	$902 ~ $1,744

Results: Statewide Emissions Reduction

The Annual & Ozone Season Day (OSD) Emissions Reduction from Energy Code-Compliant Single Family Construction in Texas

	Annual emissions reduction	Equivalent to…	OSD emissions reduction
Statewide (2002 -2009)	4,112 (Tons NOx/yr) = **8.6%** of the impact of all TERP stationary programs	**~215,300 cars taken off the road for 1 year**	22.58 (Tons NOx/day) = **17%** of the impact of all TERP stationary programs

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Acknowledgement

Funding for this study was provided by the Texas State Legislature through the Texas Emissions Reduction Plan (TERP).

Thank You!

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