



ENERGY SYSTEMS LABORATORY
TEXAS A&M ENGINEERING EXPERIMENT STATION

Energy Efficiency and Renewable Energy Impacts on Emission Reductions

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CATEE 2015

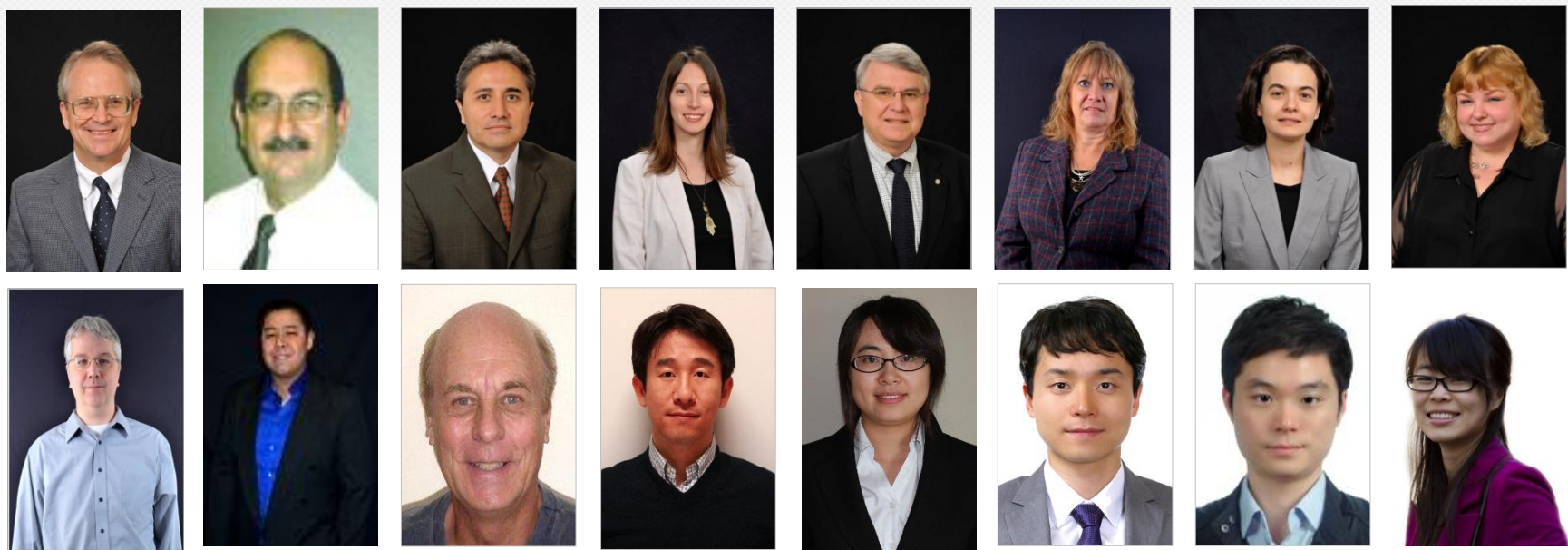
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LEGISLATIVE RESPONSE

Legislation to reduce energy/emissions 2001 to Present

Senate Bill 5 (77th Legislature, 2001)

- Ch. 386. Texas Emissions Reduction Plan
 - Sec. 386.205. Evaluation Of State Energy Efficiency Programs (with PUC)
- Ch. 388. Texas Building Energy Performance Standards
 - Sec. 388.003. Adoption Of Building Energy Efficiency Performance Standards.
 - Sec. 388.004. Enforcement Of Energy Standards Outside Of Municipality.
 - Sec. 388.007. Distribution Of Information And Technical Assistance.
 - Sec. 388.008. Development Of Home Energy Ratings.

TERP Amended (78th Legislature, 2003)

- Ch. 388. Texas Building Energy Performance Standards
 - (HB 1365) Sec. 388.004. Enforcement Of Energy Standards Outside Of Municipality.
 - (HB 1365) Sec. 388.009. Energy-Efficient Building Program.
- Ch. 388. Texas Building Energy Performance Standards
 - (HB 3235) Sec. 388.009. Certification of Municipal Inspectors.

TERP Amended (79th Legislature, 2005)

- Ch. 382. Health and Safety Code
 - (HB 2129) Sec. 386.056 Development of Creditable Statewide emissions from wind and other renewables.
 - (HB 965) Sec. 382.0275 Commission Action Relating to Water Heaters

TERP Amended (80th Legislature, 2007)

- Ch. 382. Health and Safety Code
 - (HB 3693) Sec. 388.003 added subsection (b-1), (b-2), (b-3) that allows SECO to adopt new editions of the IECC based on written recommendations from the Laboratory.
 - (HB 3693) Sec. 388.008 Development of Standardized report formats for newly constructed residences.
- Ch. 386.252 Health and and Safety Code
 - (SB 12) Section 388.03 added subsection (b-1), (b-2) allows SECO to adopt new editions of the IECC based on written recommendations from the Laboratory.

TERP Amended (81st Legislature, 2009)

- Ch. 382. Health and Safety Code
 - (HB 1796) Section 23 amends Sec. 386.252 (a) and (b) extends date of TERP to 2019 and requires Commission to contract with Laboratory for creditable EE/RE emissions reductions.

TERP Amended (82nd Legislature, 2011)

- Ch. 477.004 Health and Safety Code
 - HB 51 Section 2, b-2, establishes advisory committee, which including the Laboratory
 - Section 3 & 4 amends review of municipal's amendments.
- Ch. 388.003e & 388.007c,d Health and Safety Code
 - HB 51 Section 3 & 4 amends review of municipal's amendments.
- Ch. 388.006 Health and Safety Code
 - SB 898 Section 2, requires the Laboratory to calculate energy savings and emissions reductions for political subdivisions reporting to SECO.
- Ch. 39.9051 Utilities Code
 - SB 924 Section 1g,h and Section 2c,d requires the Laboratory to calculate energy savings and emissions reductions for political subdivisions reporting to SECO.

NO new amendments were passed (83rd Legislature, 2013)

TERP Amended (84th Legislature, 2015)

- Section 388.003, Health and Safety Code
 - HB 1736 Section 1 Establishes the 2015 energy codes as the TBEPS effective Sept 1, 2016. The state may adopt new codes no sooner than every 6 years. The section also adds Energy Rating Index as a voluntary compliance alternative.



EPA CRITERIA FOR SIP CREDITS (2004)

Quantifiable: The emission reductions generated by measures to reduce emissions must be quantifiable and include procedures to evaluate and verify over time the level of emission reductions actually achieved.

Surplus: Emission reductions are surplus as long as they are not otherwise relied on to meet air quality attainment requirements in air quality programs related to your SIP.

Enforceability: Measures that reduce emissions from electricity generation may be: (1) Enforceable directly against a source; (2) Enforceable against another party responsible for the energy efficiency or renewable energy activity; or (3) Included under our *voluntary measures* policy.

Record Keeping: The measure should be permanent throughout the term for which the credit is granted unless it is replaced by another measure or the State demonstrates in a SIP revision that the emission reductions from the measure are no longer needed to meet applicable requirements.



ENERGY SAVINGS & NO_x EMISSIONS REDUCTION

ESL Calculates NO_x Emissions Reductions for:

- 1. Code-Compliant Construction:** Energy savings from new constructions
 - ESL Single-family construction
 - ESL Multi-family construction
 - ESL Commercial construction
- 2. Green Power Production:** Wind and other renewables
- 3. PUC SB7:** Energy efficiency programs implemented by electric utilities under the Public Utility Regulatory Act § 39.905
- 4. SECO:** Energy-efficiency programs towards school districts, government agencies, city and county governments, private industries and residential energy consumers
- 5. A/C Retrofits:** Installation of SEER 13/14 *replacement* air conditioners in existing residences








SAVINGS FROM CODE COMPLIANT CONSTRUCTION



IC3v. 3.14.4

Current 2009 Version



User Login






Welcome! This is publicly accessible energy code compliance software based on the Texas Building Energy Performance Standards. You must register a username and password in order to continue. You may then access your records using your user name and password.

Email Address:

Password:

Login

[Register](#) [Forgot Password](#)



Login Screen

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



IC3v. 3.14.4

Current 2009 Version

Single Family House

Passing Single-Family Project

Project Information | Floors | Windows | Insulation / Mechanical | HVAC / DHW | Roof | Horizontal Projections | Status

Energy Code

Choose Your Energy Code:
IECC 2009

Site Address

NOTE: All fields on this page (except notes) must be completed to print a certificate.

Project Name:
Passing Single-Family

Builder Name:
Ross Morel

Builder Phone:
832-928-5121

Site Street Address:
100 First Street A, a

City:
College Station

County:
BRAZOS

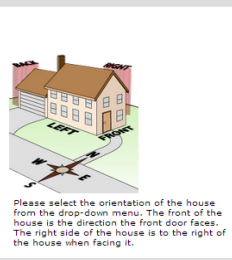
Zip Code:
77840

Inspection and Plan Review Notes (Limit 255 characters):
This is a test

Orientation

Front of House Faces:
south

Next



Please select the orientation of the house from the drop-down menu. The front of the house is the direction the front door faces. The right side of the house is to the right of the house when facing it.

Energy Code/Site Address/Project Details

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



IC3v. 3.14.4

Current 2009 Version

Single Family House
Single Family House

Passing Single-Family Project

[Project Information](#) [Floors](#) [Windows](#) [Insulation / Mechanical](#) [HVAC / Chw](#) [Roof](#) [Horizontal Projections](#) [Status](#)

Floors

Number of Floors:

2

1st Floor

Conditioned Floor Area (sq ft):

2500

Perimeter of Conditioned Area (ft):

250

Average Ceiling Height (ft):

10

2nd Floor

Conditioned Floor Area (sq ft):

2000

Perimeter of Conditioned Area (ft):

200

Average Ceiling Height (ft):

8

Conditioned Floor Area Overhanging Unconditioned Space (sq ft):

50

Bedrooms

Number of Bedrooms:

4

Structural

Foundation Type:

Slab On Grade

[Remove Slab Insulation](#)

Slab Insulation R-Value:

12

Not recommended for use in areas with a high likelihood of termite infestation. Please refer to your local building code office if you are unsure whether your project requires slab insulation.

[Next](#)



Please select the number of floors the house will have.

Floors/BedRooms/Foundation

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



IC3v. 3.14.4

Current 2009 Version

Single Family House

Single Family House

Single Family House

Passing Single-Family Project

Project Information Floors Windows Insulation / Mechanical HVAC / ChW Roof Horizontal Projections Status

Glazing Properties

Solar Heat Gain Coefficient

0.25

U-factor

0.25

1st Floor Windows

Front (sq ft)

10

Right (sq ft)

50

Back (sq ft)

50

Left (sq ft)

50

2nd Floor Windows

Front (sq ft)

30

Right (sq ft)

25

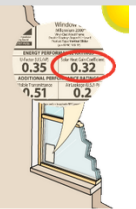
Back (sq ft)

20

Left (sq ft)

25

Next



Please enter the Solar Heat Gain Coefficient (SHGC) for the fenestrations (e.g., windows and doors). (This information should be provided on the construction documents to be verified at the time of inspection.)

Windows

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



IC3v. 3.14.4

Current 2009 Version

Single Family House

Single Family House

Single Family House

Passing Single-Family Project

Project Information
Floors
Windows
Insulation / Mechanical
HVAC / DHW
Roof
Horizontal Projections
Status

— Mechanical —

Mechanical in conditioned space?:
Yes ☐ No ☒

Measurements for Blower Door:
Tested

Blower Door (in ACH50):

Measurements for Duct Tightness:
Tested

Duct Tightness (in CFM25, Post-Construction Test):

— Insulation —

Wall Cavity Insulation R-Value:

Insulated Wall Sheathing R-Value:

Exterior Wall Finish:

Total Roof/Ceiling Insulation R-Value:

Supply Duct Insulation R-Value:

Return Duct Insulation R-Value:

Please enter the R-Value for the wall cavity insulation. Insulation R-Values are to be verified during inspection.

Next
Previous

Mechanical System/Insulation

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



IC3v. 3.14.4

Current 2009 Version

Single Family House

Single Family House

Single Family House

Single Family House

Single Family House

Passing Single-Family Project

Project InformationFloorsWindowsInsulation / MechanicalHVAC / DHWRoofHorizontal ProjectionsStatus

Heating

Heating Type:
Electric Resistance

Cooling

A/C Efficiency (SEER):
14

A/C Size (tons):
6

Water Heater

Water Heater Type:
Electric


Energy Factor:
0.96

Use Detailed DHW Input
Yes No

Water Heater Size (gal):
30

Burner Capacity (kW):
10000

Next



Please select the heating type for the house (e.g., heat pump, natural gas).

HVAC/DHW

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



IC3v. 3.14.4

Current 2009 Version

Single Family House

Single Family House

Single Family House

Single Family House

Single Family House

Single Family House

Passing Single-Family Project

Project Information | Floors | Windows | Insulation / Mechanical | HVAC / DHW | **Roof** | Horizontal Projections | Status

Roof

Roof Covering Material:
Comp Shingle

Uses Radiant Barrier:
Yes No

Ceiling Area

Flat Roof Area (sq ft):
502

Cathedral Ceiling Area (sq ft):
1

Attic Floor Area (sq ft):
2500

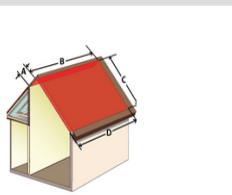
Area of Wall Adjacent to Unconditioned Attic Space (sq ft):
25

Ceiling Area Explained

Current Ceiling Area: 3003 sq ft

Minimum Ceiling Area: 2550 sq ft

Ceiling Area over:
1st Floor: 550 sq ft
2nd Floor: 2000 sq ft



A-B + C-D

Please enter the square footage of the cathedral ceilings.

Next

Roof/Ceiling

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



IC3v. 3.14.4

Current 2009 Version

Single Family House

Single Family House

Single Family House

Single Family House

Single Family House

Single Family House

Passing Single-Family Project

[Project Information](#)
[Floors](#)
[Windows](#)
[Insulation / Mechanical](#)
[HVAC / DHW](#)
[Roof](#)
[Horizontal Projections](#)
[Status](#)

1st Floor Horizontal Projections

Front: (feet and inches i.e.: 4' - 6")

Right: (feet and inches i.e.: 4' - 6")

Back: (feet and inches i.e.: 4' - 6")

Left: (feet and inches i.e.: 4' - 6")

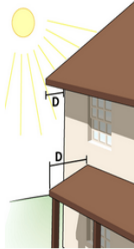
2nd Floor Horizontal Projections

Front: (feet and inches i.e.: 4' - 6")


Right: (feet and inches i.e.: 4' - 6")

Back: (feet and inches i.e.: 4' - 6")

Left: (feet and inches i.e.: 4' - 6")



Please enter the distance measured from the wall to the outer edge of the projection.

 Next

Shading

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



IC3v. 3.14.4

Current 2009 Version

Single Family House

Single Family House

Single Family House

Single Family House

Single Family House

Single Family House

Single Family House

Project Information
Floors
Windows
Insulation / Mechanical
HVAC / CHW
Roof
Horizontal Projections
Status

Project Details for: Passing Single-Family Project
Project Status

Project Information

Energy Code: IECC 2009

Builder Name: Ross Morel

Builder Phone: 832-928-5121

Site Street Address: 100 First Street N, a

City: College Station

Zip: 77840

County: BRAZOS

Notes: This is a

Floors

First Floor:

Conditioned Floor Area: 2500 sq ft

Perimeter of Conditioned Space: 250 ft

Ceiling Height: 10 ft

Second Floor:

Conditioned Floor Area: 2000 sq ft

Perimeter of Conditioned Space: 200 ft

Area of Conditioned Over Unconditioned:

Ceiling Height: 50 sq ft

Orientation: South

Number of Bedrooms: 4

Foundation Type: Slab On Grade

Insulation: R-12

Windows

Solar Heat Gain Coefficient: 0.25

U-factor: 0.25

First Floor Window Area:

Front: 10 sq ft

Right: 50 sq ft

Back: 50 sq ft

Left: 50 sq ft

Second Floor Window Area:

Front: 30 sq ft

Right: 25 sq ft

Back: 20 sq ft

Left: 25 sq ft

Insulation / Mechanical

Mechanical in Conditioned Space: No

Wall Cavity Insulation: R-45

Insulated Wall Sheathing: R-12

Exterior Finish: Brick

Total Roof/Ceiling Insulation: R-50

Blower Door: 4 (Tested)

Mechanical Ventilation: Balanced

Mechanical Ventilation Rate: 170 CFM

Mechanical Ventilation Operation: 3 hrs/day

Mechanical Ventilation Fan Power: 120 Watts

Duct Tightness Measurement Type: Total Leakage

Duct Tightness: 125 (Tested)

Fraction Outside: 0.8

Supply Duct Insulation: 8

Return Duct Insulation: 8

HVAC/CHW

Heating Type: Electric Resistance

A/C Efficiency (SEER): 14 SEER

A/C Size (tons): 9

Water Heater Type: Electric

Water Heater Energy Factor: 0.96

Water Heater Size: 30

Water Heater Burner Capacity: 10000

Roof

Roof Covering Material: Comp Shingle

Radiant Barrier: Yes

Flat Roof Area: 502 sq ft

Cathedral Ceiling Area: 1 sq ft

Attic Floor Area: 2500 sq ft

Wall Area Next To Attic: 25 sq ft

Horizontal Projections

First Floor Horizontal Projections:

Front: 0' 0"

Right: 0' 0"

Back: 0' 0"

Left: 0' 0"

Second Floor Horizontal Projections:

Front: 0' 3"


Right: 0' 3"

Back: 0' 3"

Left: 0' 3"

5.6% Above Code

Congratulations! Your project has passed code requirements! Notice: 2012 IECC requires 75% of lamps in permanently installed lighting fixtures be high-efficiency lamps (IECC 2012 R404.1)



Inspection List

Certificate

Energy Report

Energy Report w/ Signature

Energy Report

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



IC3v. 3.14.4

Current 2009 Version

Single Family House

Single Family House

Single Family House

Single Family House

Single Family House

Single Family House

Single Family House

Single Family House

Single Family House

Single Family House

Project Information

Energy Code: IECC 2009

Builder Name: Ross Morel

Builder Phone: 832-929-5121

Site Street Address: 100 First Street A, a

City: College Station

Zip: 77840

County: BRAZOS

Notes: This is a test

Project Details for: Passing Single-Family Project

Project Information

First Floor:

Conditioned Floor Area: 2500 sq ft

Perimeter of Conditioned Space: 250 ft

Ceiling Height: 10 ft

Second Floor:

Conditioned Floor Area: 2000 sq ft

Perimeter of Conditioned Space: 200 ft

Area of Conditioned Over Unconditioned: 50 sq ft

Ceiling Height: 8 ft

Orientation: South

Number of Bedrooms: 4

Foundation Type: Slab On Grade

Insulation: R- 12

Windows

Solar Heat Gain Coefficient: 0.25

U-factor: 0.25

First Floor Window Area:

Front: 10 sq ft

Right: 50 sq ft

Back: 50 sq ft

Left: 50 sq ft

Second Floor Window Area:

Front: 30 sq ft

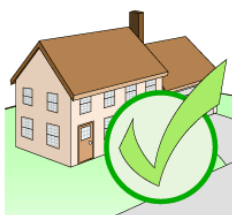
Right: 25 sq ft

Back: 20 sq ft

Left: 25 sq ft

5.6% Above Code

Congratulations! Your project has passed code requirements! Notice: 2012 IECC requires 75% of lamps in permanently installed lighting fixtures be high-efficiency lamps (IECC 2012 R404.1)



Inspection List

Certificate

Energy Report

Energy Report w/ Signature

Energy Report

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



IC3v. 3.14.4

Current 2009 Version

Single Family House
Single Family House
Single Family House
Single Family House
Single Family House
Single Family House
Single Family House
Single Family House

IC3 International
CODE COMPLIANCE CALCULATOR

SINGLE FAMILY HOUSE ENERGY REPORT


Project Details for:
TEST_SF_2012

Builder: sunglok
Builder Phone: 1111111111

Address: address
City: Houston
County: HARRIS
Zip: 77840
Date Issued: 10/20/2014
Certificate #: 892066


Emissions Reduction: 1 lbs
NOx: 0 lbs
SOx: 496 lbs
CO2:

Project Notes:
test



**6%
Above Code**

This single family residential project was found to be in compliance with the performance measures described in IECC 2012 using the v.3.14.4 calculation tool developed by the Energy Systems Laboratory, a division of the Texas A&M Engineering Experiment Station.



The values produced are generated by the DOE-2 building energy analysis program. These values do not constitute a guarantee of actual energy usage by EEL or TEES.

Authorized Signature : _____

Copyright 2011 Energy Systems Laboratory

[TEST_SF_2012] certificate page 1 of 3

Certificate

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



IC3v. 3.14.4

Current 2009 Version

Single Family House
Single Family House
Single Family House
Single Family House
Single Family House
Single Family House
Single Family House

RESIDENTIAL ENERGY EFFICIENCY CERTIFICATE

Window U-Value	U-0.40	Cooling Efficiency	SEER 13
Window SHGC	0.25	Heating Efficiency	Natural Gas Furnace AFUE-0.78
Wall Cavity Insulation	R-12	Water Heater Efficiency	Natural Gas Water Heater EF-0.59
Roof/Ceiling Insulation	R-33	Certificate Number	880678
Floor/Foundation Insulation	NA	Builder Email	sunglokdo@tees.tamus.edu
Supply Duct Insulation	R-8	Builder Phone	
Return Duct Insulation	R-8	Date Issued	10/20/2014

IC3 International CODE COMPLIANCE CALCULATOR

Builder or Registered Design Professional _____

This certificate was generated by IC3 in compliance with IECC 2012

SOx: _____

CO2: 496 lbs

Project Notes:
test

TEES

The values produced are generated by the DOE-2 building energy analysis program. These values do not constitute a guarantee of actual energy usage by ESI, or TEES.

Authorized Signature : _____

Copyright 2011 Energy Systems Laboratory [TEST_SF_2012] certificate page 1 of 3

Certificate



SAVINGS FROM CODE COMPLIANT CONSTRUCTION



IC3v. 3.14.4

Current 2009 Version

Single Family House
Single Family House
Single Family House
Single Family House
Single Family House
Single Family House
Single Family House

IC3 International
CODE COMPLIANCE CALCULATOR

SINGLE FAMILY HOUSE ENERGY REPORT

Project Details for:
TEST_SF_2012

Builder: sunglok
Builder Phone: 1111111111

Address: address
City: Houston
County: HARRIS
Zip: 77840
Date Issued: 10/20/2014
Certificate #: 892066

Emissions Reduction: 1 lbs
NOx: 0 lbs
SOx: 496 lbs
CO2:

Project Notes:
test

**6%
Above Code**

This single family residential project was found to be in compliance with the performance measures described in IECC 2012 using the v.3.14.4 calculation tool developed by the Energy Systems Laboratory, a division of the Texas A&M Engineering Experiment Station.

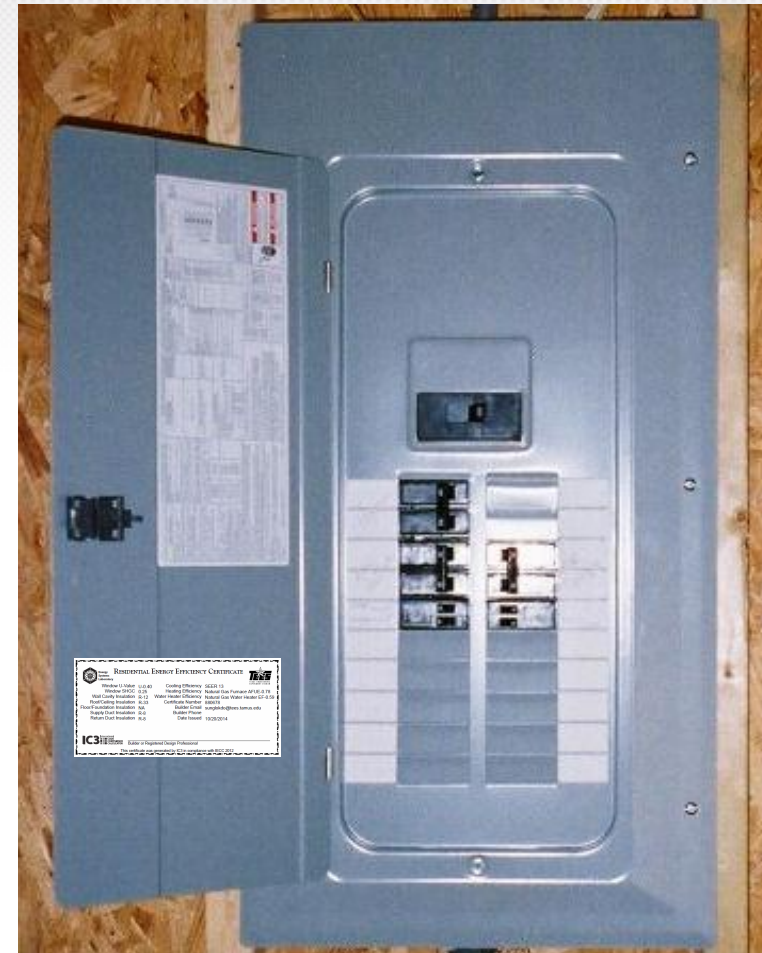
TEXAS A&M ENGINEERING
TEES

The values produced are generated by the DOE-2 building energy analysis program. These values do not constitute a guarantee of actual energy usage by EEL or TEES.

Authorized Signature : _____

Copyright 2011 Energy Systems Laboratory

[TEST_SF_2012] certificate page 1 of 3






Certificate on Electrical Panel

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



New 2015 Version



Welcome to IC3 version 4.0. This version calculates the code compliance for single family projects under IECC 2015. If you need to enter a project under the 2009 or 2012 IECC, then you need to go to version 3.14 IC3 here: [IC3 version 3.14](#)

User Login

This is the publicly accessible energy code compliance software based on the Texas Building Energy Performance Standards. You must register a username and password in order to continue. If you are already registered in IC3 version 3.x, you must register again in the new system.



Username:



Password:

Please enter a username

Please enter a password

[Register New User](#) [Forgot Password](#)

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[Credits](#) [Help/FAQ](#) [Manual](#) [IC3 v4.0.1](#)

Login Screen

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



New 2015 Version

[Return to Project List](#)
 Project Name: 000 2015 Qinbo Li
 Energy Code: 2015 IECC
 Street Address: 1000 Balcones Dr
 County: AUSTIN
 City: BELLVILLE
 Zip: 77777
 Builder Name: test test
 Builder Email: patrickparker@tees.tamu
 Builder Phone: 123-456-7890
 Notes: This is a test.
[Submit Project](#)
 When downloading the energy Report, there are issues with browser plug-ins converting the .pdf to HTML5. See the link for details. [Help/FAQ](#)

Global Parameters

Number of Floors: 1
 Number of Bedrooms: 2
 Orientation of Unit Front Side: East
 Exterior Finish Type: Stucco
 Window SHGC: 0.3
 U-Value: 0.2
 Insulation: Wall Cavity Insulation R-35, Wall Continuous Insulation R-10
 Studs: Stud Type 2 x 4
 Ducts: Ducts in Conditioned Space ☒
 Testing: Roof Foundation
 Heating: A/C Water Heater

Floor: 1

Front Side

Length of Wall (ft): 50
 Window Area (sq ft): 21
 Horizontal Shading (in): 0.8
 Height of Wall (ft): 8

Left Side

Length of Wall (ft): 50
 Window Area (sq ft): 0
 Horizontal Shading (in): 0
 Height of Wall (ft): 8

Right Side

Length of Wall (ft): 50
 Window Area (sq ft): 0
 Horizontal Shading (in): 0
 Height of Wall (ft): 8

Conditioned Floor Area (sq ft): 2500

Back Side

Length of Wall (ft): 50
 Window Area (sq ft): 11
 Horizontal Shading (in): 0.8
 Height of Wall (ft): 8

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[Credits](#) [Help/FAQ](#) [Manual](#) [IC3 v4.0.1](#)

Main Page

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



New 2015 Version

Return to Project List

Project Name	000 2015 Qinbo Li
Energy Code	2015 IECC ?
Street Address	1000 Balcones Dr ?
County	AUSTIN ?
City	BELLVILLE ?
Zip	77777 ?
Builder Name	test test ?
Builder Email	patrickparker@tees.tamu ?
Builder Phone	123-456-7890 ?
Notes:	<div>This is a test.</div>

Energy Code/Site Address/Project Details

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



New 2015 Version

Floor 1

Front Side

Length of Wall (ft) 50

Window Area (sq ft) 21

Horizontal Shading (in) 0.8

Height of Wall (ft) 8

Left Side

Length of Wall (ft) 50

Window Area (sq ft) 0

Horizontal Shading (in) 0

Height of Wall (ft) 8

Right Side

Length of Wall (ft) 50

Window Area (sq ft) 0

Horizontal Shading (in) 0

Height of Wall (ft) 8

Back Side

Length of Wall (ft) 50

Window Area (sq ft) 11

Horizontal Shading (in) 0.8

Height of Wall (ft) 8

Conditioned Floor Area (sq ft) 2500

Floors/BedRooms/Foundation

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



New 2015 Version

Global Parameters

Number of Floors

1

?

Number of Bedrooms

2

?

Orientation of Unit Front Side

East

?

Exterior Finish Type

Stucco

?

Window

SHGC

0.3

?

U-Value

0.2

?

Insulation

Wall Cavity Insulation

R-35

?

Wall Continuous Insulation

R-10

?

Studs

Stud Type

2 x 4

?

Ducts

Ducts in Conditioned Space

☒

?

Global Parameters

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



New 2015 Version

Testing

Testing

Mechanical Ventilation Type

Balanced

?

Ventilation Rate (CFM)

100

?

Ventilation Operation (hrs/day)

12

?

Ventilation Fan Power(Watts)

12

?

Blower Door Test (ACH50)

Blower Door Test

Tested

?

Blower Door Test Value

5

?

Close

Roof

Roof

Roof Covering Material

Wood Shingles

?

Radiant Barrier

☐

?

Sealed Attic

☒

?

Roof Insulation:

R-25

?

Ceiling Area

Attic Floor Area (sq ft)

2500

?

Flat Roof Area (sq ft)

0

?

Cathedral Ceiling Area (sq ft)

0

?

Area of Wall Adjacent to Unconditioned Attic Space (sq ft)

0

?

The total entered roof area in 2500 sq ft. The total floor area is 2500 sq ft

Close

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



New 2015 Version

Foundation

Foundation

Type of Foundation

Slab on Grade

Foundation Insulation

R-0.23

Close

A/C

A/C

SEER:

18

Tonnage

2

Close

Heating

Heating

Heating Type:

Heat Pump

Heating Efficiency (HSPF):

9.8

Close

Water Heater

Water Heater

Type of Water Heater

Heat Pump

Energy Factor

2.1


Use detailed DHW input☐

Close

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



New 2015 Version



Single Family House Energy Report

Project Details

Project Name: 000 2015 Qinbo Li

Builder Name: test test

Builder Phone: 123-456-7890

Builder Email: patrickparker@tees.tamus

Address: 1000 Balcones Dr

City: BELLVILLE

County: AUSTIN

Zip: 77777

Certificate #: 1001252

Date Issued: 11/19/2015


Notes: This is a test.

Emissions Reduction

NOx: 0 lbs.


SOx: 0 lbs.

CO2: 181 lbs.



**1%
Above Code**

This single family residential project was found to be in compliance with the performance measures described in the 2015 IECC as calculated by the Energy Systems Laboratory, a division of the Texas A&M Engineering Experiment Station using IC3 version 4.0.1




ENERGY SYSTEMS LABORATORY

TEXAS A&M ENGINEERING EXPERIMENT STATION

The values produced are generated by the DOE-2 building energy analysis program. These values do not constitute a guarantee of actual energy usage by ESL or TEES.

Authorized Signature



Version 4.0.1

Copyright 2015 Energy Systems Laboratory

000 2015 Qinbo Li Page 1 of 3

Certificate

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



New 2015 Version

Residential Energy Efficiency Certificate



Window U-Value	U- 0.2	Duct Tightness (in CFM25)	0
Window SHGC	0.3	Cooling Efficiency	SEER 18
Wall Cavity Insulation	R - 35	Heating Efficiency	Heat Pump HSPF-9.80
Roof/Ceiling Insulation	R - 25	Water Heater Efficiency	Heat Pump EF-2.10
Floor/Foundation Insulation	R - 0	Builder Email	patrickparker@tees.tamus.edu
Supply Duct Insulation	R - 0	Builder Phone	123-456-7890
Return Duct Insulation	R - 0	Date Issued	11/19/2015
Blower Door (in ACH50)	5	Certificate Number	1,001,252



Builder or Registered Design Professional _____

This certificate was generated by IC3 in compliance with 2015 IECC

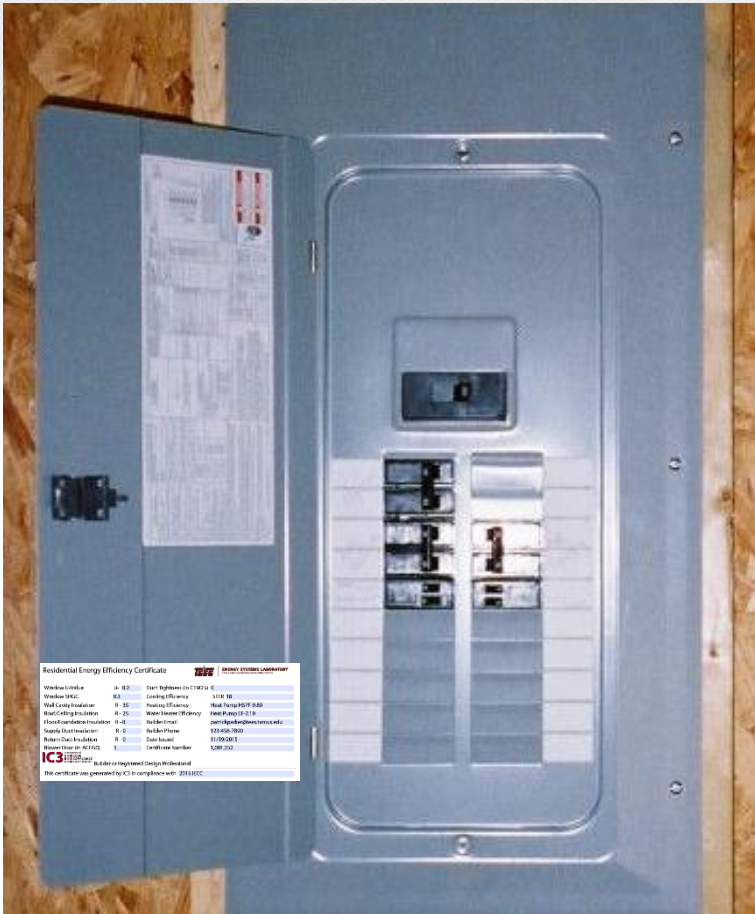


Certificate on Electrical Panel

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



New 2015 Version



Certificate on Electrical Panel

IC3 REGISTRY



Certificates

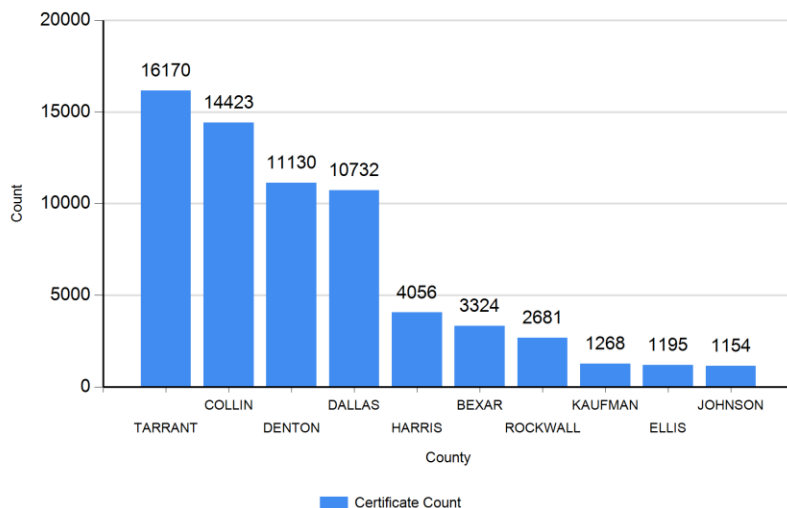
Jan. 2015 to Date: 23,728

Total to Date: 116,763

Top 10 Counties for 2009 to 2015

Top 10 Counties generating IC3 Certificates from

From 10/1/2009 to 11/16/2015



User Login

Welcome! This is publicly accessible energy code compliance software based on the Texas Building Energy Performance Standards. You must register a username and password in order to continue. You may then access your records using your user name and password.

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Setting the Standards for Quality



Average SEER Across Counties

Average A/C SEER across Counties for 2015

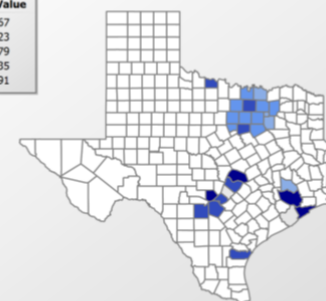
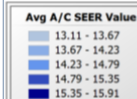
Overall data Statistics derived from a subset of Counties having house count > 10

	Average	Standard Deviation
Single Family	14.68	1.09
Multi Family	14.92	1.25

Single Family

County	Avg SEER Value	House Count
Brazoria	15.91	35
Fort bend	15.77	39
Kendall	15.75	16
Galveston	15.58	31
Williamson	15.43	84
Harris	15.37	778
Travis	15.35	806
Bexar	15.33	727
Nueces	15.32	159
San patricio	15.30	33
Wichita	15.22	18
Medina	14.93	14
Comal	14.91	109
Johnson	14.88	335
Denton	14.84	2189
Dallas	14.78	1941
Ellis	14.60	470
Collin	14.55	3103
Parker	14.41	219
Hunt	14.40	45
Hood	14.39	38
Tarrant	14.36	3998

A/C SEER Distribution



IC3 REGISTRY



Certificates

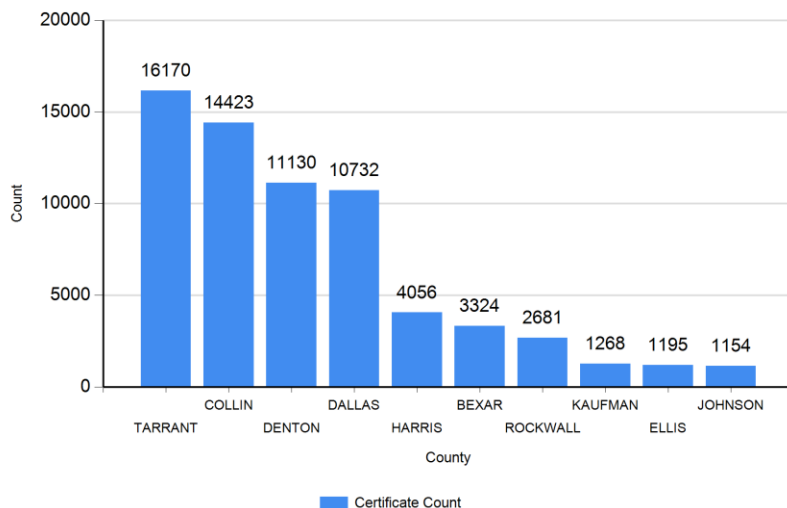
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Average SEER Across Counties

Average A/C SEER across Counties for 2015

Overall data Statistics derived from a subset of Counties having house count > 10

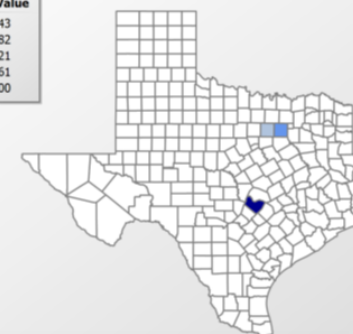
	Average	Standard Deviation
Single Family	14.68	1.09
Multi Family	14.92	1.25

Multi Family

County	Avg SEER Value	Unit Count
Travis	16.00	41
Dallas	15.03	109
Tarrant	14.03	62

A/C SEER Distribution

Avg A/C SEER Value
14.03 - 14.43
14.43 - 14.82
14.82 - 15.21
15.21 - 15.61
15.61 - 16.00



	Average
Single Family	14.68
Multi Family	14.92

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



Has an analysis been performed to determine actual measured energy savings (i.e., real utility bills)?

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



Yes!

Verification of Energy Savings from the Implementation of the Residential Building Codes in Texas

Juan-Carlos Baltazar, PhD, PE
Member ASHRAE

Chunliu Mao
Student Member ASHRAE

Jeff Habert, PhD, PE
Fellow ASHRAE

ABSTRACT

The International Energy Conservation Code (IECC) was adopted in 2001 by the State of Texas to help reduce annual heating and cooling loads in residential buildings. After 2006, the Texas Legislature required that the IECC 2006 be adopted and requested our Laboratory to track the annual energy savings and NOx emission reductions from the implementation of the Texas Building Energy Performance Standards (TBEPS). This paper discusses the verification of the energy savings from the implementation of the IECC 2000/2001 and IECC 2006 building codes in Texas using a utility bill analysis methodology. In the methodology, a sample of analyzed houses was carefully selected and separated into three groups of single-family residential houses that were constructed by the same builder, with very similar construction types. Each group was built in a different period to account for the impact of the different adopted codes. This study shows that the electricity savings from the application of the 2000/2001 IECC and the 2006 IECC are approximately 20% and 10%, respectively when compared to houses built to prior standards.

INTRODUCTION

The significance that the energy codes implementation has brought to the reduced energy use in residences has been mentioned in many forums; however, few studies have quantified what savings these code adoptions have provided. Texas, as in many other states in the U.S., has participated in the application of the energy codes since 2001, not just with the objective of the energy efficiency, but also to encourage the reduction of NOx emissions by electricity providers due to the more stringent building energy codes. For those reasons, Texas adopted the 2000 International Energy Conservation Code (IECC) with the 2001 supplement, as its first state-wide building energy code. Since then, several local amendments to the IECC have been adopted by the different municipalities in the state. Currently, most of the residential homes in Texas abide by several versions that are more stringent than the IECC 2006 building energy code. The IECC 2000/2001 and IECC 2006 versions, were the codes that took the first steps to address the residential energy efficiency from the design of building thermal envelope and systems (IECC, 2000, 2001, and 2006). The Texas Legislature has also requested annual tracking and reporting of the energy savings and emissions reductions. Typically, the calculations of residential and commercial energy savings and emission reductions are performed using certified code-compliance simulations (Habert et al., 2009), since there is no statewide measured residential energy use records.

This paper presents a methodology that was used to verify the energy savings from the impact of the implementation

Juan-Carlos Baltazar is a Research Engineer of the Energy Systems Laboratory of the Texas A&M University and Member ASHRAE. Chunliu Mao is a Ph.D. student and Student Member ASHRAE. Jeff Habert, is professor of Department of Architecture at Texas A&M University and Associate Director of Energy Systems Laboratory, and a Fellow ASHRAE.

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



The Laboratory has analyzed actual utility bills from 2003 – 2009 in College Station for the same builder in the same subdivision using the Princeton Scorekeeping method and a three parameter analysis*.

*Results published in the 2014 ASHRAE Transactions.

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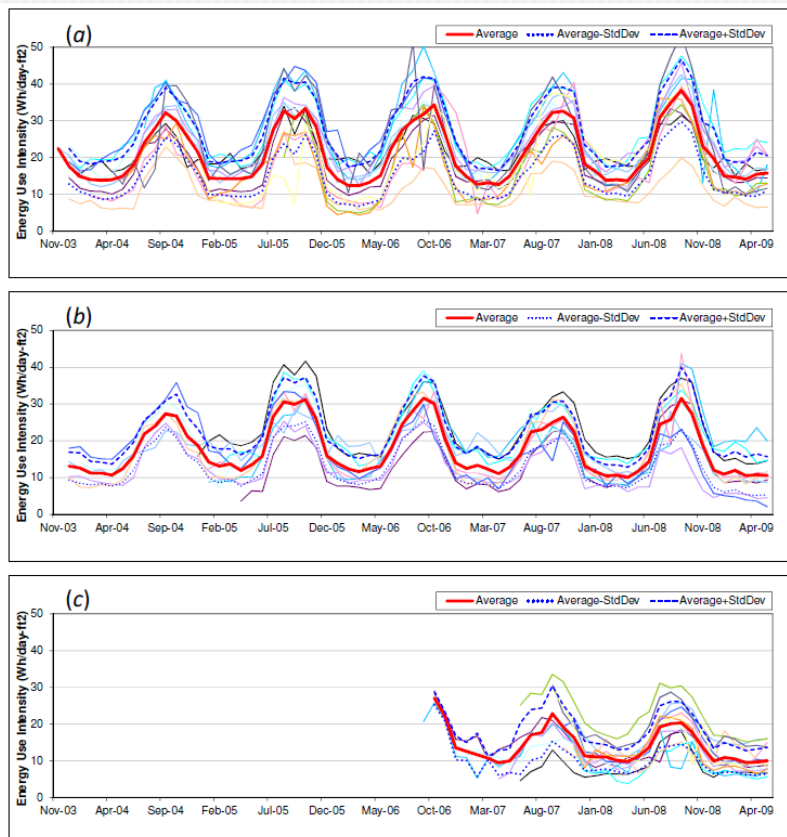
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SAVINGS FROM CODE COMPLIANT CONSTRUCTION



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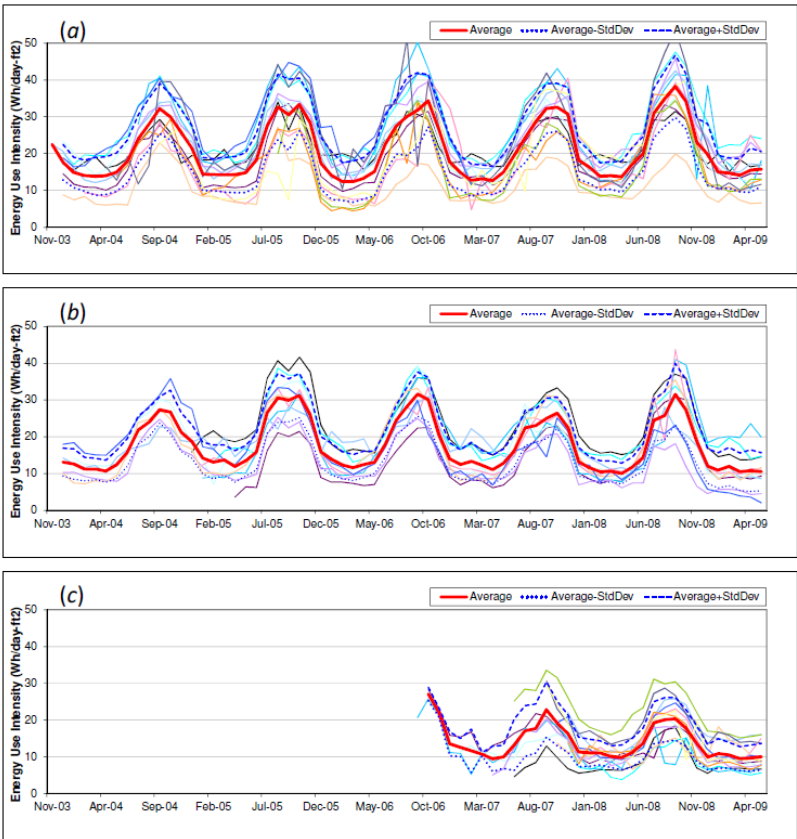
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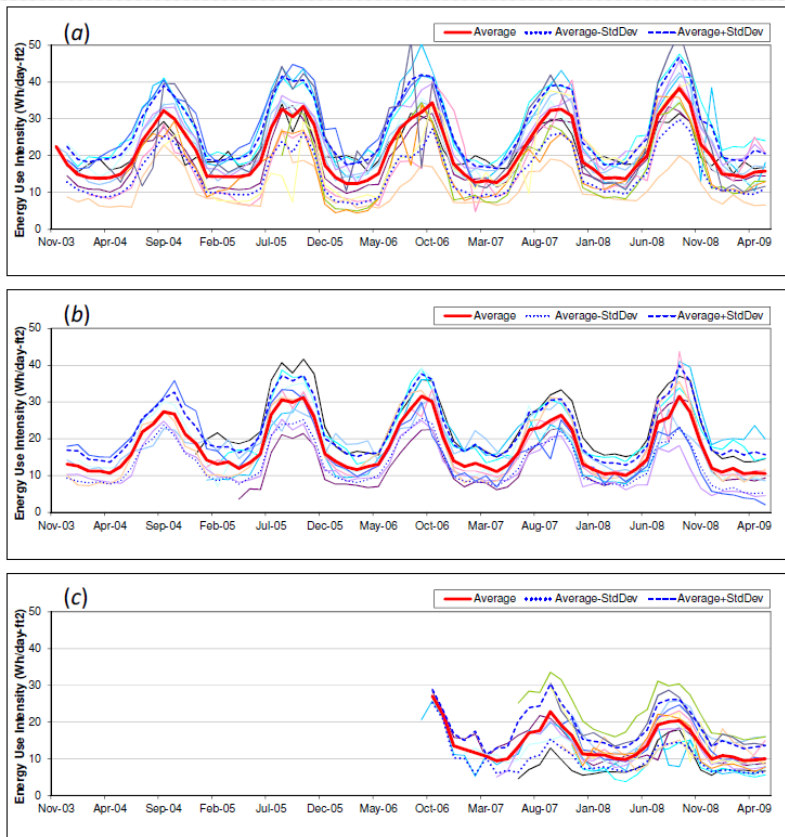
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SAVINGS FROM CODE COMPLIANT CONSTRUCTION



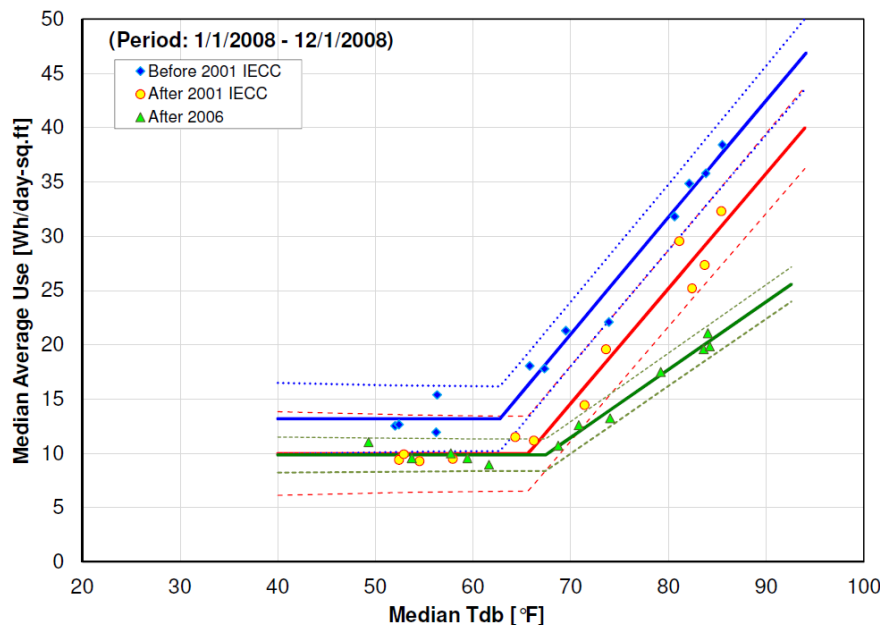
SAVINGS FROM CODE COMPLIANT CONSTRUCTION



This analysis looked at houses built:

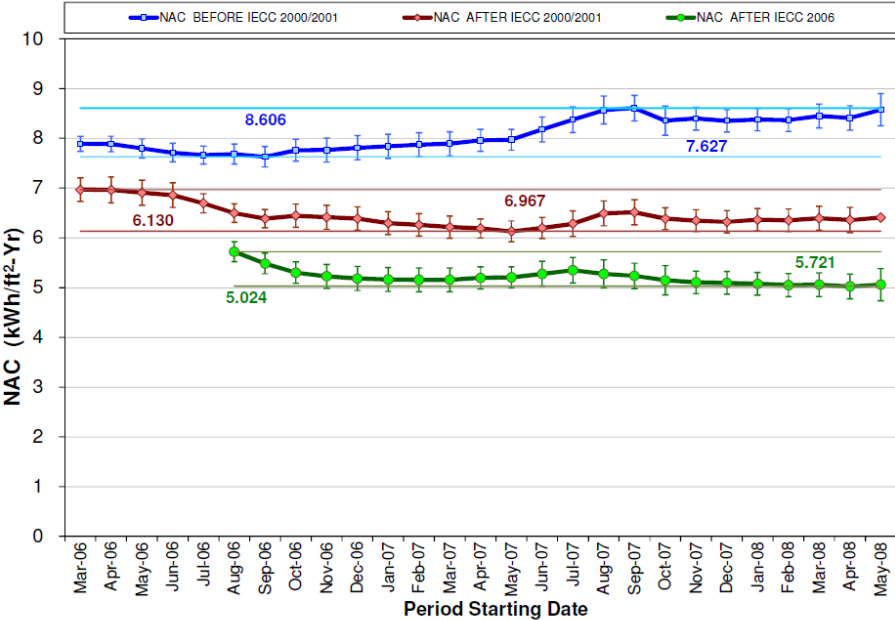
- before 2001
- after the 2001 IECC and
- after the 2006 IECC (SEER 13)

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



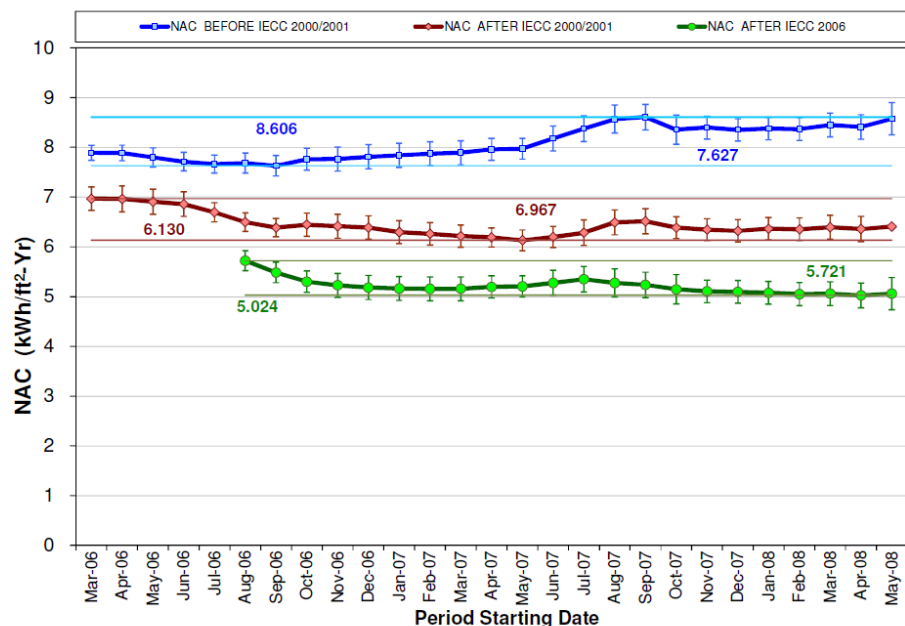
The results showed:
electricity savings from the
the 2000/2001 IECC and the
2006 IECC were 20% and
19%, respectively when
compared to houses built
prior to the code.

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



The results showed: electricity savings from the the 2000/2001 IECC and the 2006 IECC were 20% and 19%, respectively when compared to houses built prior to the code.

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



These results match simulations performed with IC3 simulations.

User Login

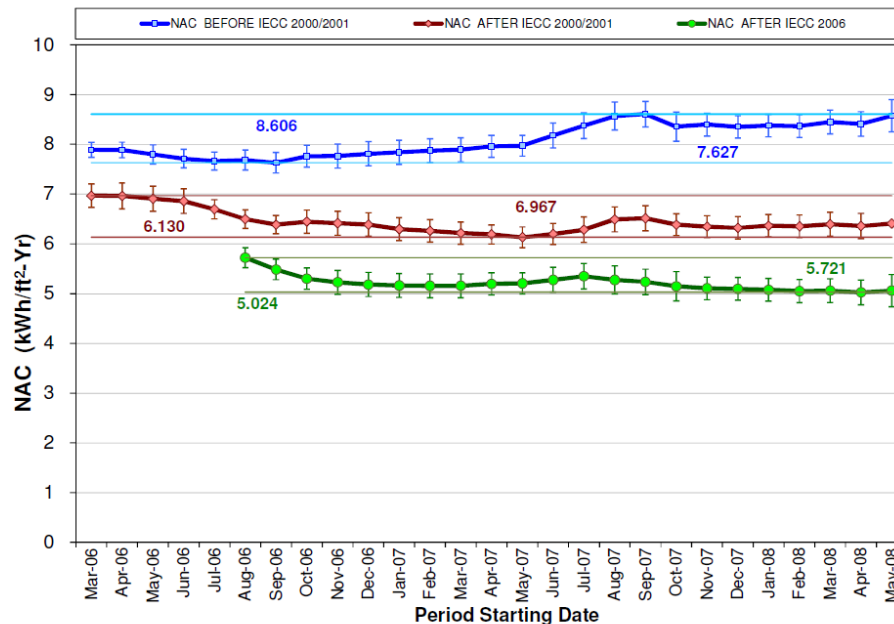
Welcome! This is publicly accessible energy code compliance software based on the Texas Building Energy Performance Standards. You must register a username and password in order to continue. You may then access your records using your user name and password.

Email Address:




Password:

[Register](#) [Forgot Password](#)

SAVINGS FROM CODE COMPLIANT CONSTRUCTION



Results for the 2009 IECC are currently underway.

User Login





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Email Address:

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[Register](#) [Forgot Password](#)

New API for IC3

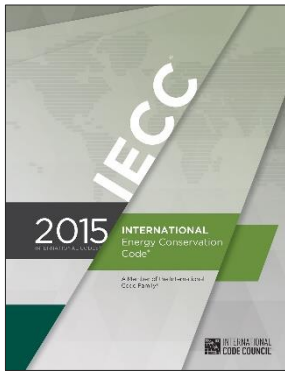
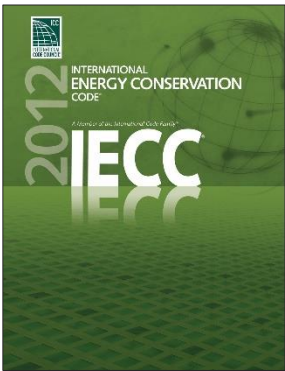
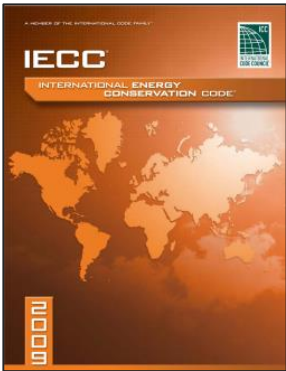
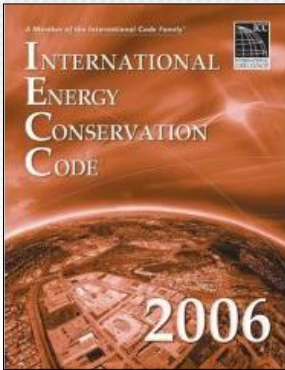
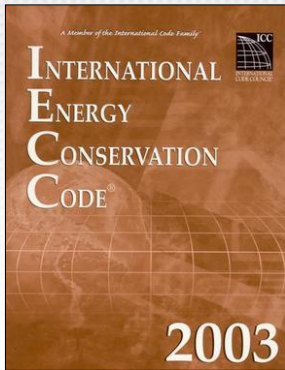
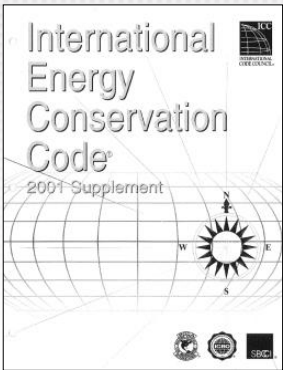
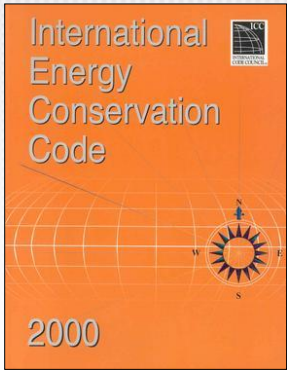


Benefits from API:

- Single screen allowing access to the same DOE-2 model used by the IC3 webpage
- Tablet/iPad/iPhone friendly
- XML input/output
- Easily integrated into existing **third party software**

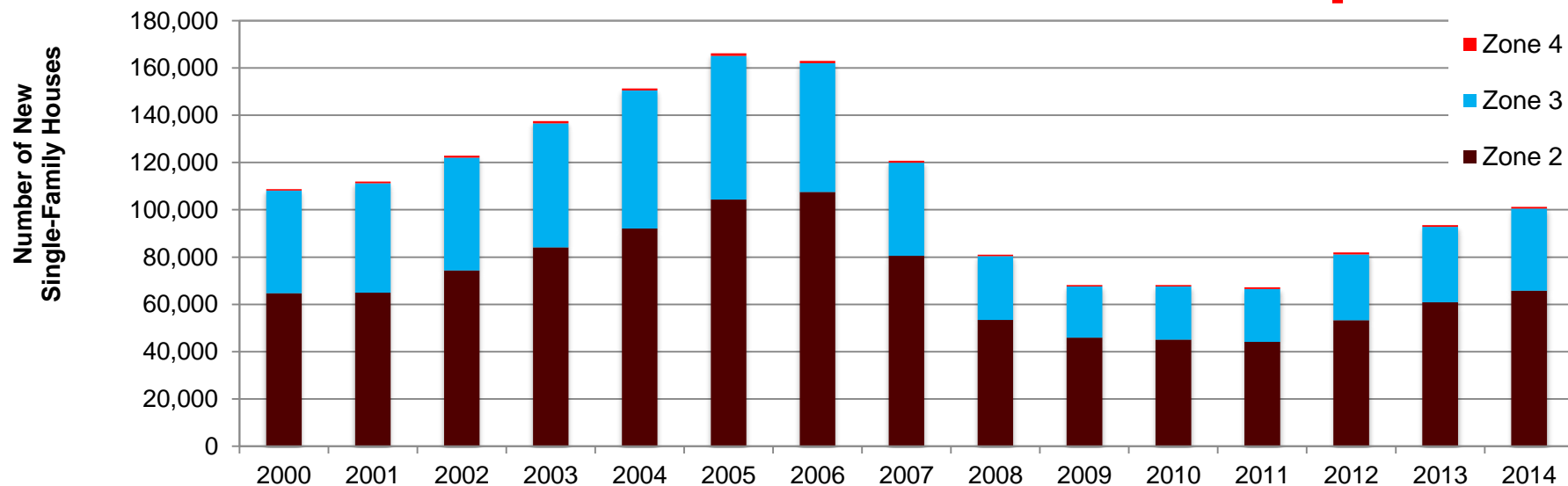
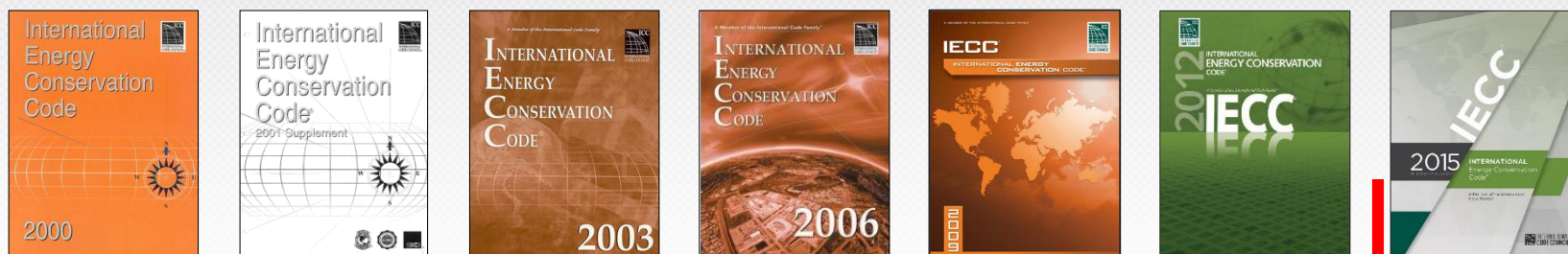
STATEWIDE SAVINGS FROM CODE COMPLIANCE (2000 – 2014)

How much electricity has been saved from residential code compliance for all single-family housing 2000-2014?



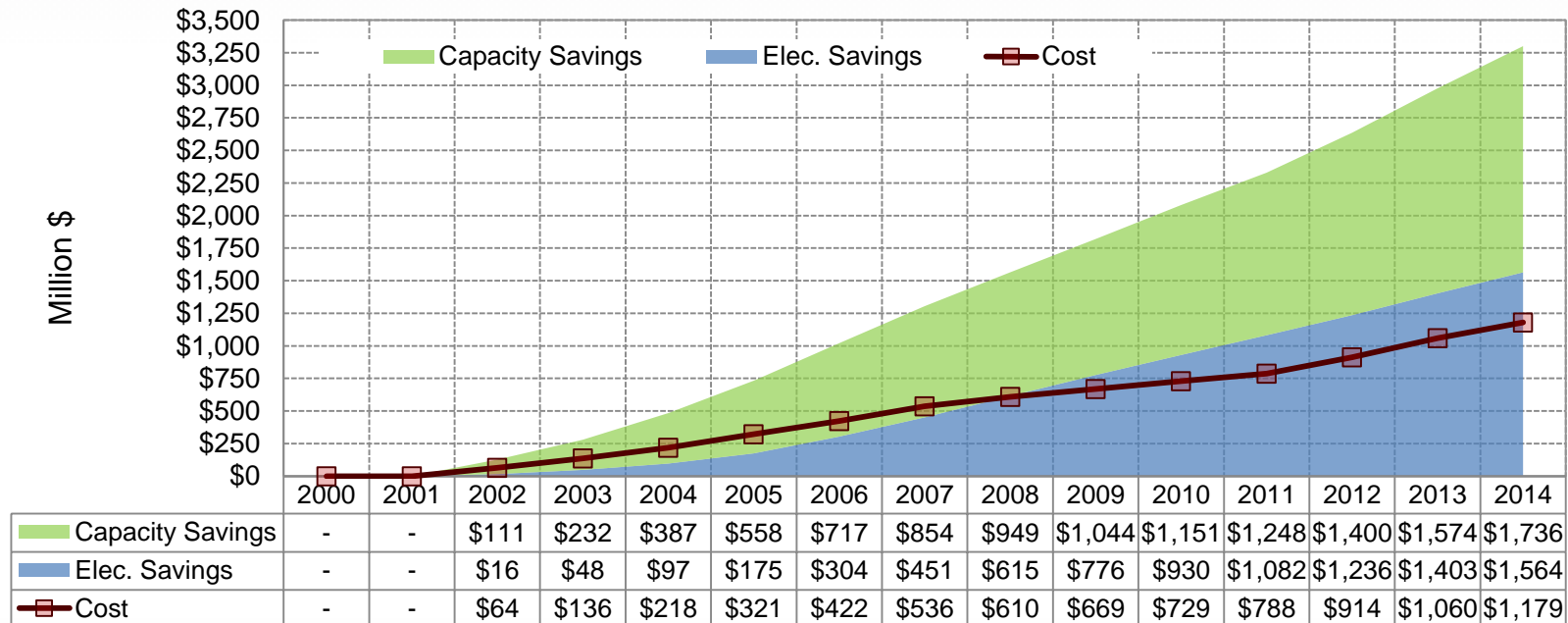
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STATEWIDE SAVINGS FROM CODE COMPLIANCE 2000 – 2014 (ESTIMATED)

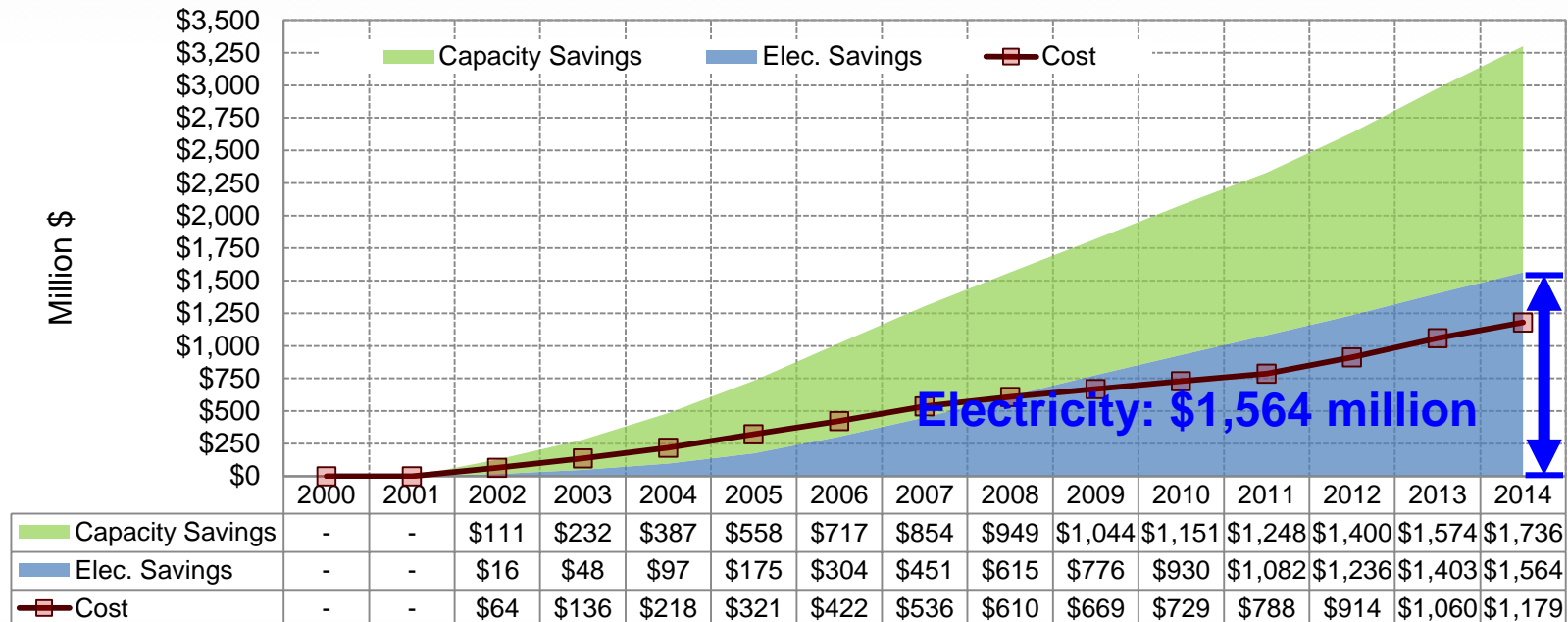
Savings (2002 to 2014)



STATEWIDE SAVINGS FROM CODE COMPLIANCE 2000 – 2014 (ESTIMATED)

Savings (2002 to 2014)

Electricity - \$1,564 million

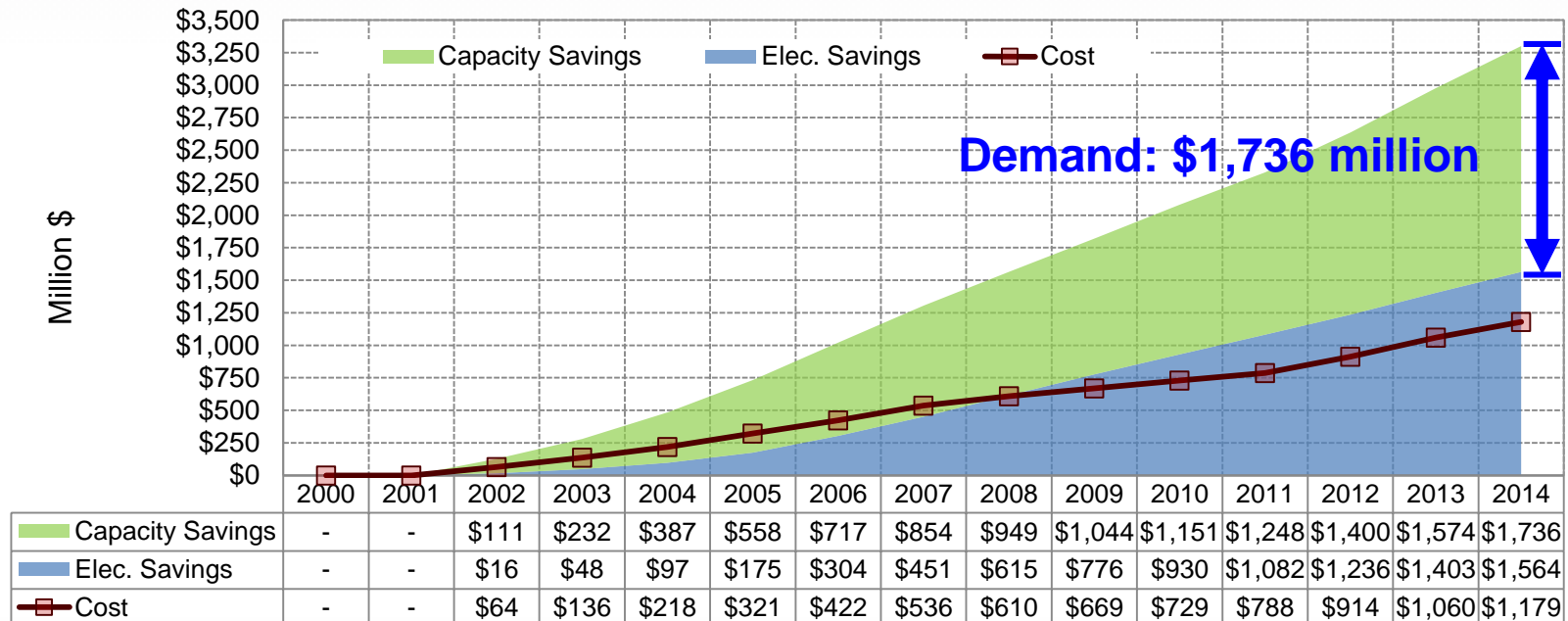


STATEWIDE SAVINGS FROM CODE COMPLIANCE 2000 – 2014 (ESTIMATED)

Savings (2002 to 2014)

Electricity - \$1,564 million

Demand - \$1,736 million



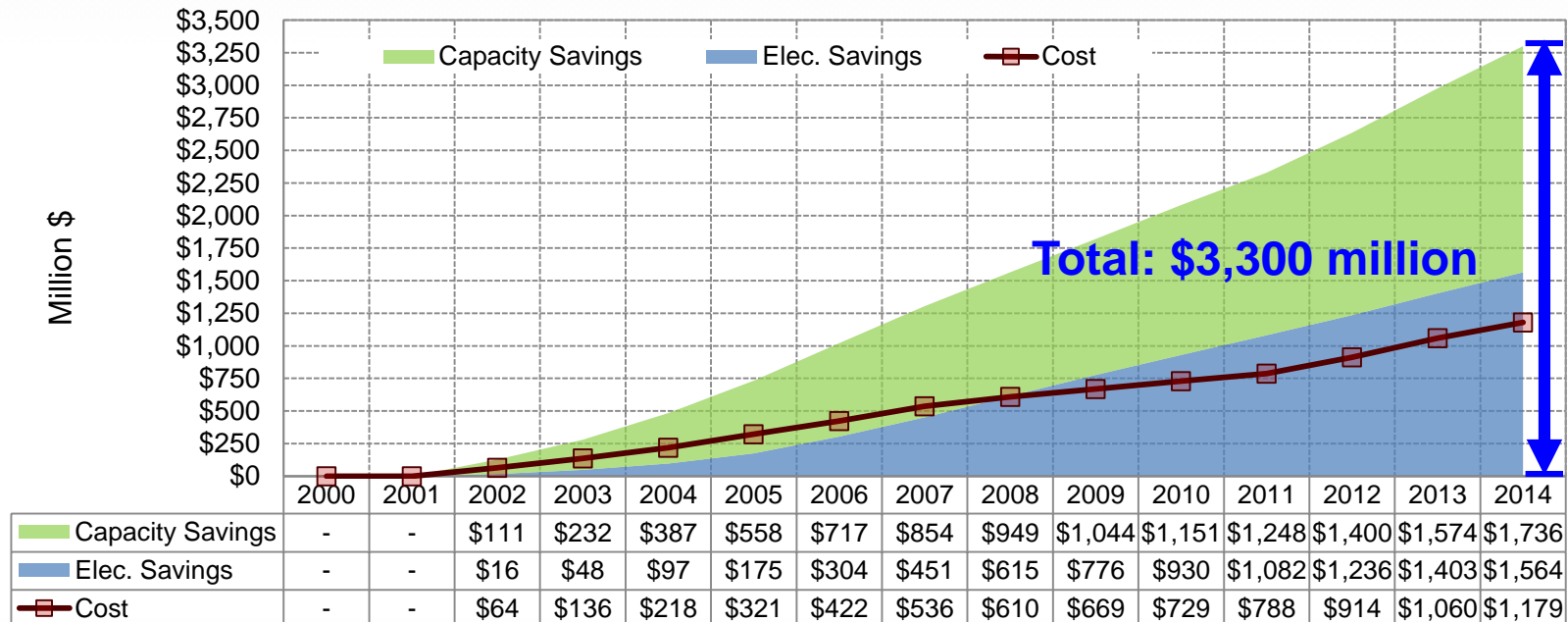
STATEWIDE SAVINGS FROM CODE COMPLIANCE 2000 – 2014 (ESTIMATED)

Savings (2002 to 2014)

Electricity - \$1,564 million

Demand - \$1,736 million

Total - \$3,300 million



STATEWIDE SAVINGS FROM CODE COMPLIANCE 2000 – 2014 (ESTIMATED)

Savings (2002 to 2014)

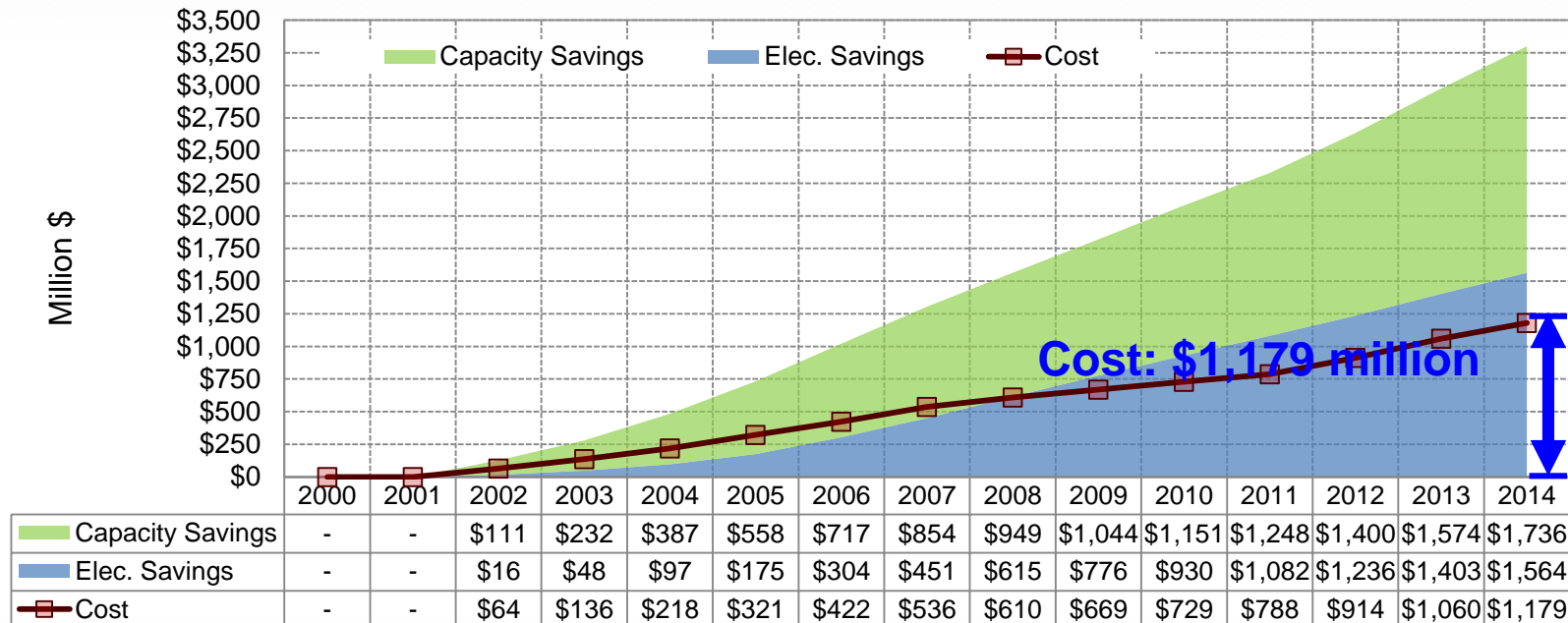
Electricity - \$1,564 million

Demand - \$1,736 million

Total - \$3,300 million

Increased Costs (2002 to 2014)

Costs - \$ 1,179 million



STATEWIDE SAVINGS FROM CODE COMPLIANCE 2000 – 2014 (ESTIMATED)

Savings (2002 to 2014)

Electricity - \$1,564 million

Demand - \$1,736 million

Total - \$3,300 million

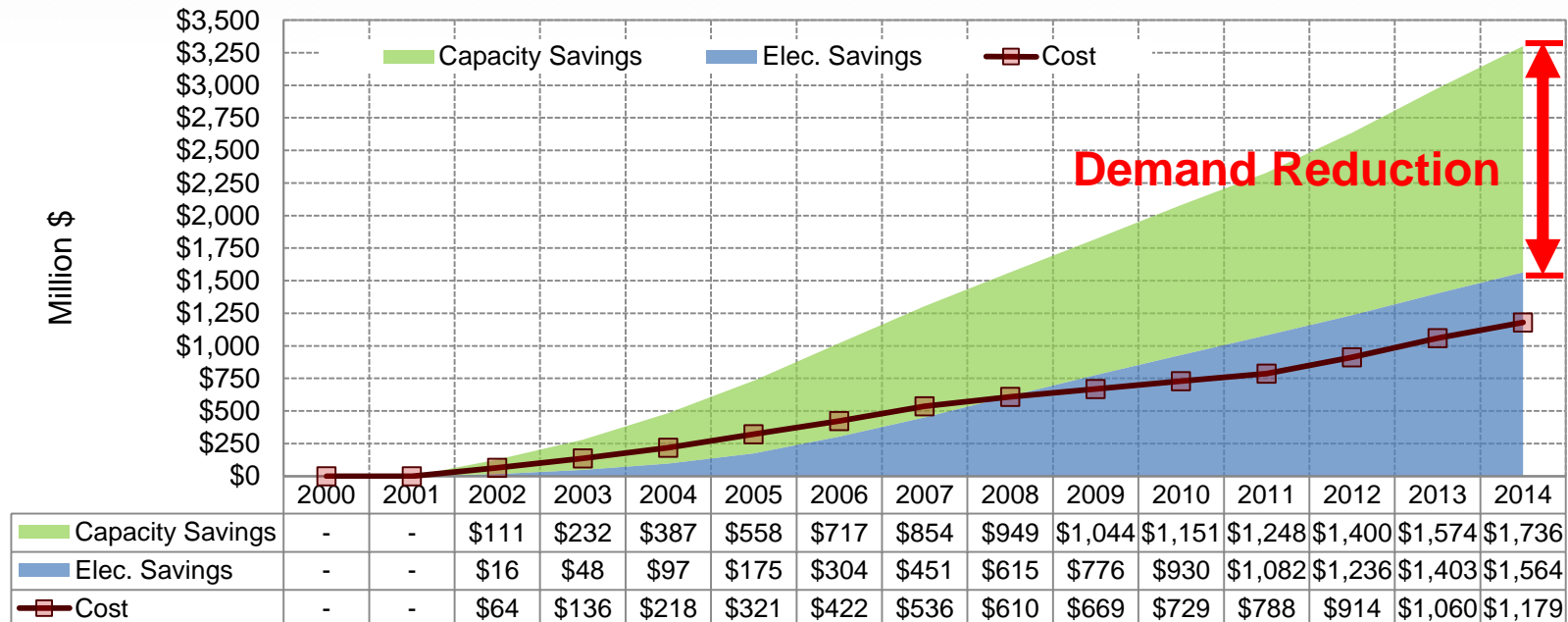
Demand Reduction in 2014

1,265.8 MW

More than one power plant

Increased Costs (2002 to 2014)

Costs - \$ 1,179 million



STATEWIDE SAVINGS FROM CODE COMPLIANCE 2000 – 2014 (ESTIMATED)

Savings (2002 to 2014)

Electricity - \$1,564 million

Demand - \$1,736 million

Total - \$3,300 million

Demand Reduction in 2014

1,265.8 MW

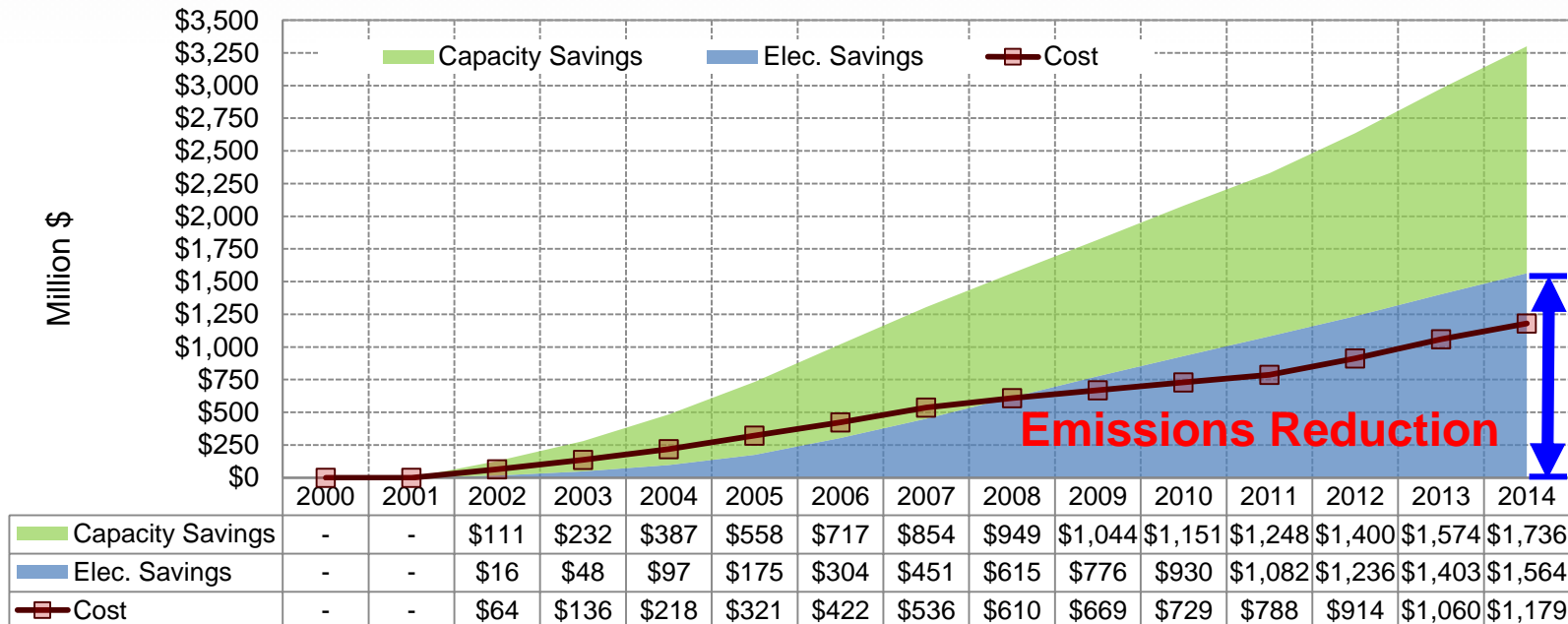
More than one power plant

Emissions Reduction in 2014

190 tons-NOx/year,
(About 20,742 cars)

Increased Costs (2002 to 2014)

Costs - \$ 1,179 million



STATEWIDE WATER SAVINGS AT POWER PLANTS 2002~2014

Electricity/Water Savings from SF (Code Compliance)



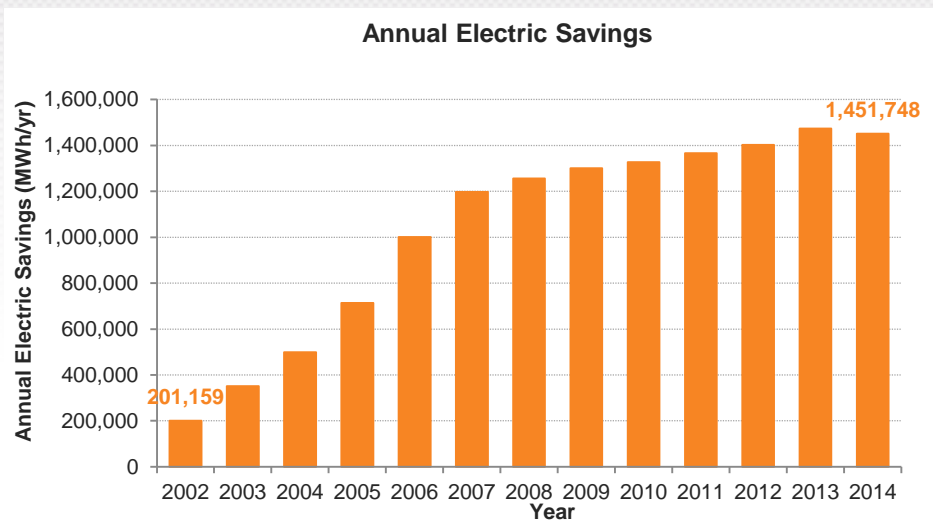
STATEWIDE WATER SAVINGS AT POWER PLANTS 2002~2014

Electricity/Water Savings from SF (Code Compliance)



STATEWIDE WATER SAVINGS AT POWER PLANTS 2002~2014

Electricity/Water Savings from SF (Code Compliance)

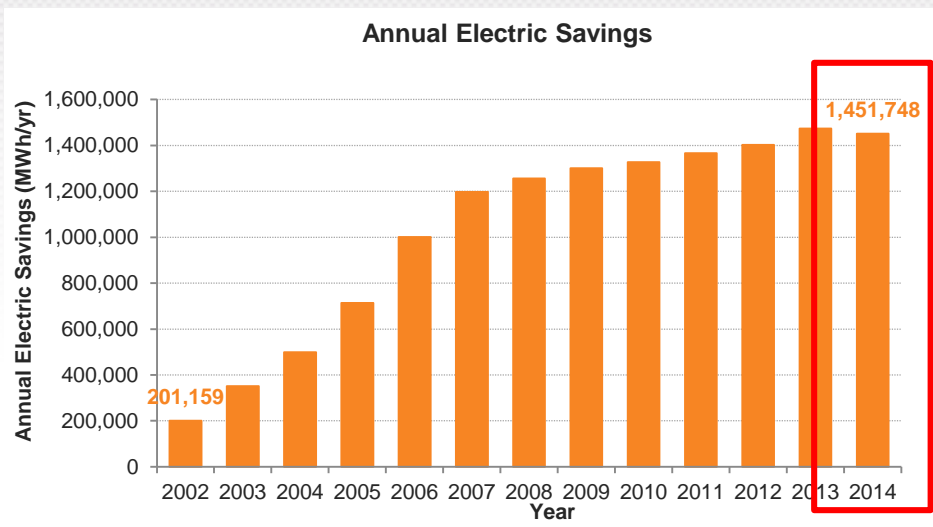


2014 Total
 Electricity Savings
 (MWh/yr)

1,451,784

STATEWIDE WATER SAVINGS AT POWER PLANTS 2002~2014

Electricity/Water Savings from SF (Code Compliance)

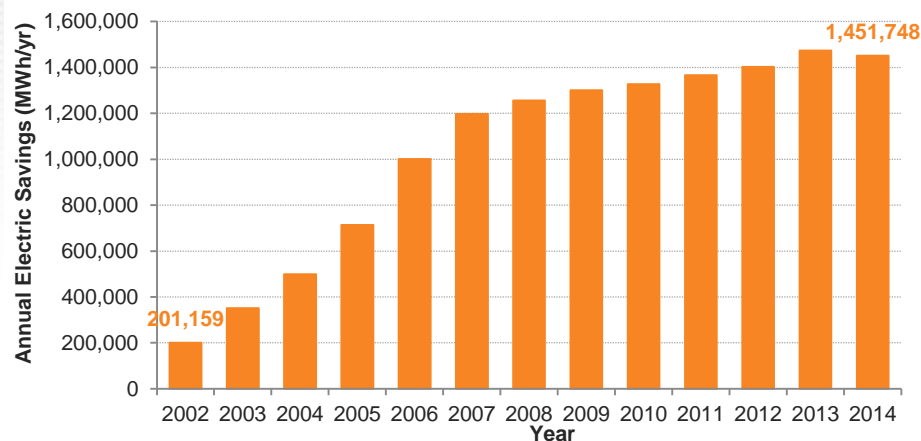


2014 Total Electricity Savings (MWh/yr)
1,451,784

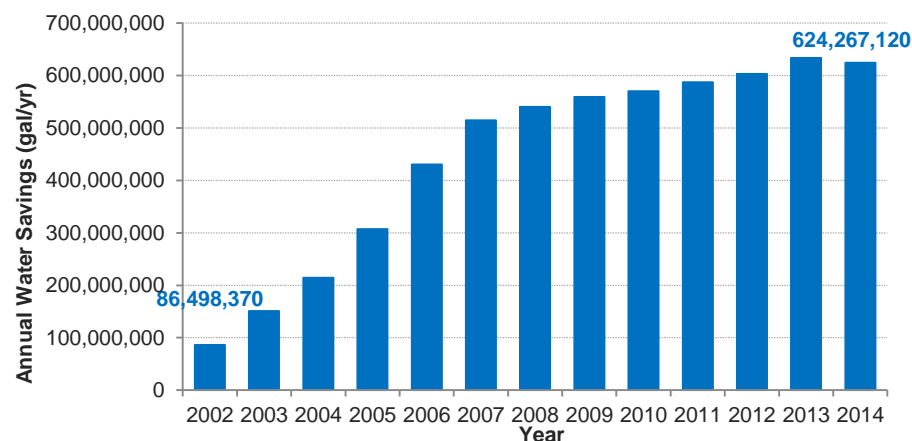
STATEWIDE WATER SAVINGS AT POWER PLANTS 2002~2014

Electricity/Water Savings from SF (Code Compliance)

Annual Electric Savings



Annual Water Savings



2014 Total
Electricity Savings

(MWh/yr)

1,451,784

2014 Total
Water Savings

(gal/yr)

624,267,120

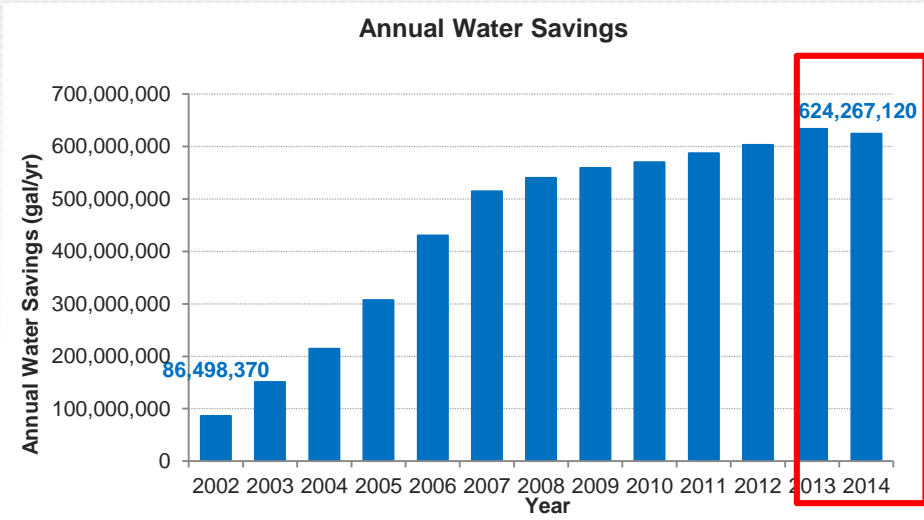
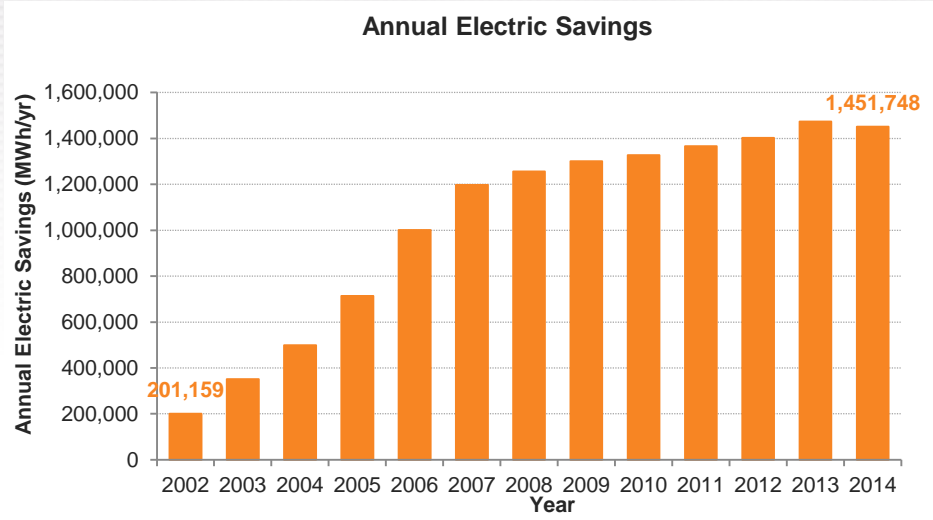
(acre-ft/yr)

1,916

Conversion Factors: 430 gal/MWh
325,851 gal/acre-ft

STATEWIDE WATER SAVINGS AT POWER PLANTS 2002~2014

Electricity/Water Savings from SF (Code Compliance)



2014 Total Electricity Savings	2014 Total Water Savings	
(MWh/yr)	(gal/yr)	(acre-ft/yr)
1,451,784	624,267,120	1,916

Conversion Factors: 430 gal/MWh
 325,851 gal/acre-ft

SAVINGS FROM RENEWABLES

420 Panel Solar PV Array In Waco, TX



Solar PV

Army Residence Community, San Antonio



Solar Thermal

Dam at Elephant Butte, El Paso, TX



Hydro

2.5 Miles Southwest of Woodville, TX



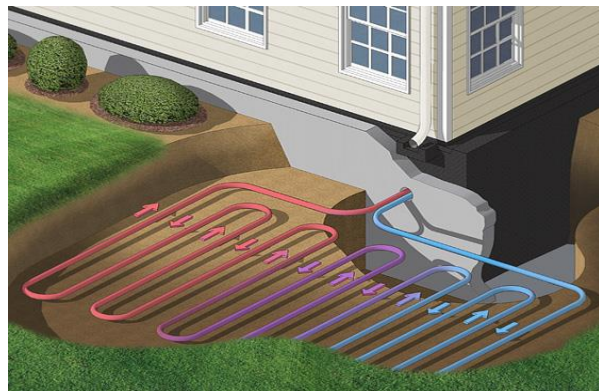
Biomass

Aspen Power plant in Lufkin, TX



Landfill Gas

Ground Source Heat Pump



Geothermal

SAVINGS FROM RENEWABLES



Solar PV

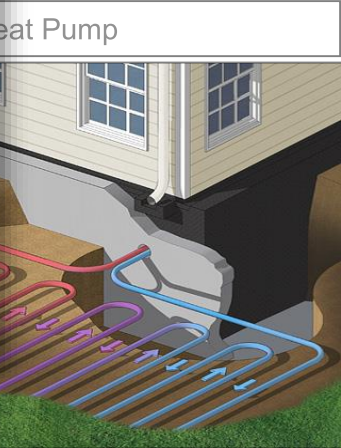


Hydro



Wind

Forest Creek Wind Farm, TX.



Biomass

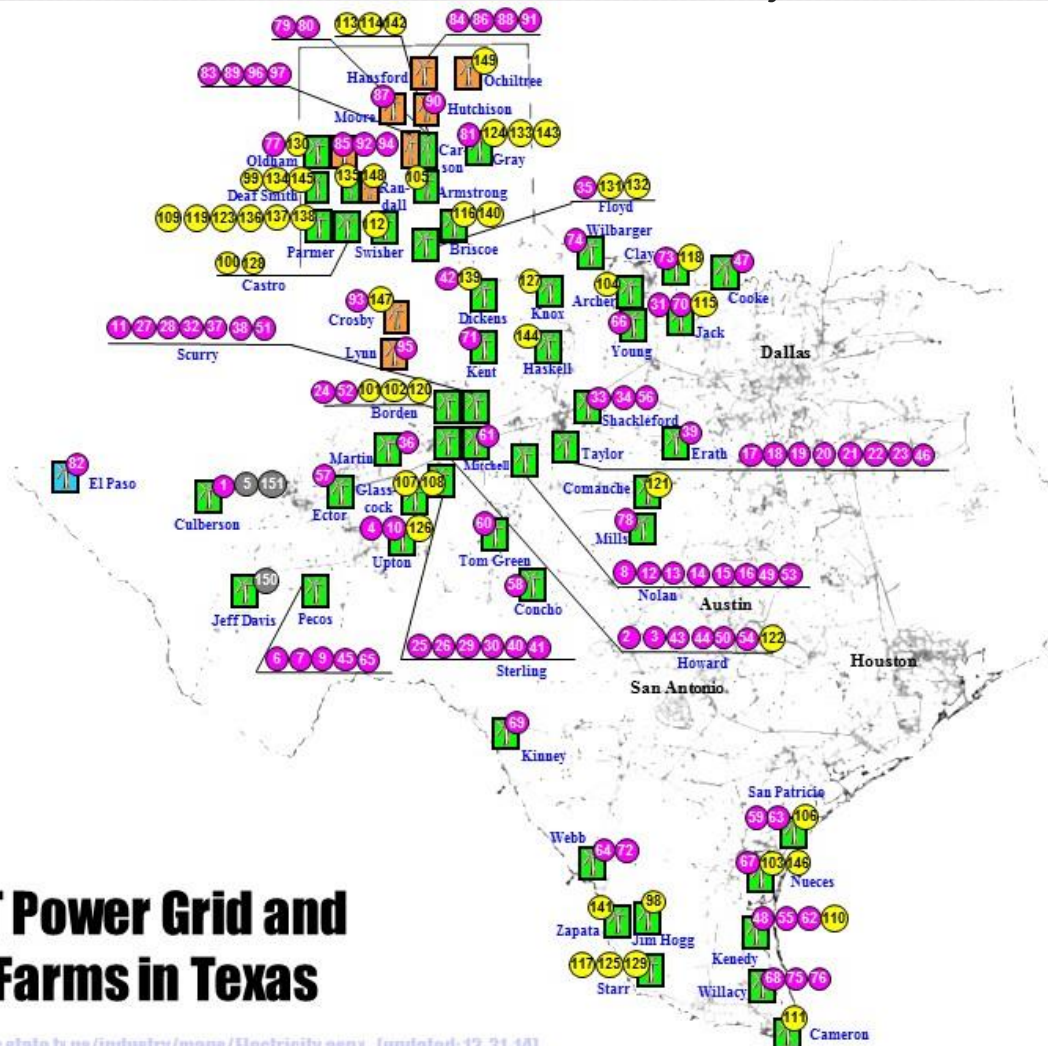


Landfill Gas

Geothermal

WIND PROJECTS IN TEXAS (2014)

Completed, Announced, and Retired Wind Projects in Texas, as of Dec. 2014

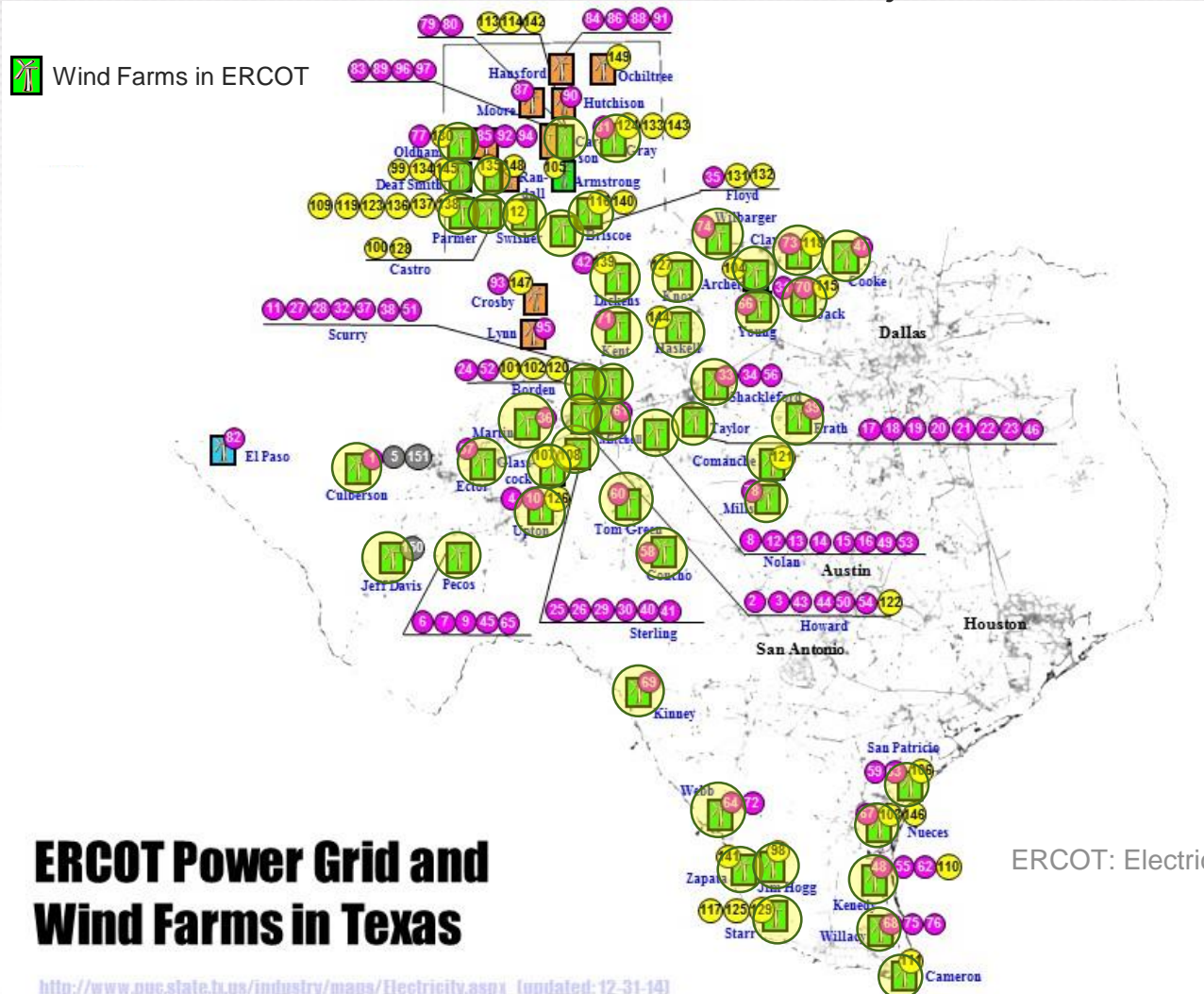


**ERCOT Power Grid and
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<http://www.puc.state.tx.us/industry/maps/Electricity.aspx> (updated: 12-31-14)

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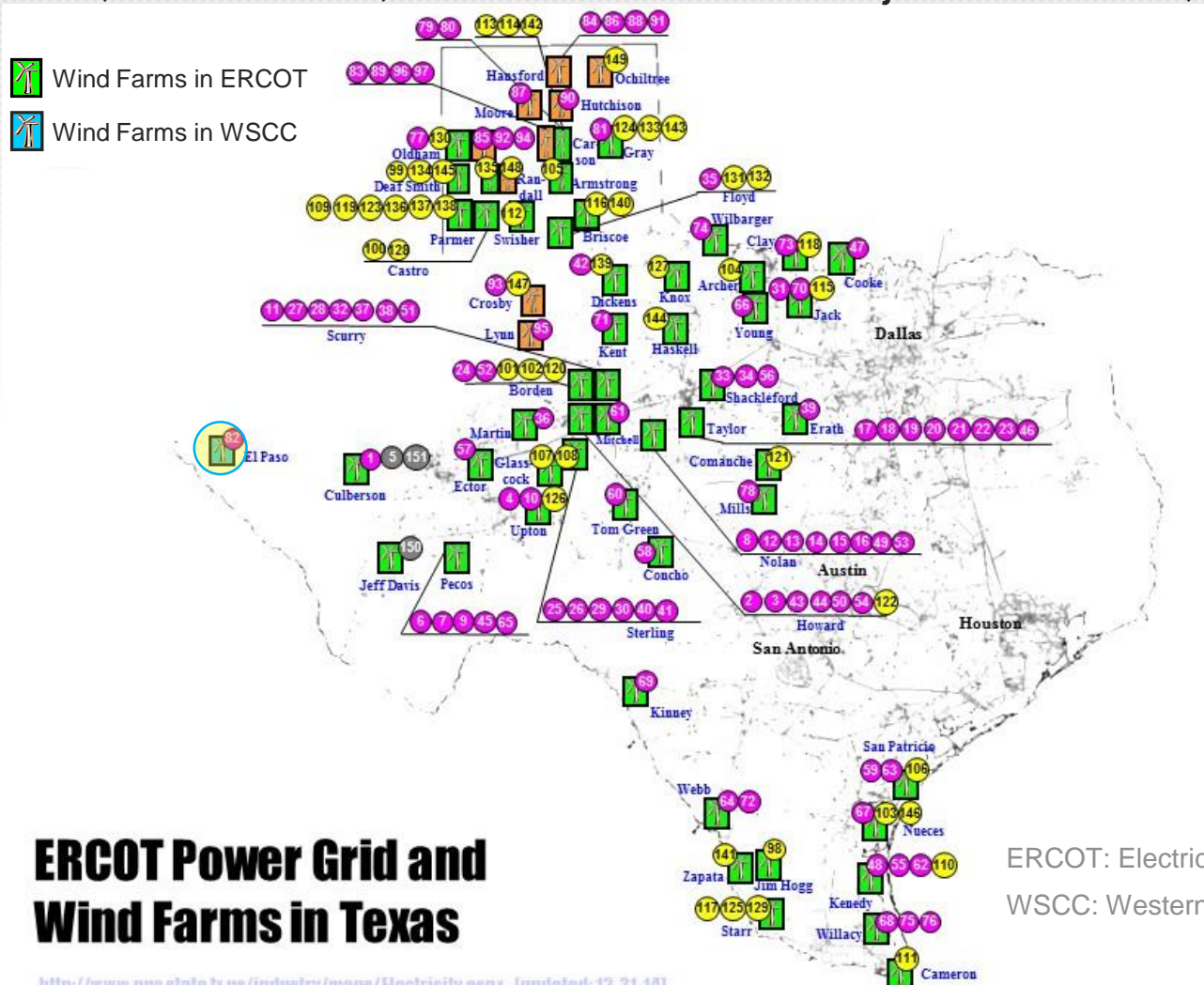


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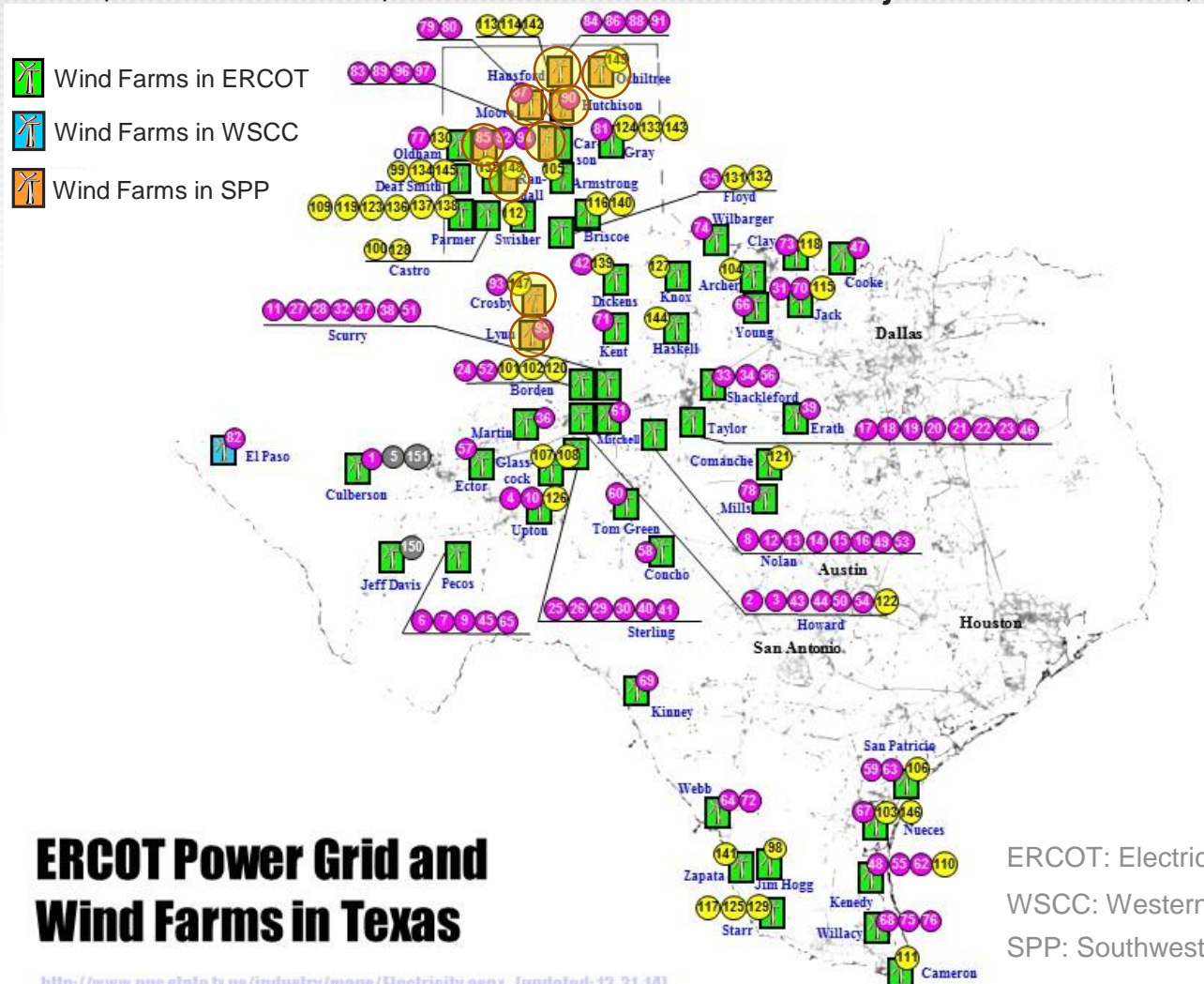


ERCOT: Electric Reliability Council of Texas
WSCC: Western Systems Coordinating Council

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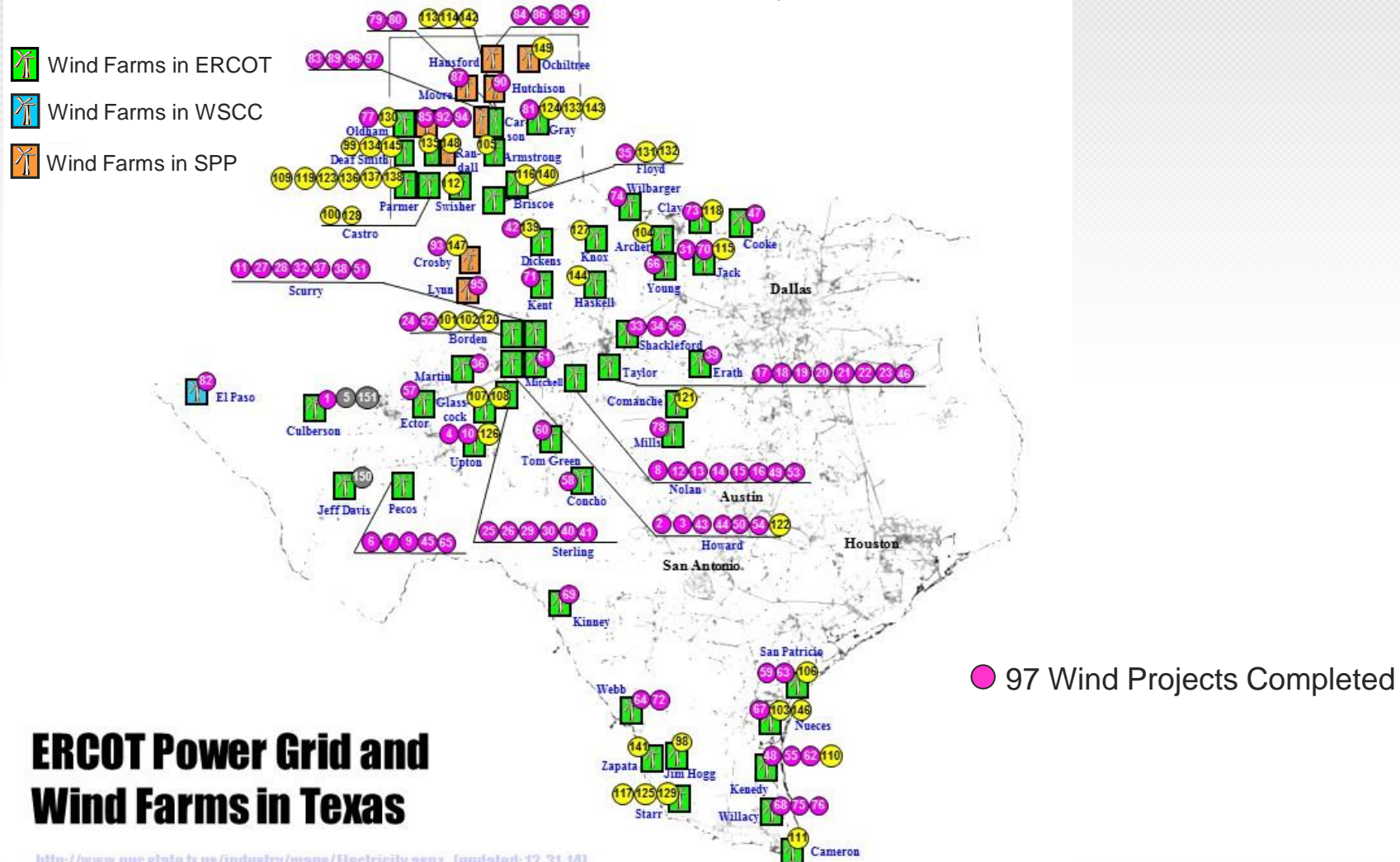
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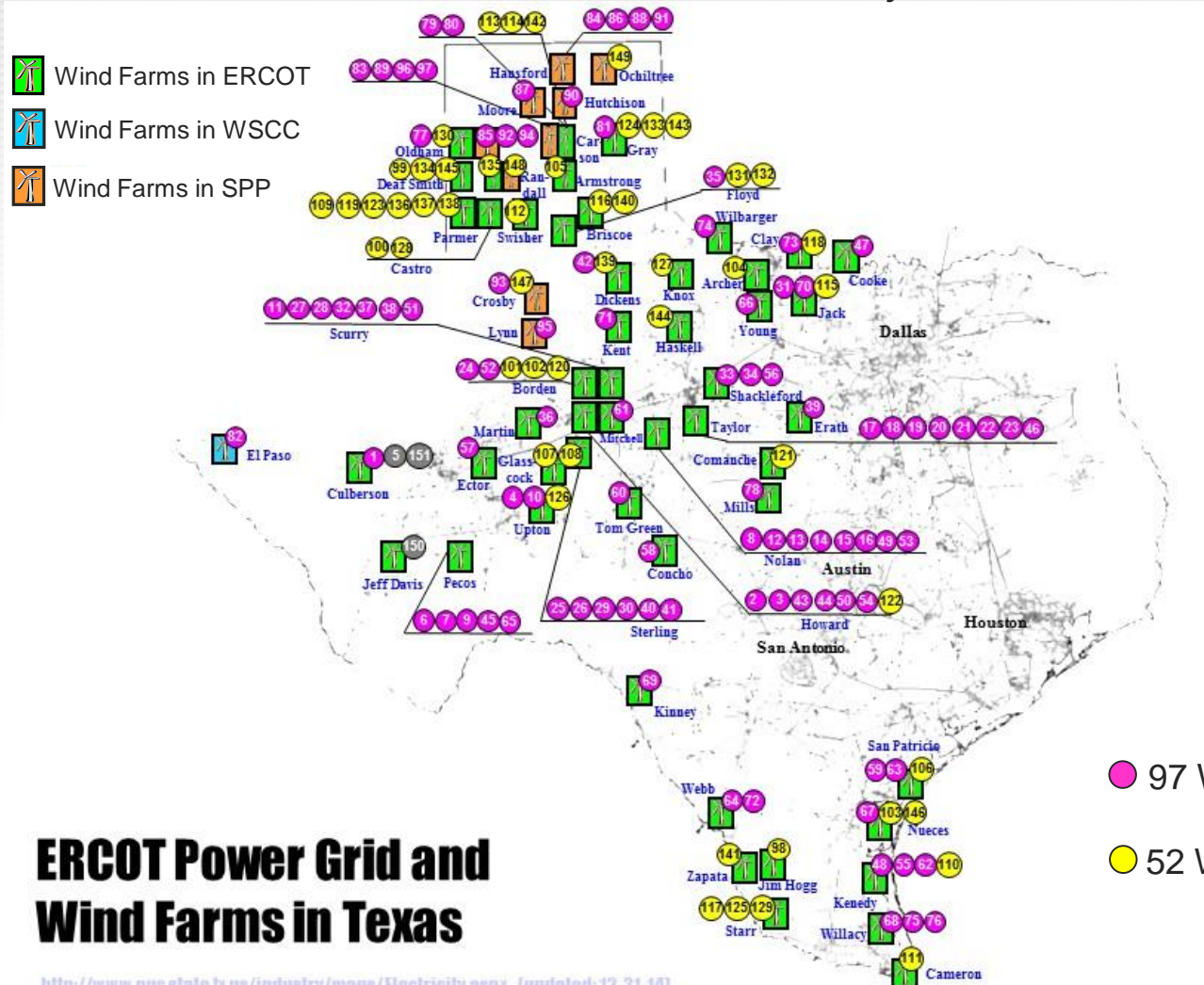
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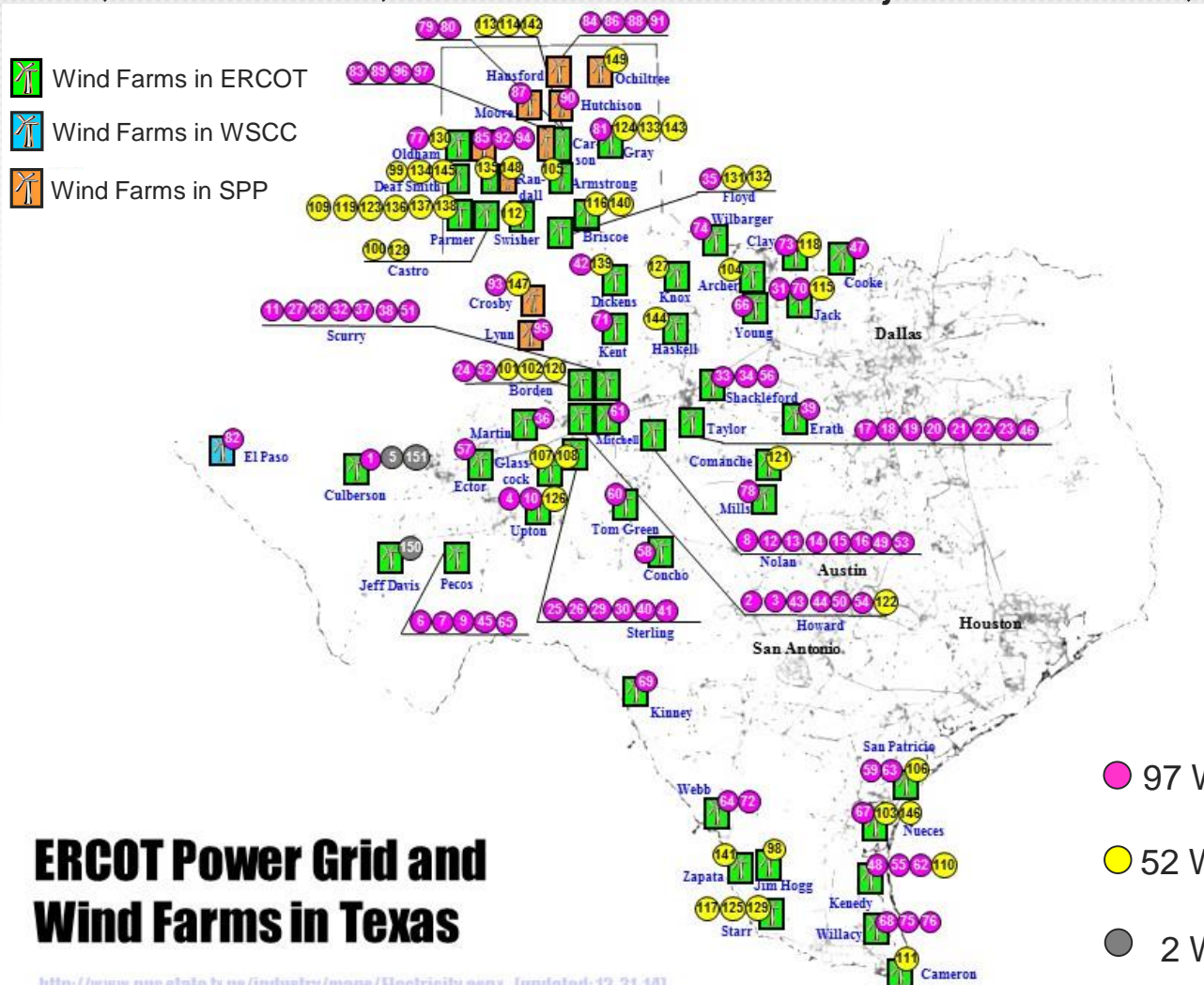
**ERCOT Power Grid and
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<http://www.puc.state.tx.us/industry/maps/Electricity.aspx> (updated: 12-31-14)

- 97 Wind Projects Completed
- 52 Wind Projects Announced

WIND PROJECTS IN TEXAS (2014)

Completed, Announced, and Retired Wind Projects in Texas, as of Dec. 2014

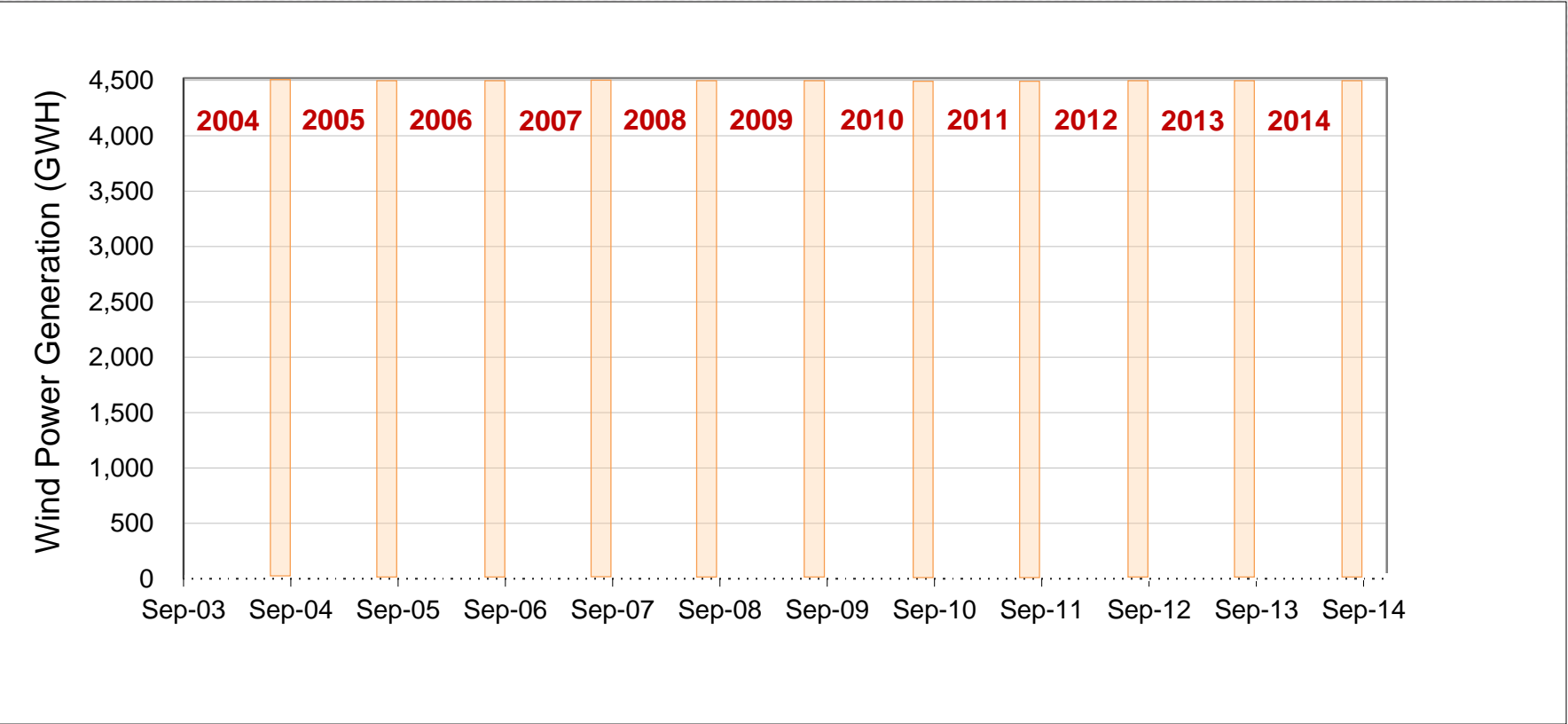


**ERCOT Power Grid and
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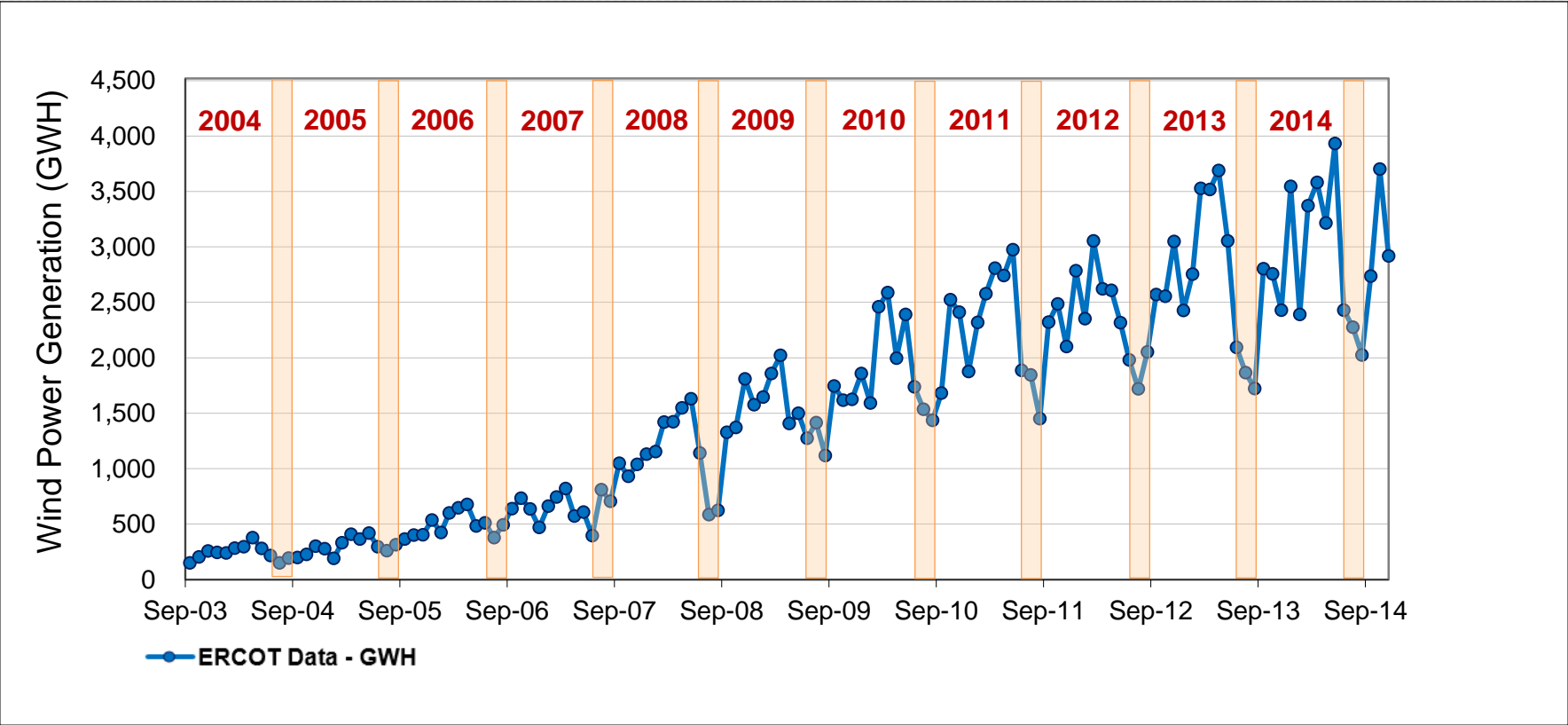
<http://www.puc.state.tx.us/industry/maps/Electricity.aspx> (updated: 12-31-14)

- 97 Wind Projects Completed
- 52 Wind Projects Announced
- 2 Wind Project Retired

WIND PROJECTS IN TEXAS (2014)

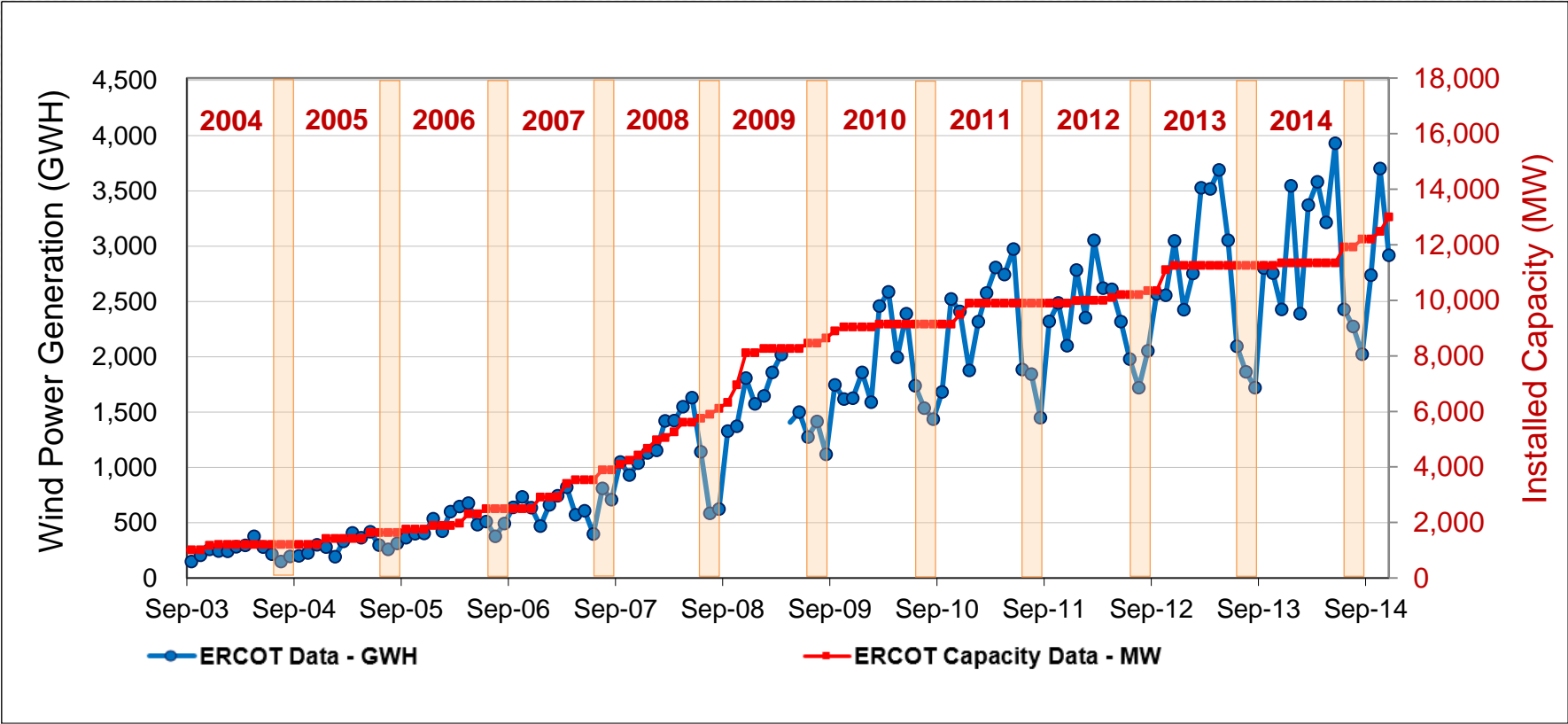


WIND PROJECTS IN TEXAS (2014)



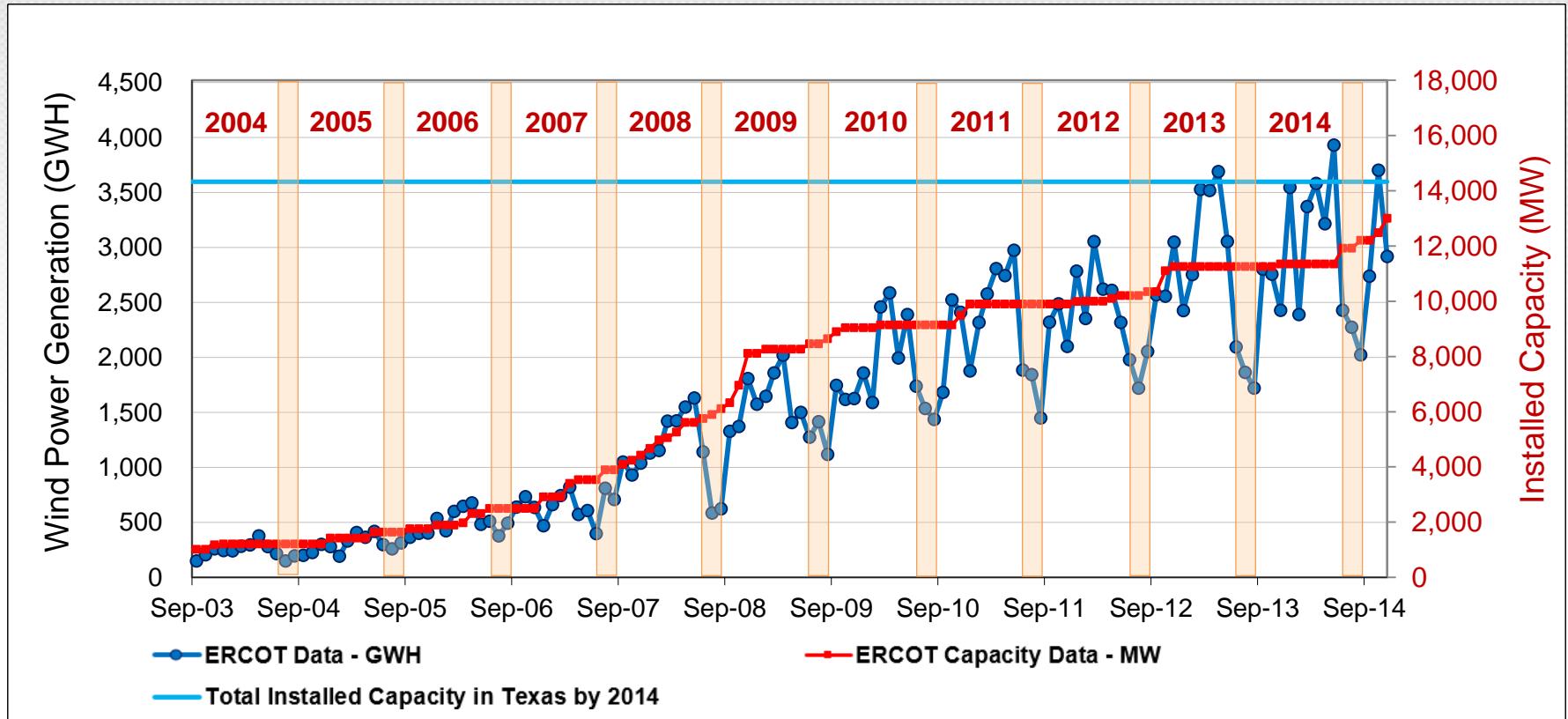
Substantial increases in measured electricity from wind energy

WIND PROJECTS IN TEXAS (2014)



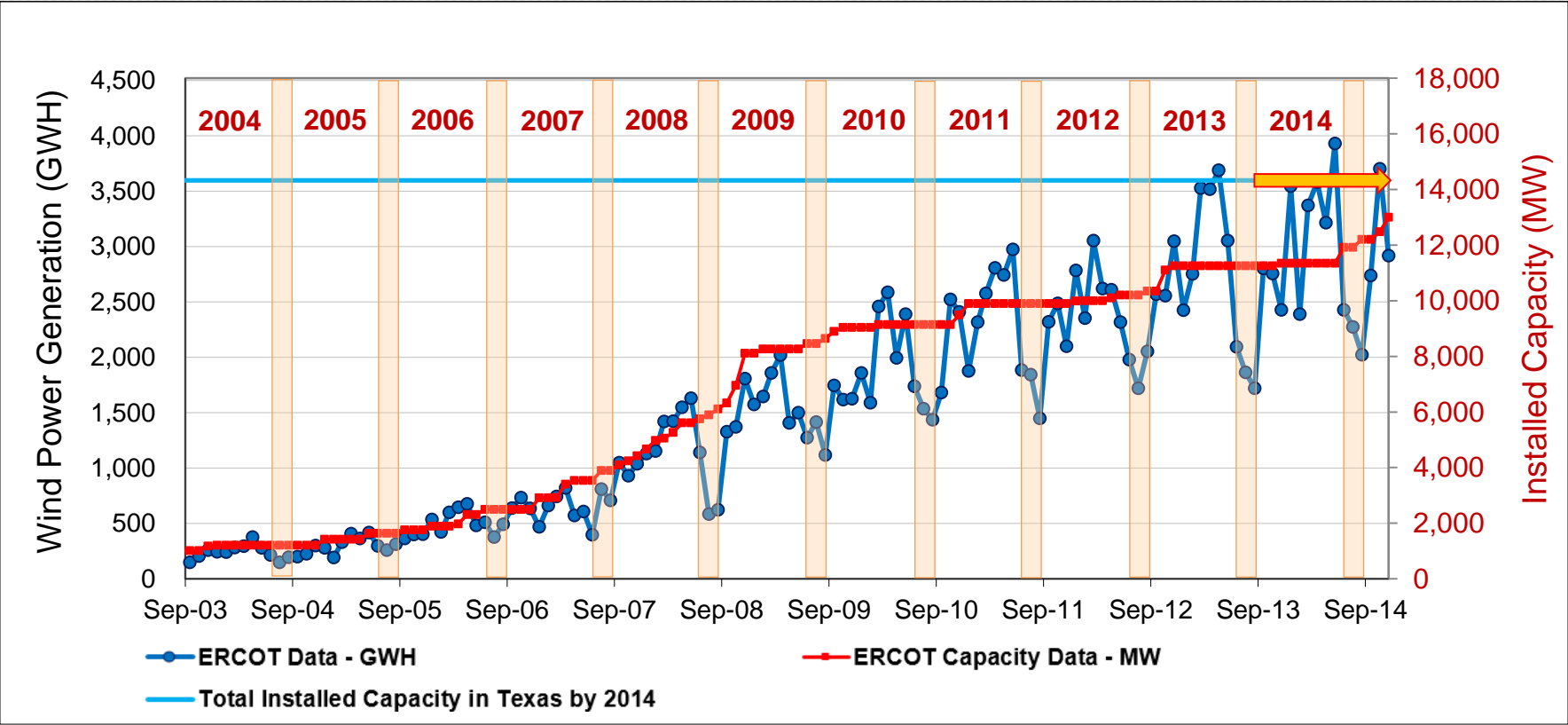
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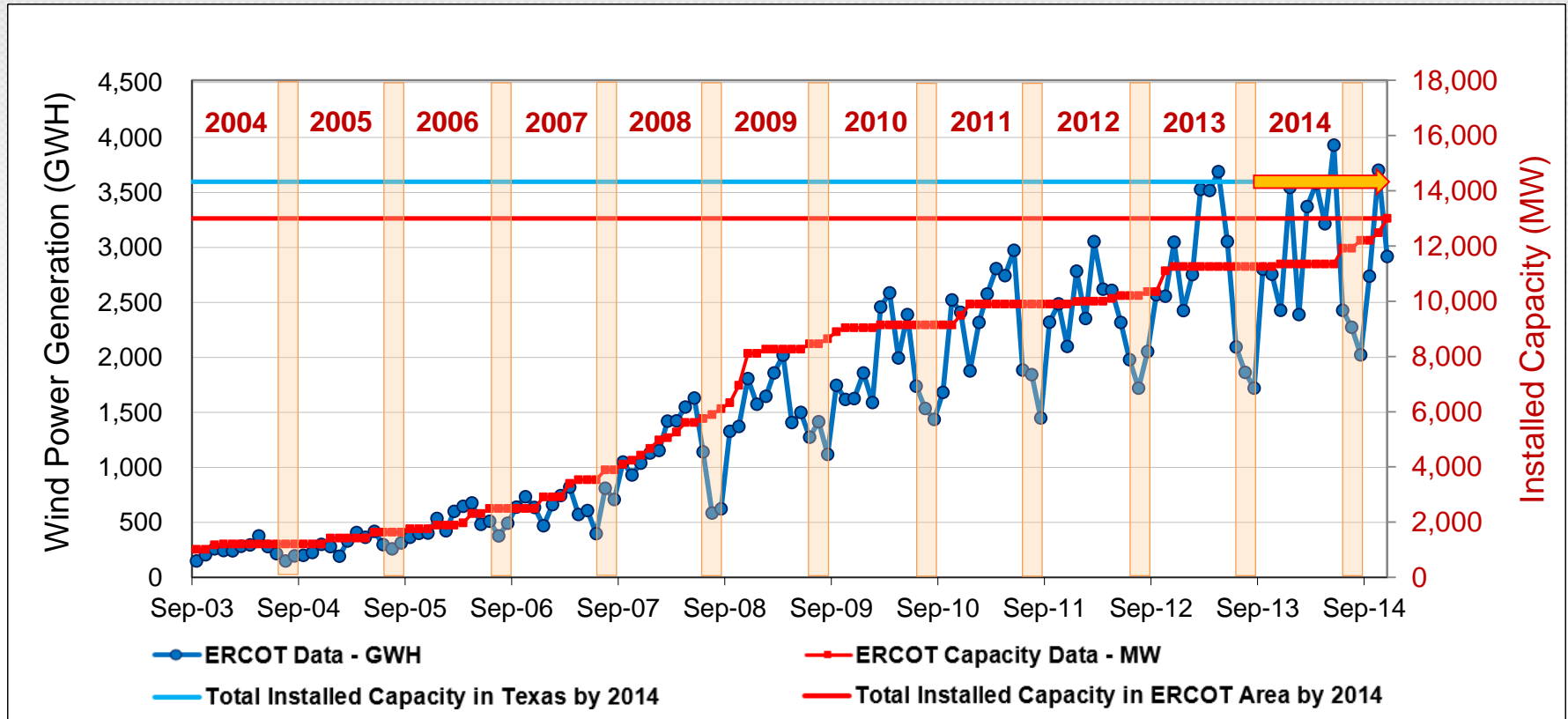
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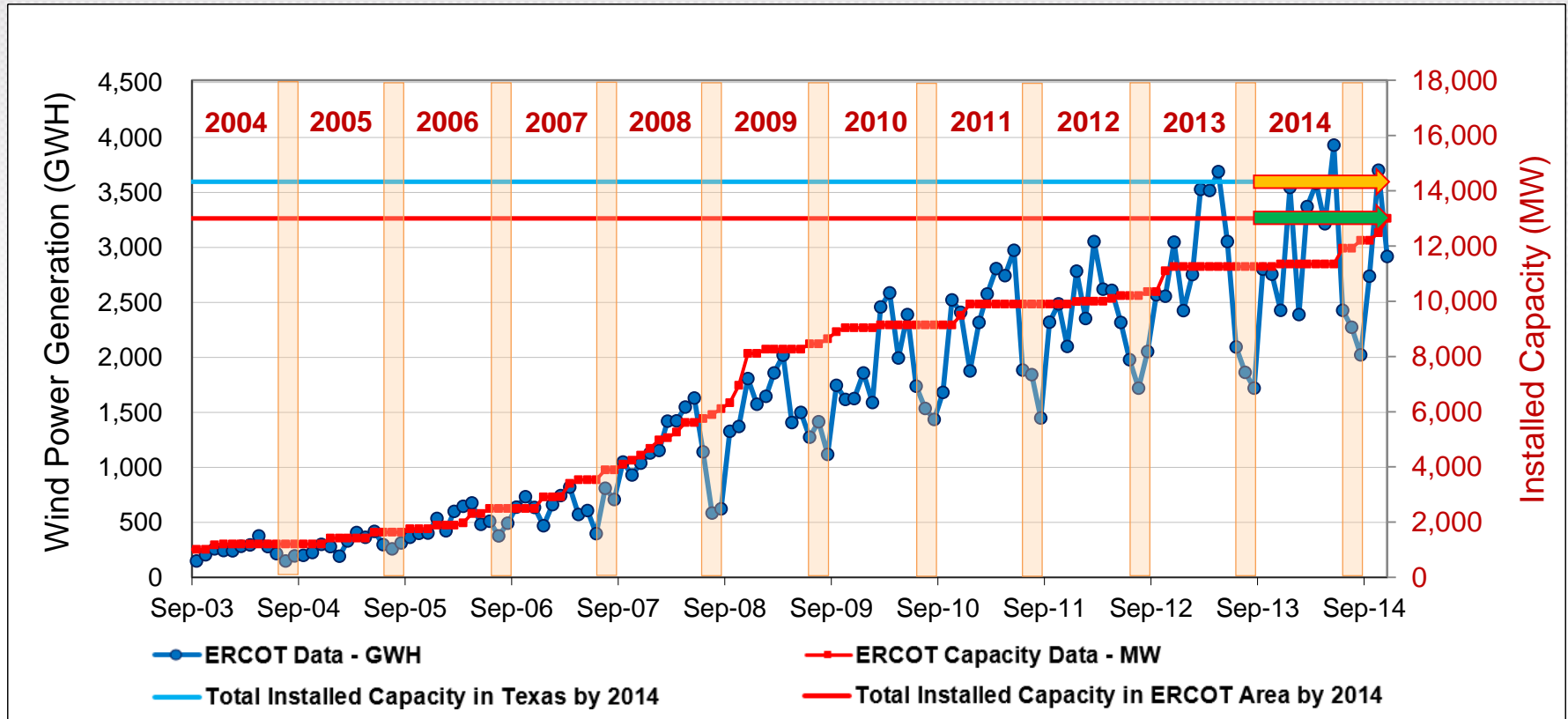
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 Total capacity: 14,327 MW in Texas

WIND PROJECTS IN TEXAS (2014)



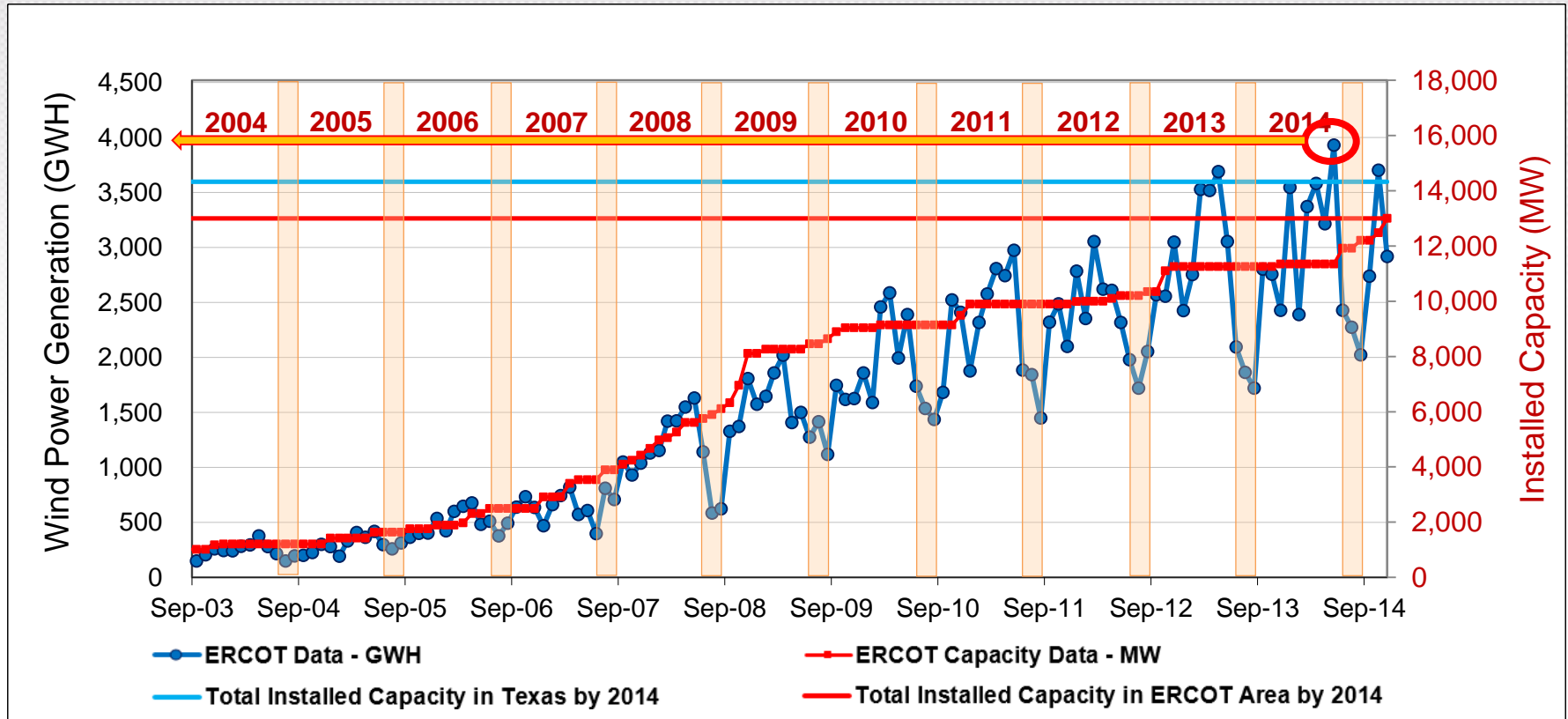
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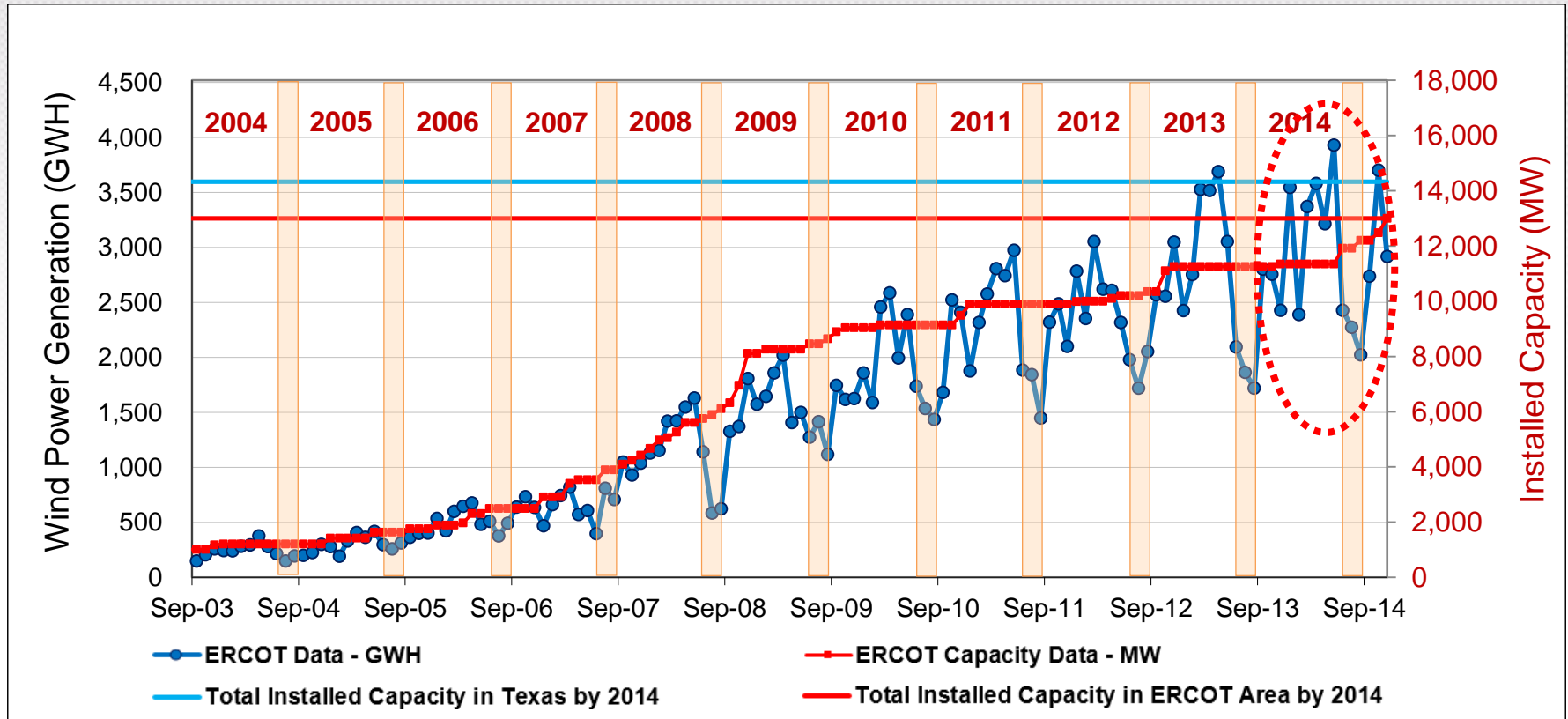
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WIND PROJECTS IN TEXAS (2014)



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 New peak wind power generation in 2014: **3,932 GWH/month**

WIND PROJECTS IN TEXAS (2014)



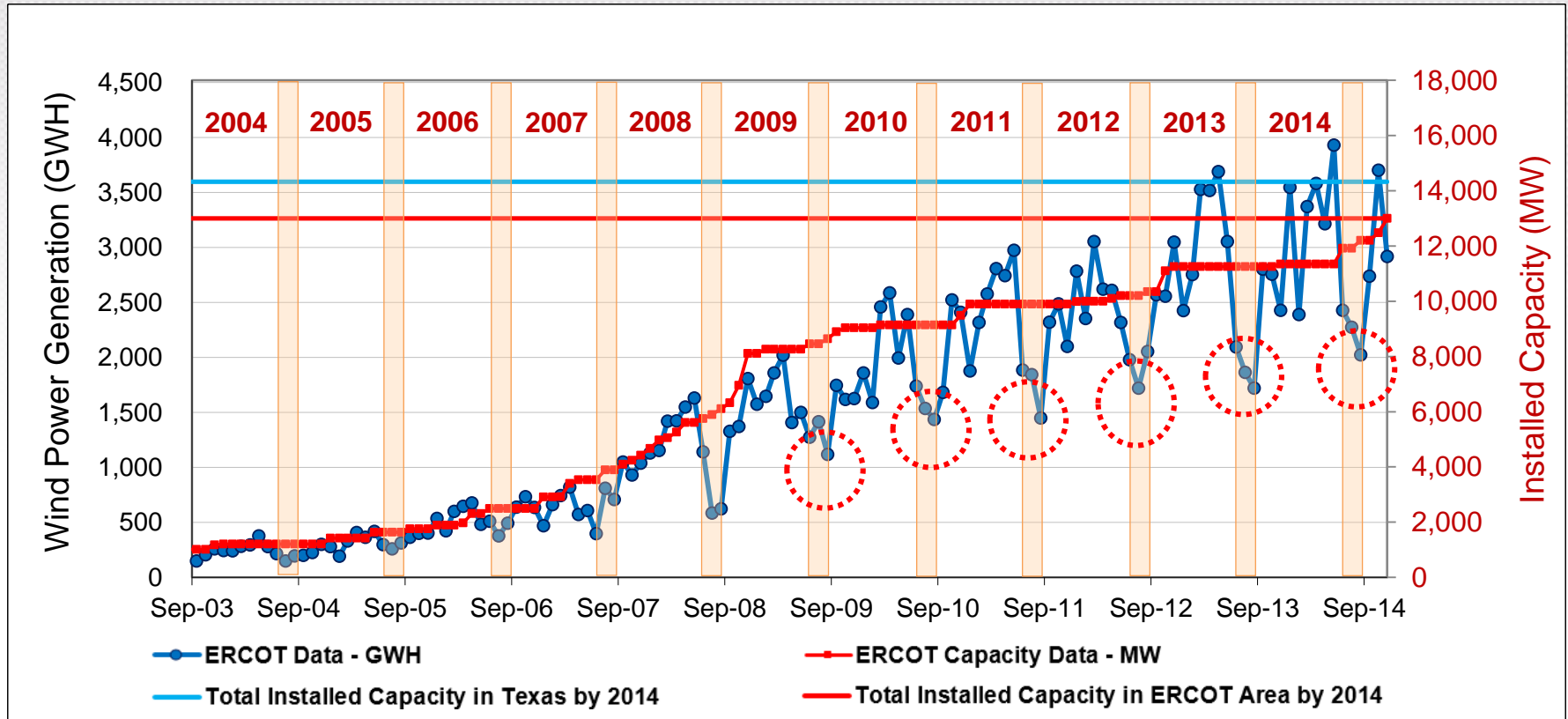
Substantial increases in measured electricity from wind energy

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New peak wind power generation in 2014: **3,932 GWH/month**

Total wind power generation in 2014: **34,301 GWH/yr** (9.9% of ERCOT)

WIND PROJECTS IN TEXAS (2014)



Substantial increases in measured electricity from wind energy

Total capacity: 14,327 MW in Texas & 13,001 MW in ERCOT

New peak wind power generation in 2014: **3,932** GWH/month

Total wind power generation in 2014: **34,301** GWH/yr (9.9% of ERCOT)

Average Ozone Season Period (OSP) power generation increasing

TRACKING WIND POWER GENERATION (2014)

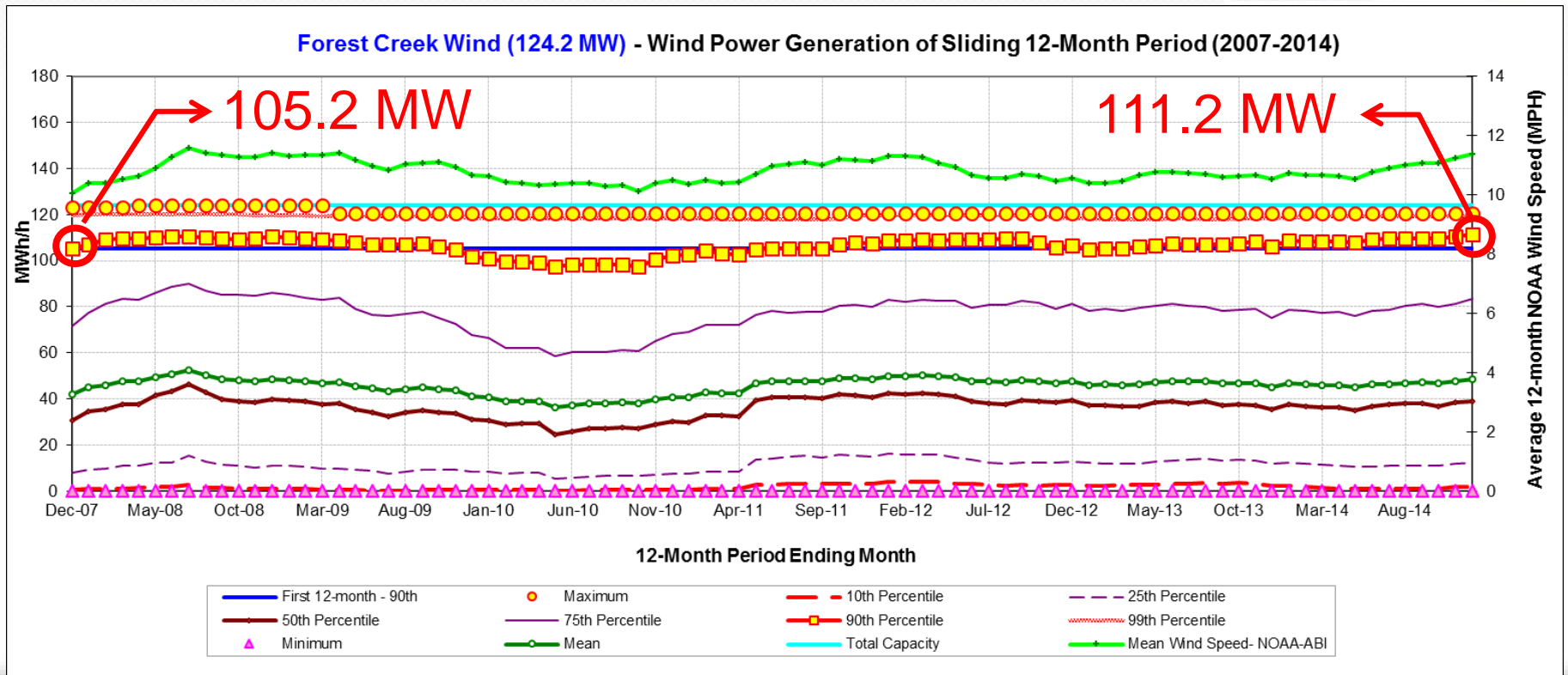
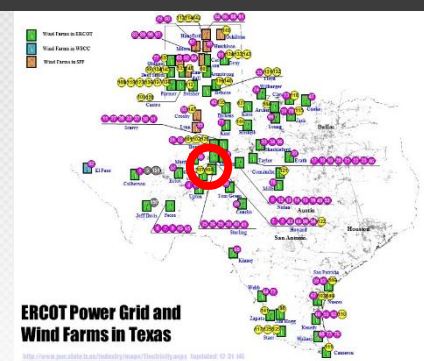
Example: Forest Creek (124.2 MW Capacity)

Is There Degradation?

December 2007: 105.2 MW

December 2014: 111.2 MW

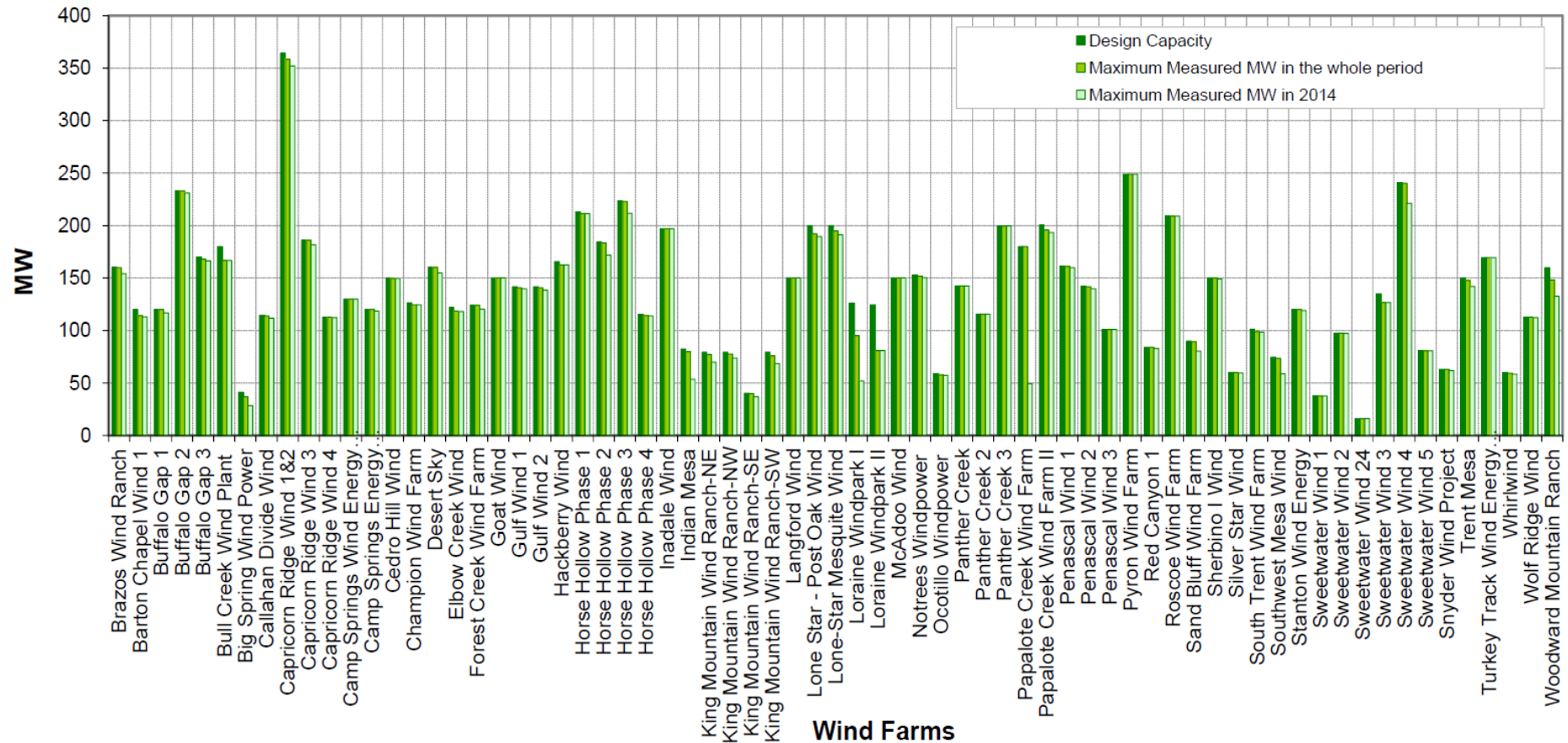
No Degradation Observed (22.5% above)



WIND FARMS CAPACITY/PRODUCTION

Are Wind farms operating to the design capacity?

Design and Hourly Measured Maximum Capacity for Wind Farms

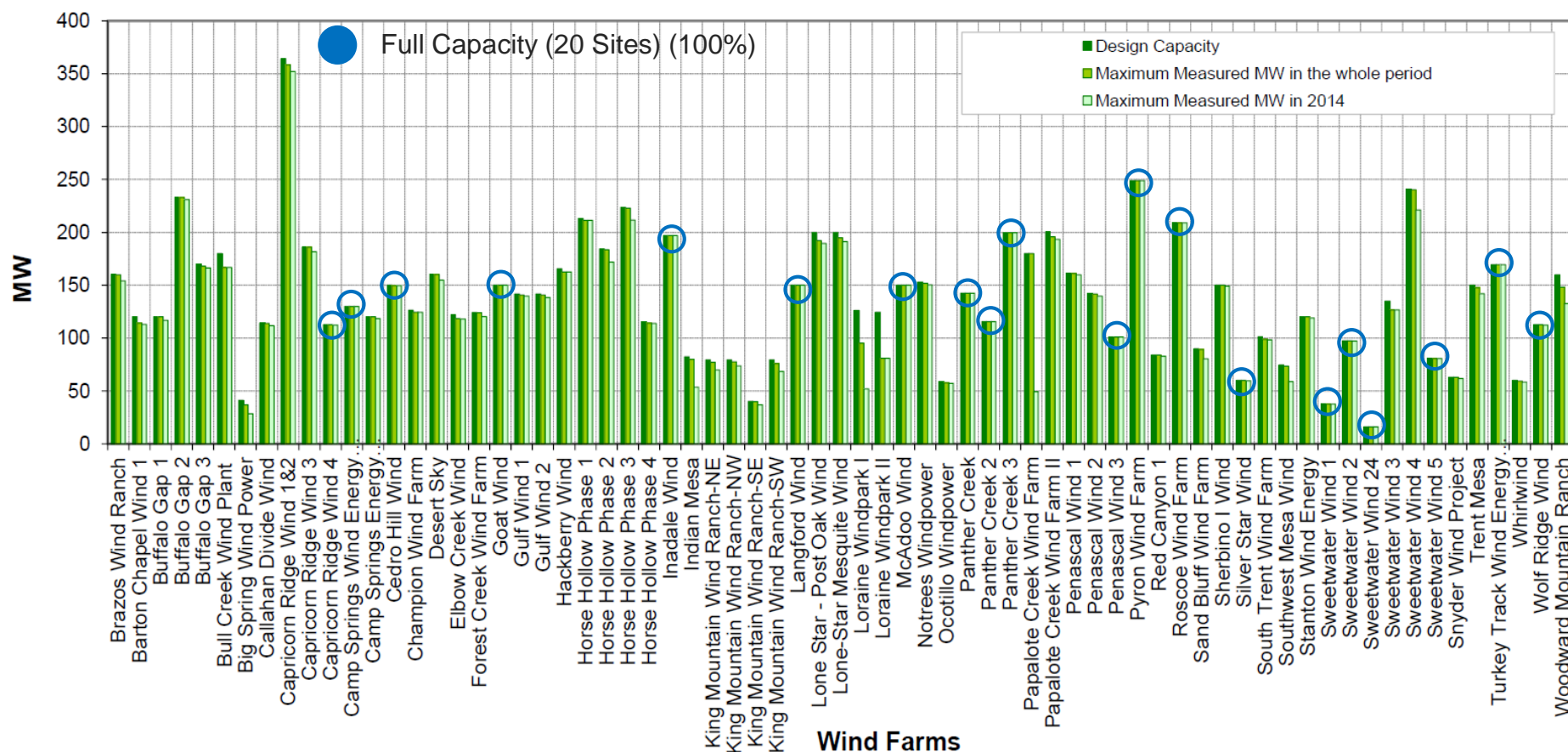


Design and Measured Maximum Capacity

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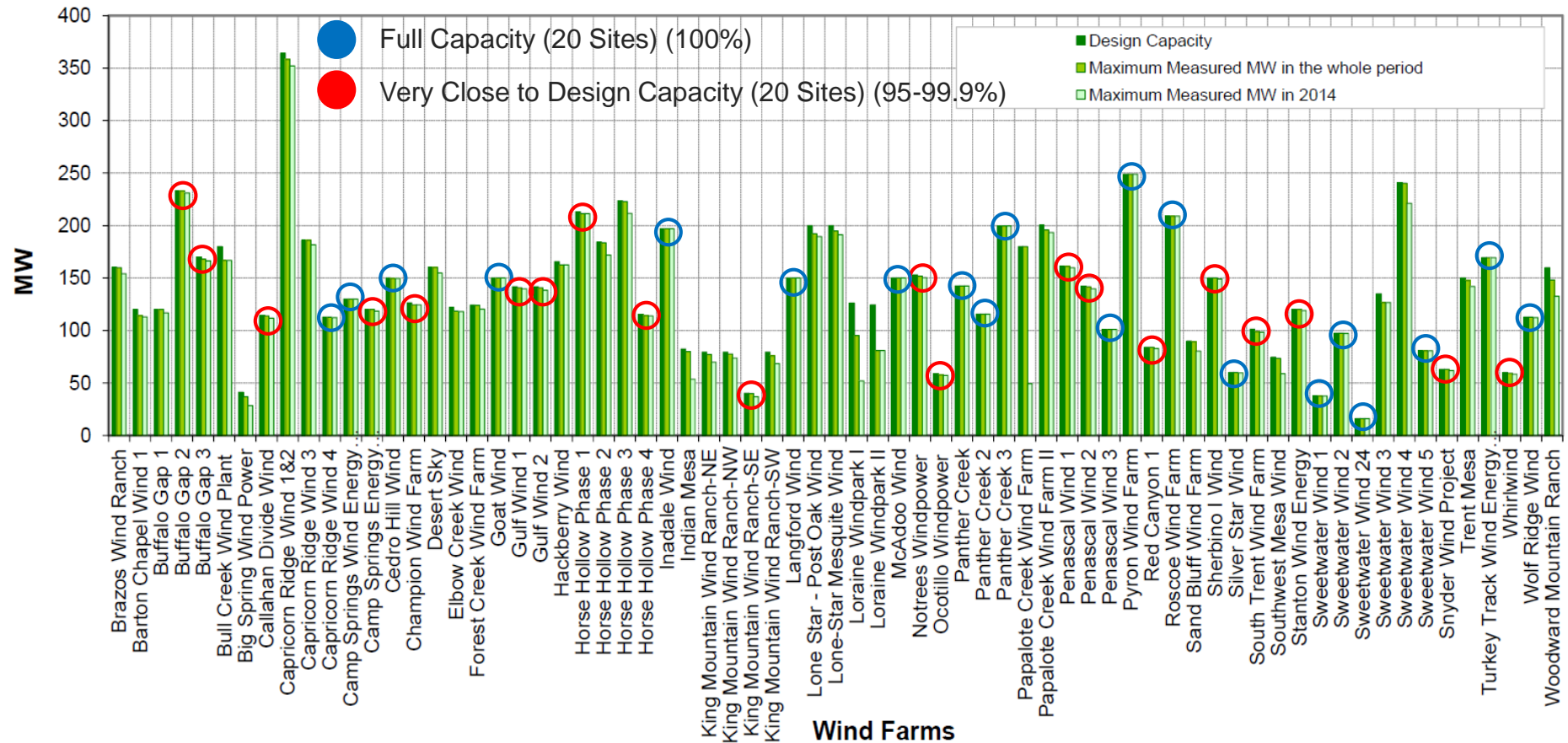


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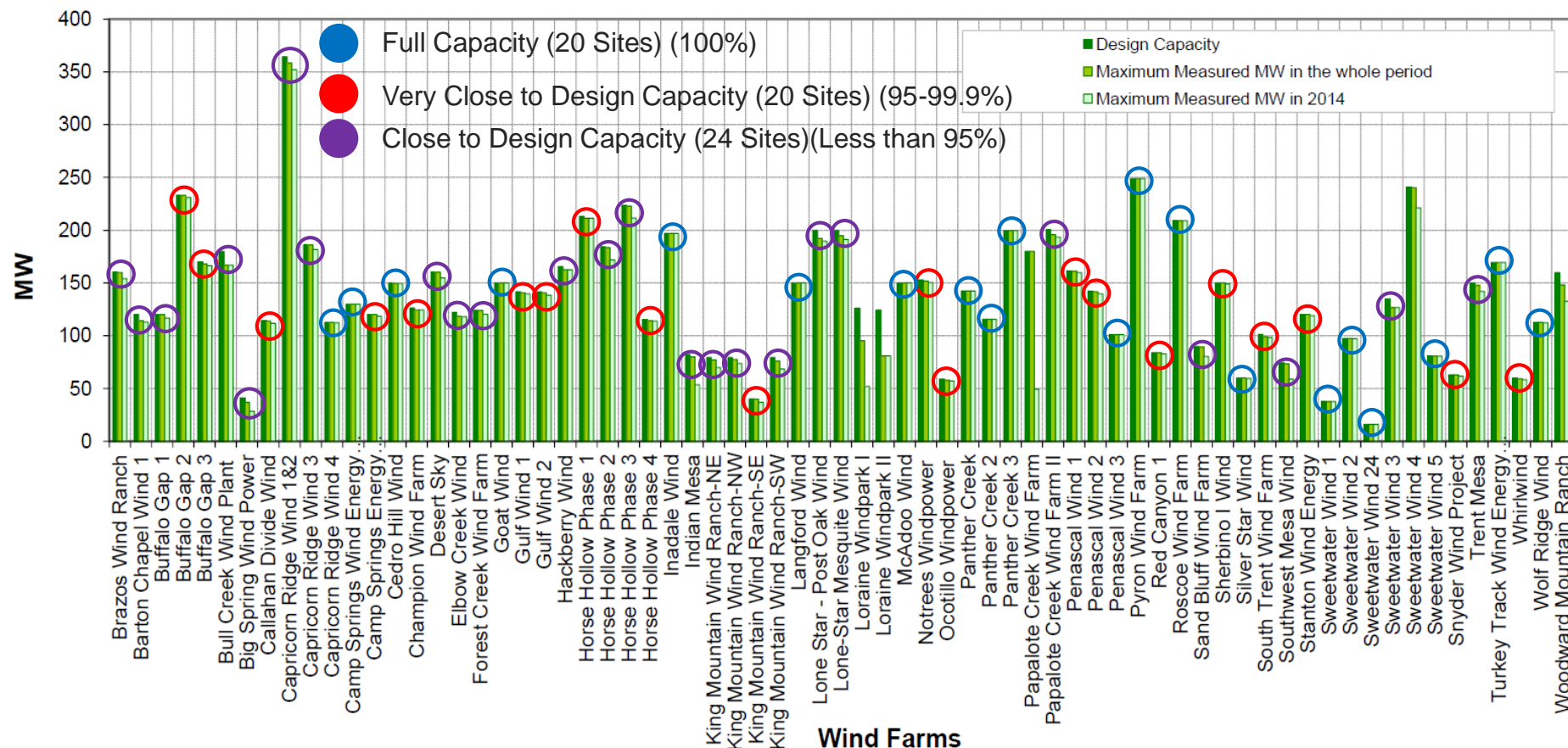


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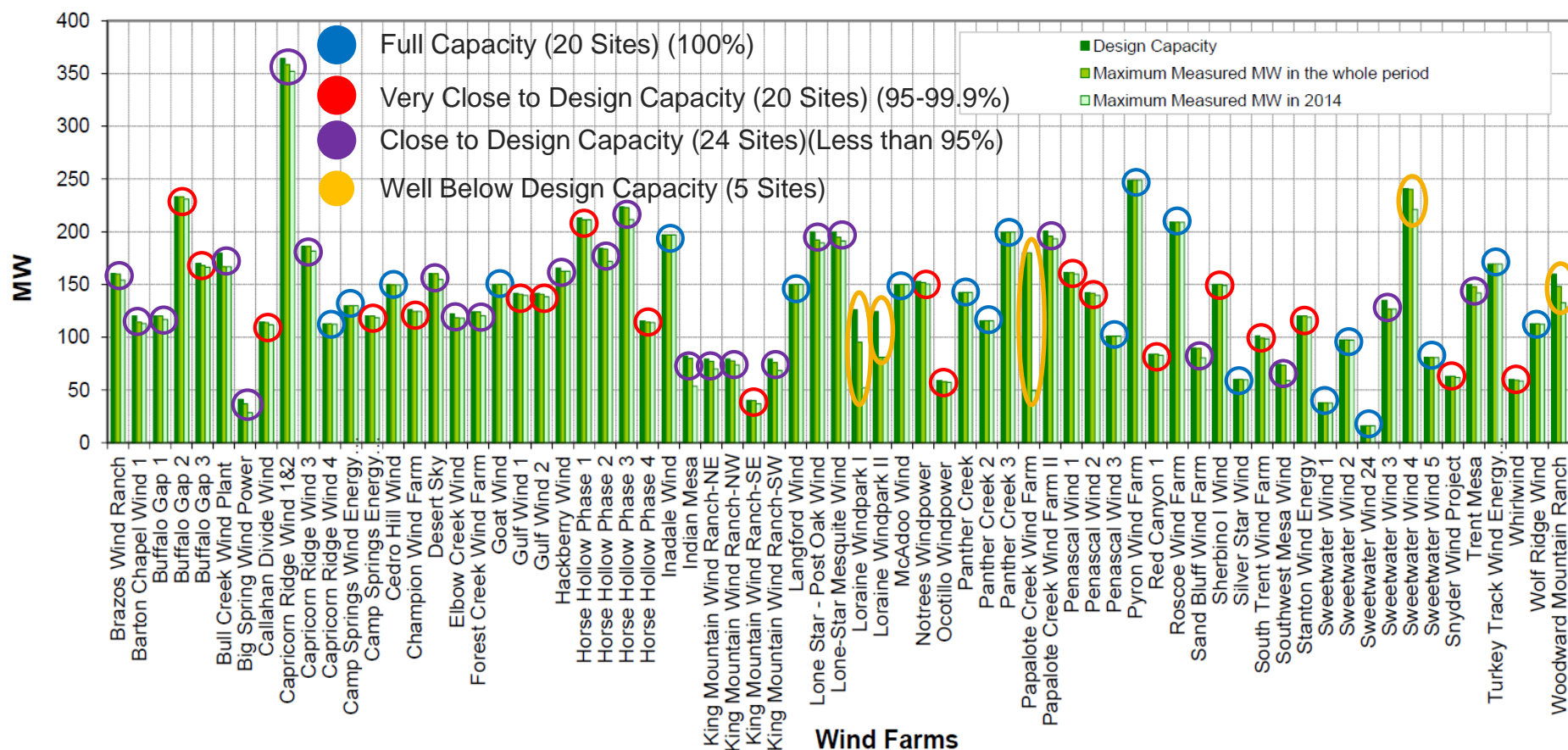


Design and Measured Maximum Capacity

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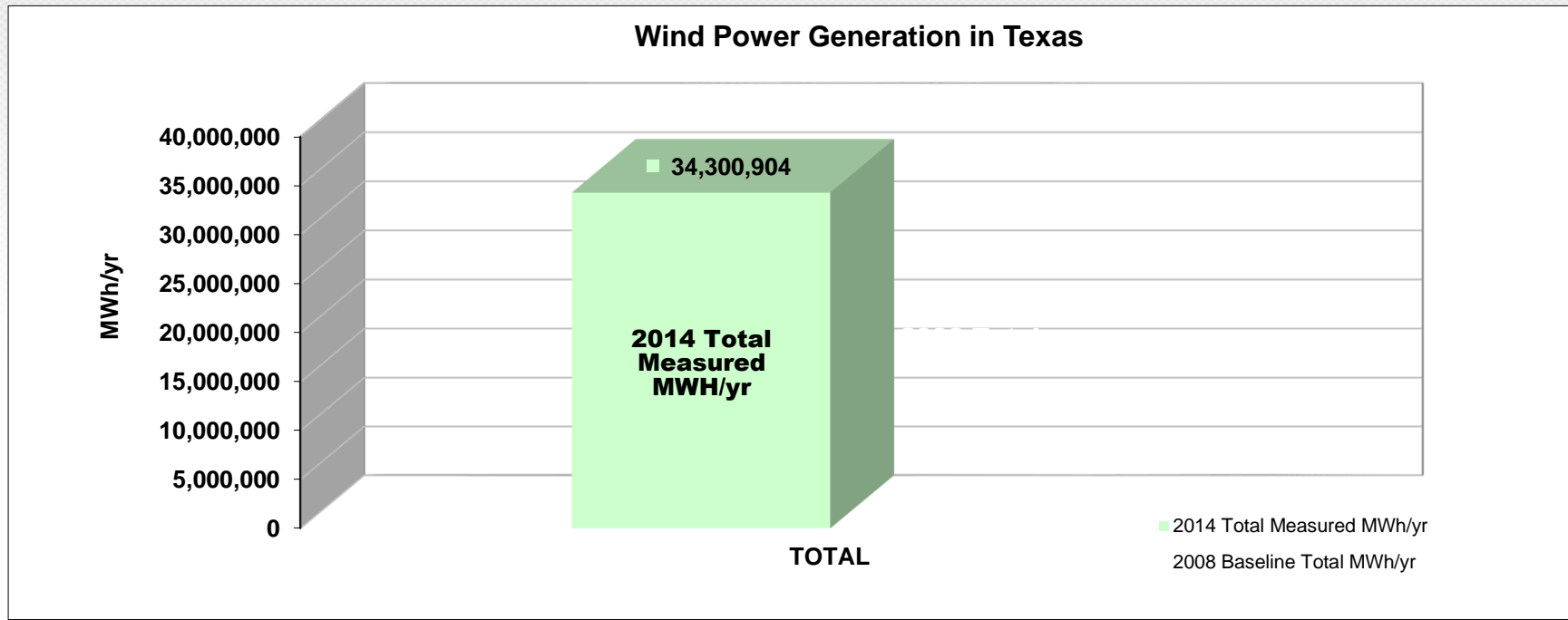
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Design and Measured Maximum Capacity

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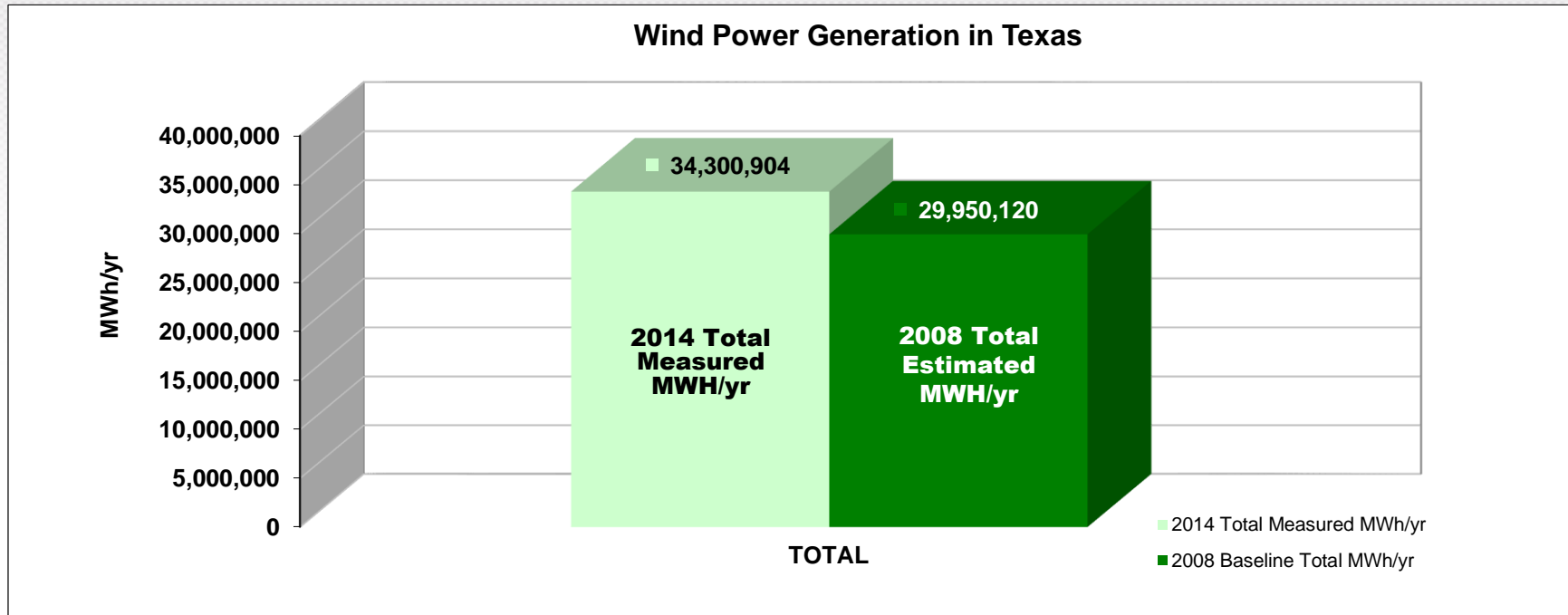
2008 Annual/OSP Baseline vs. 2014 Annual/OSP Measured



2008 Calculated from 2014 Measured Annual Power Production

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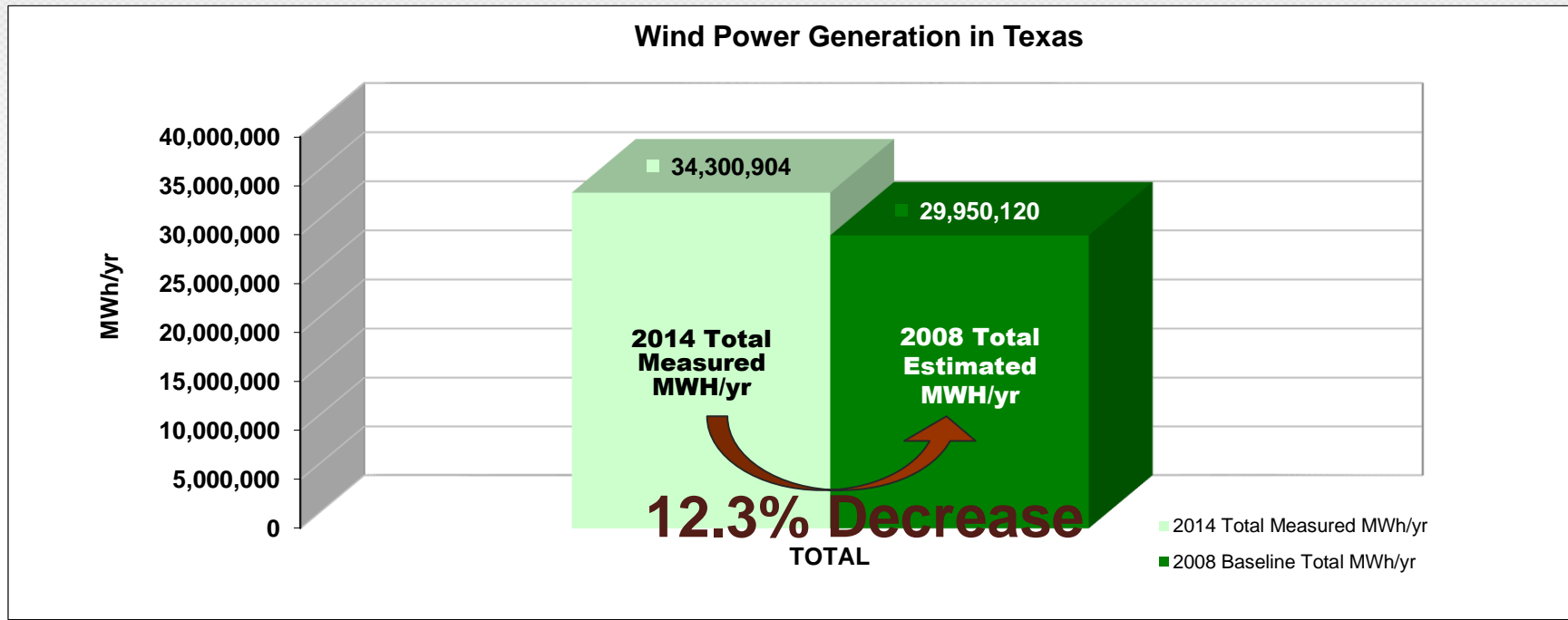
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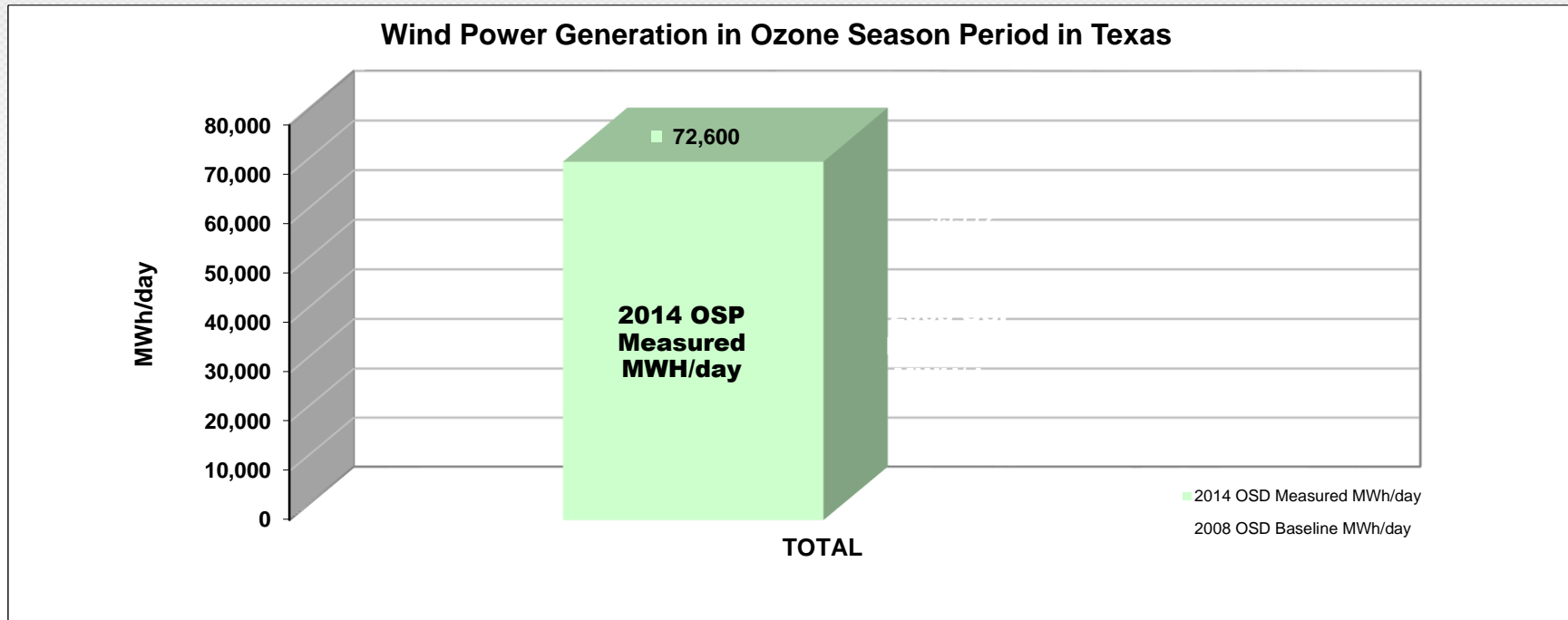


(Due to wind normalized weather condition)

2008 Calculated from 2014 Measured Annual Power Production

WIND FARMS CAPACITY/PRODUCTION

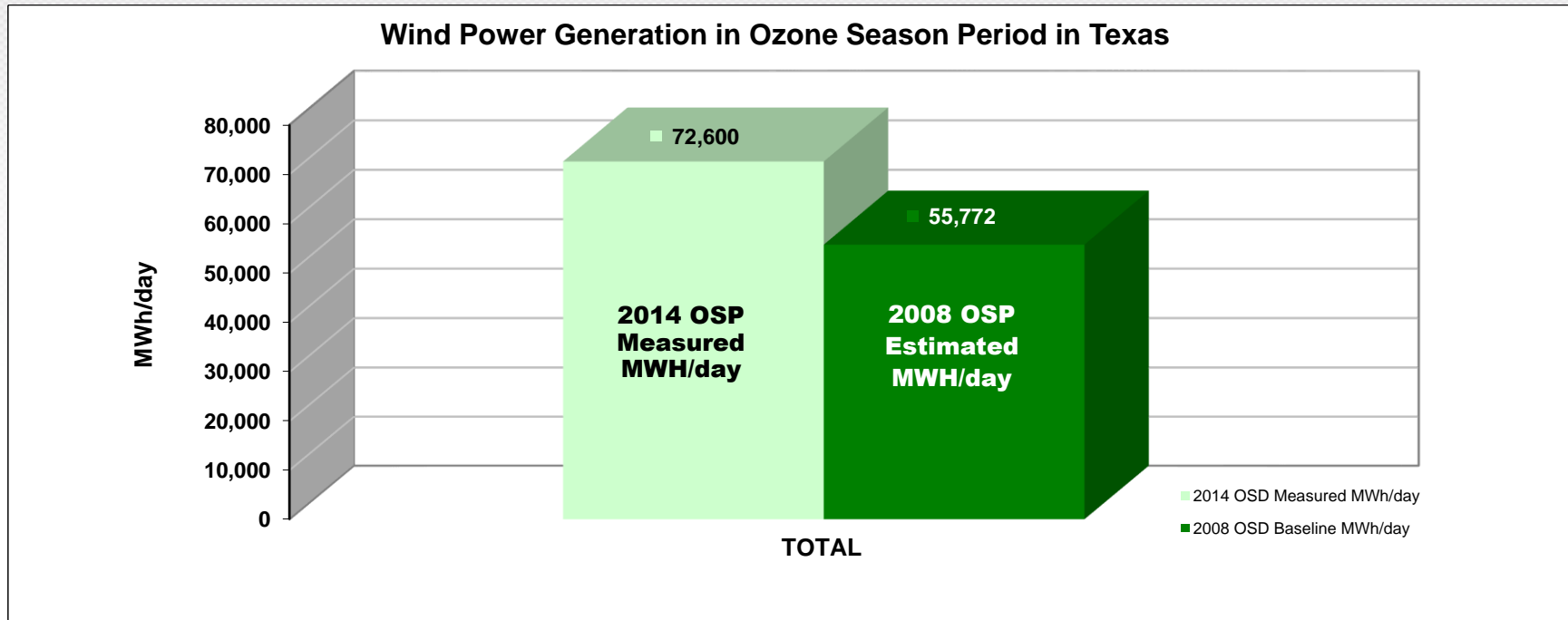
2008 Annual/OSP Baseline vs. 2014 Annual/OSP Measured



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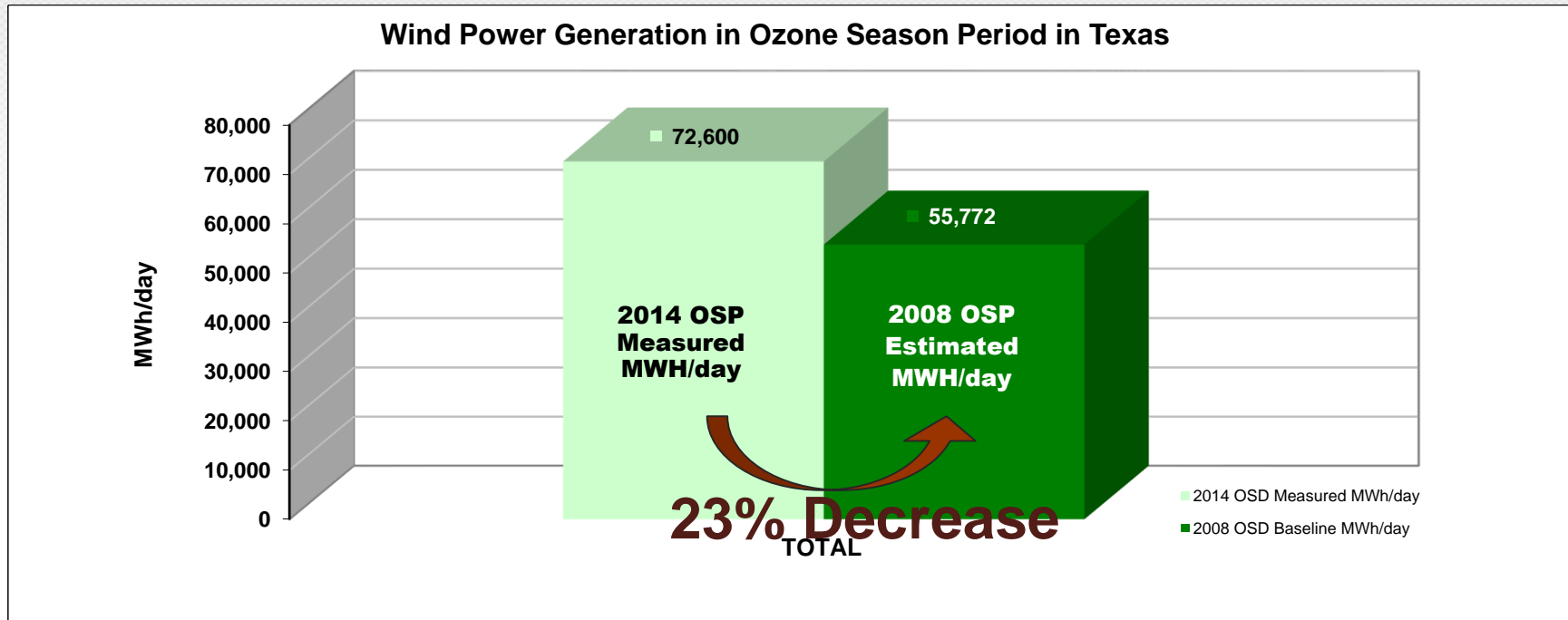
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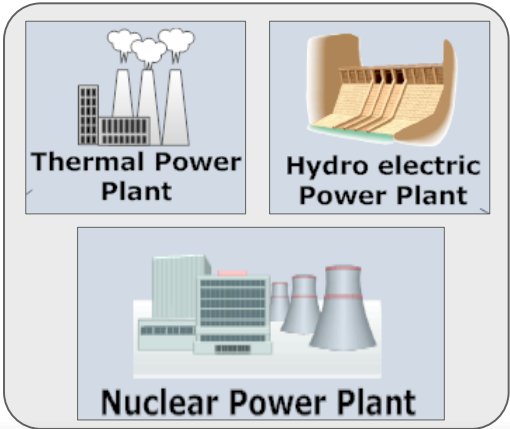
2008 Calculated from 2014 Measured OSP Power Production

NOx REDUCTIONS USING eGRID

NOx emissions reductions calculation from electricity savings

GENERATION

- Conventional

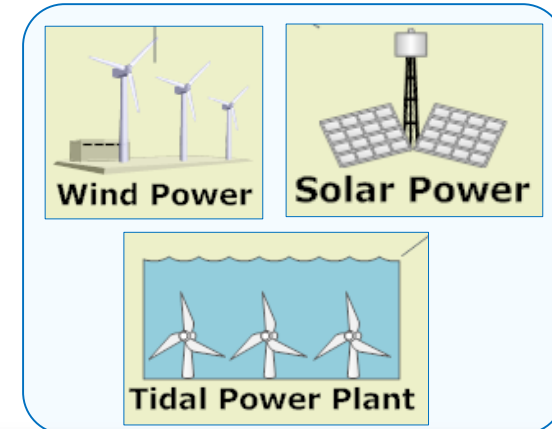
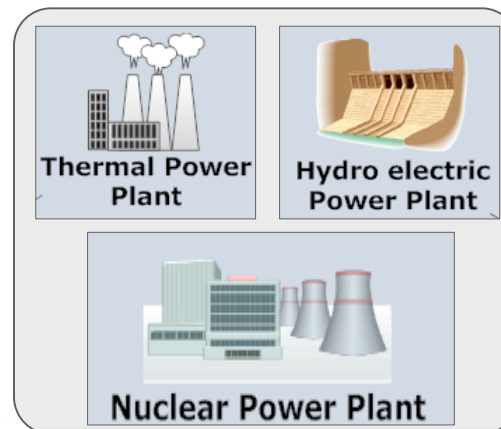


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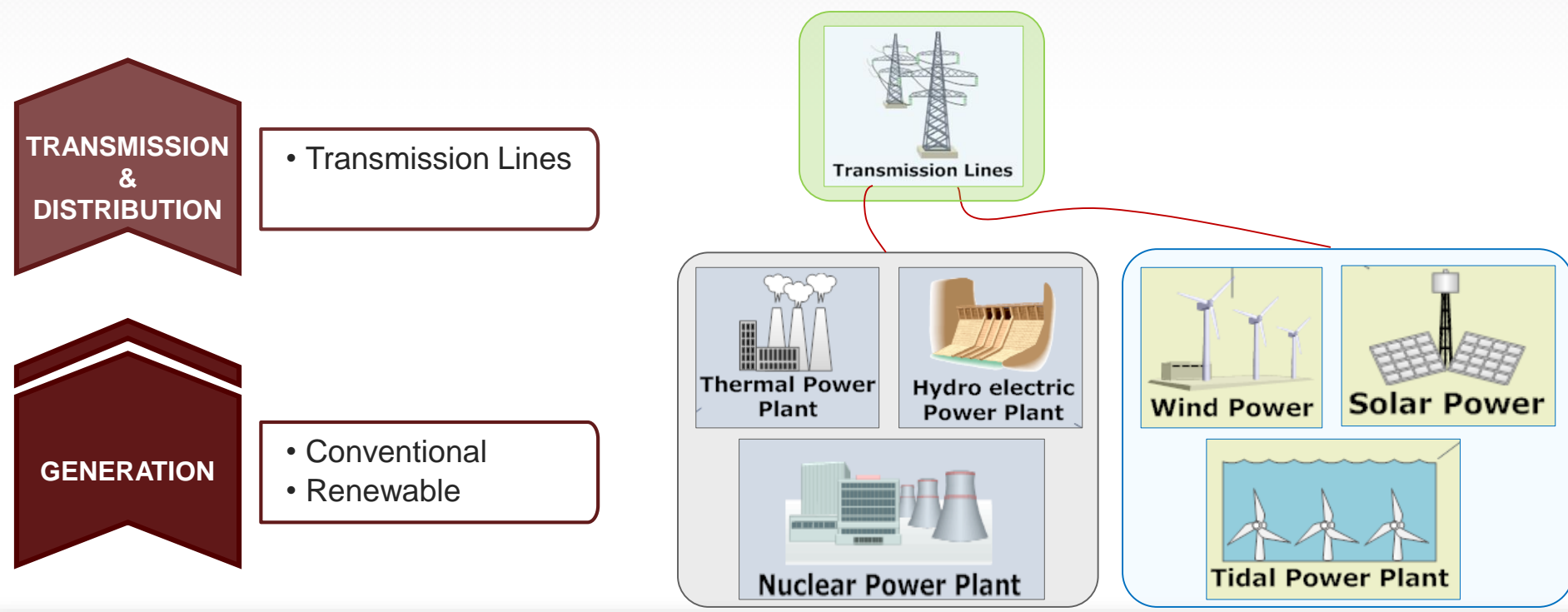
GENERATION

- Conventional
- Renewable



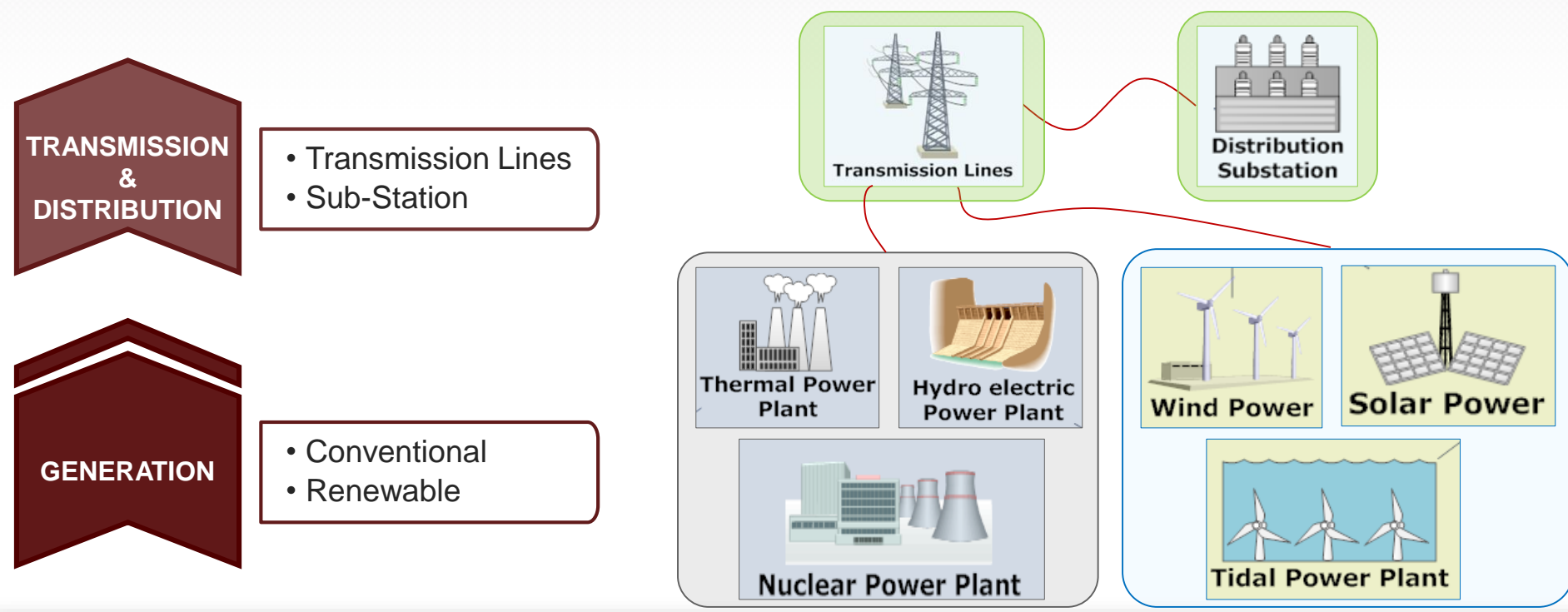
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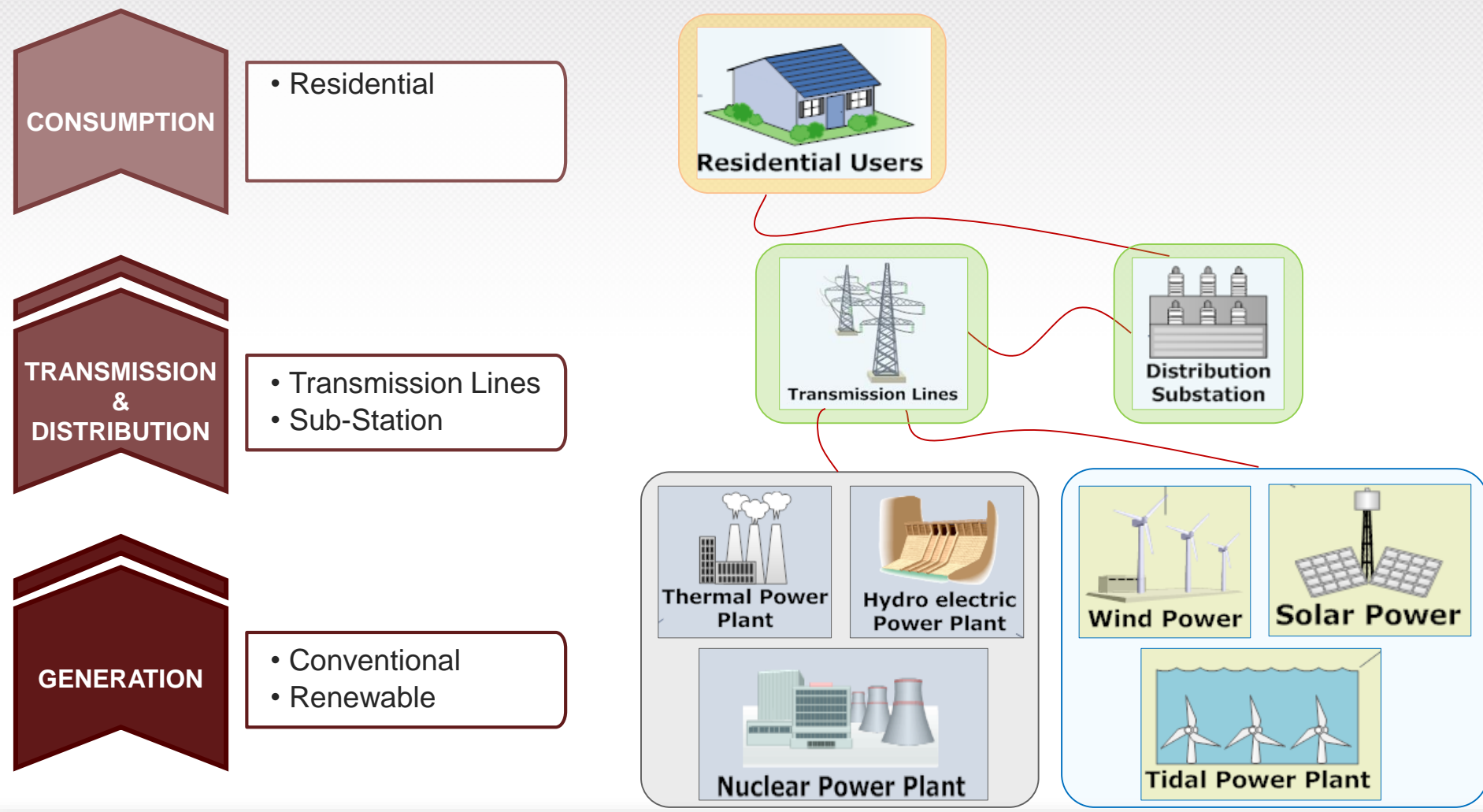
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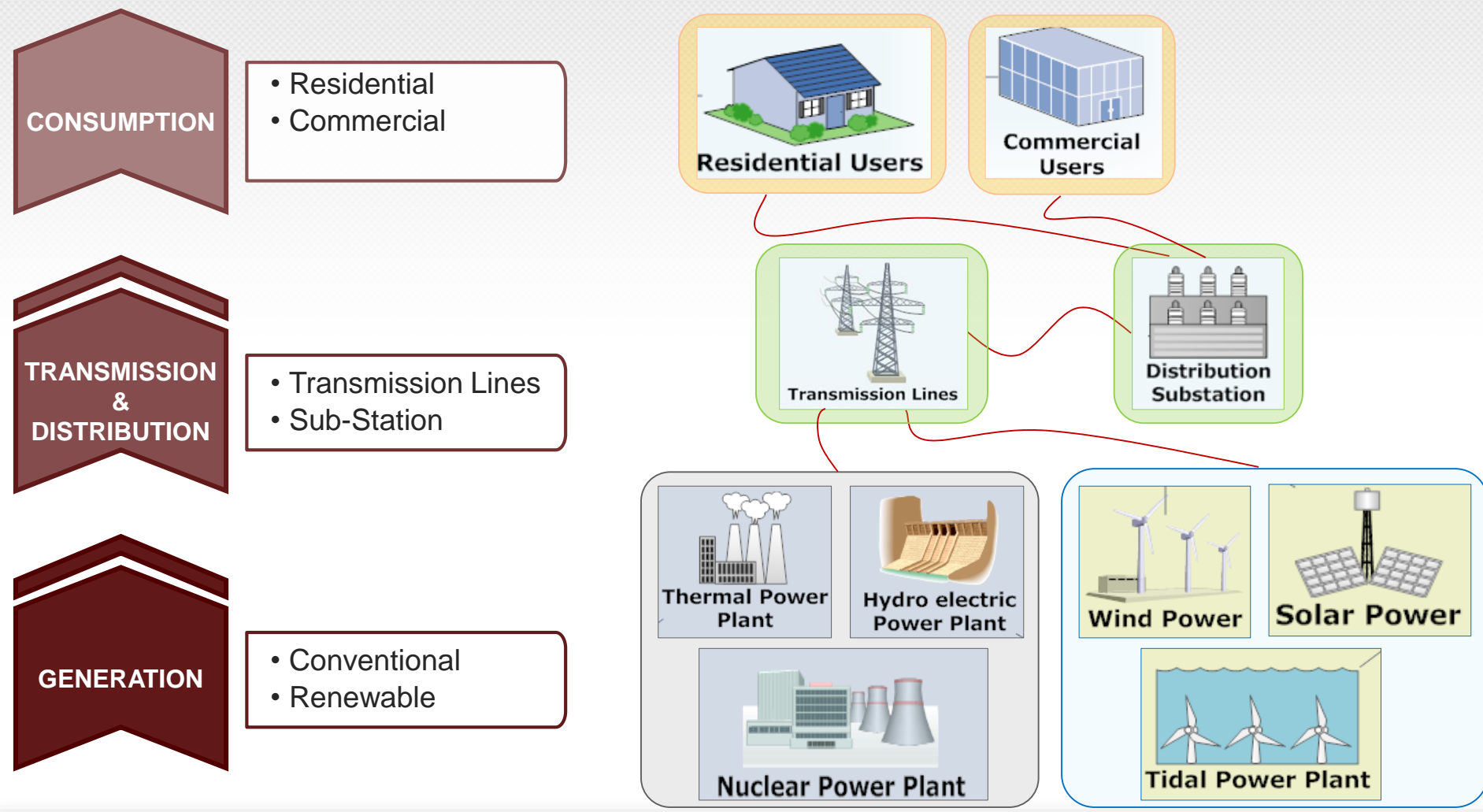
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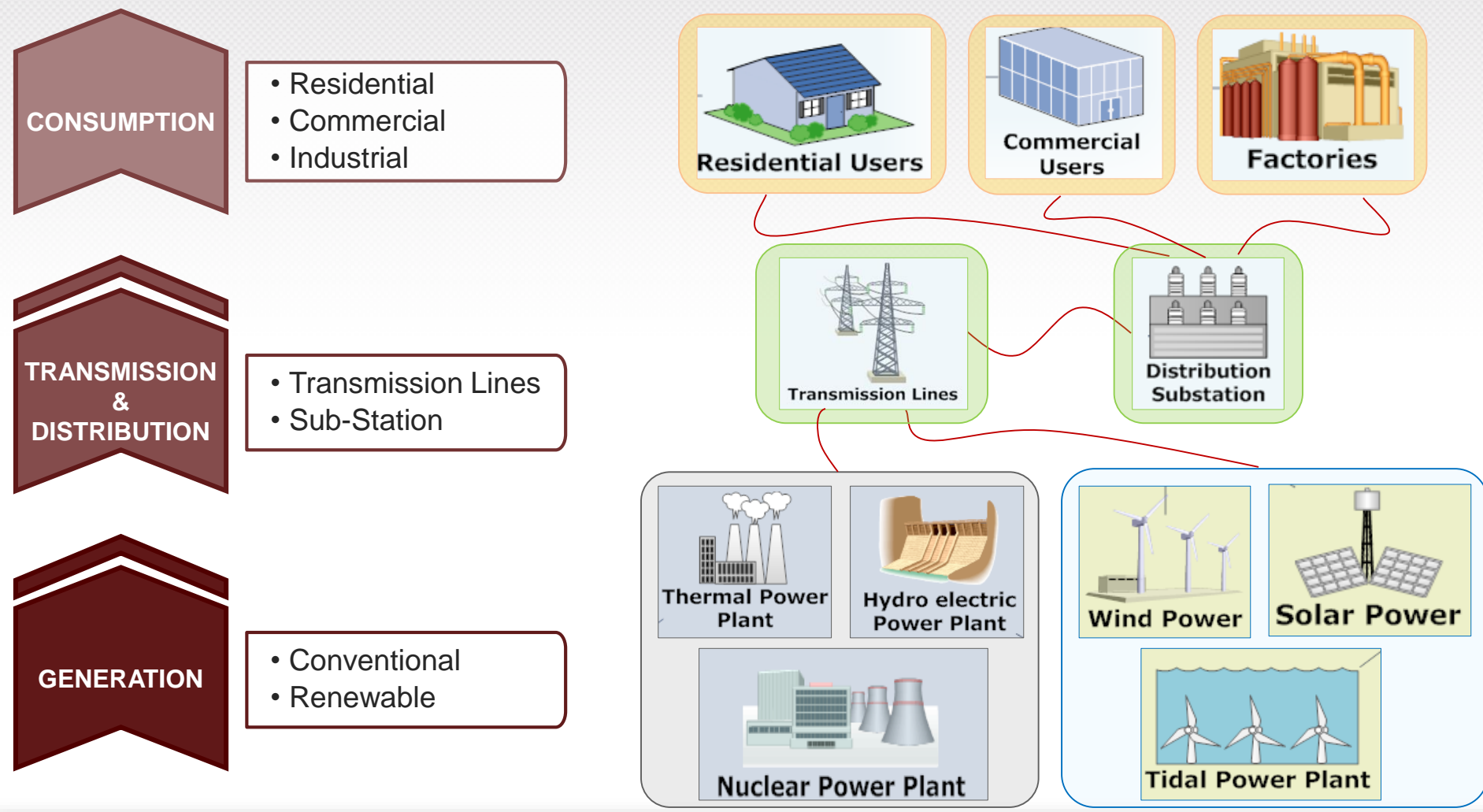
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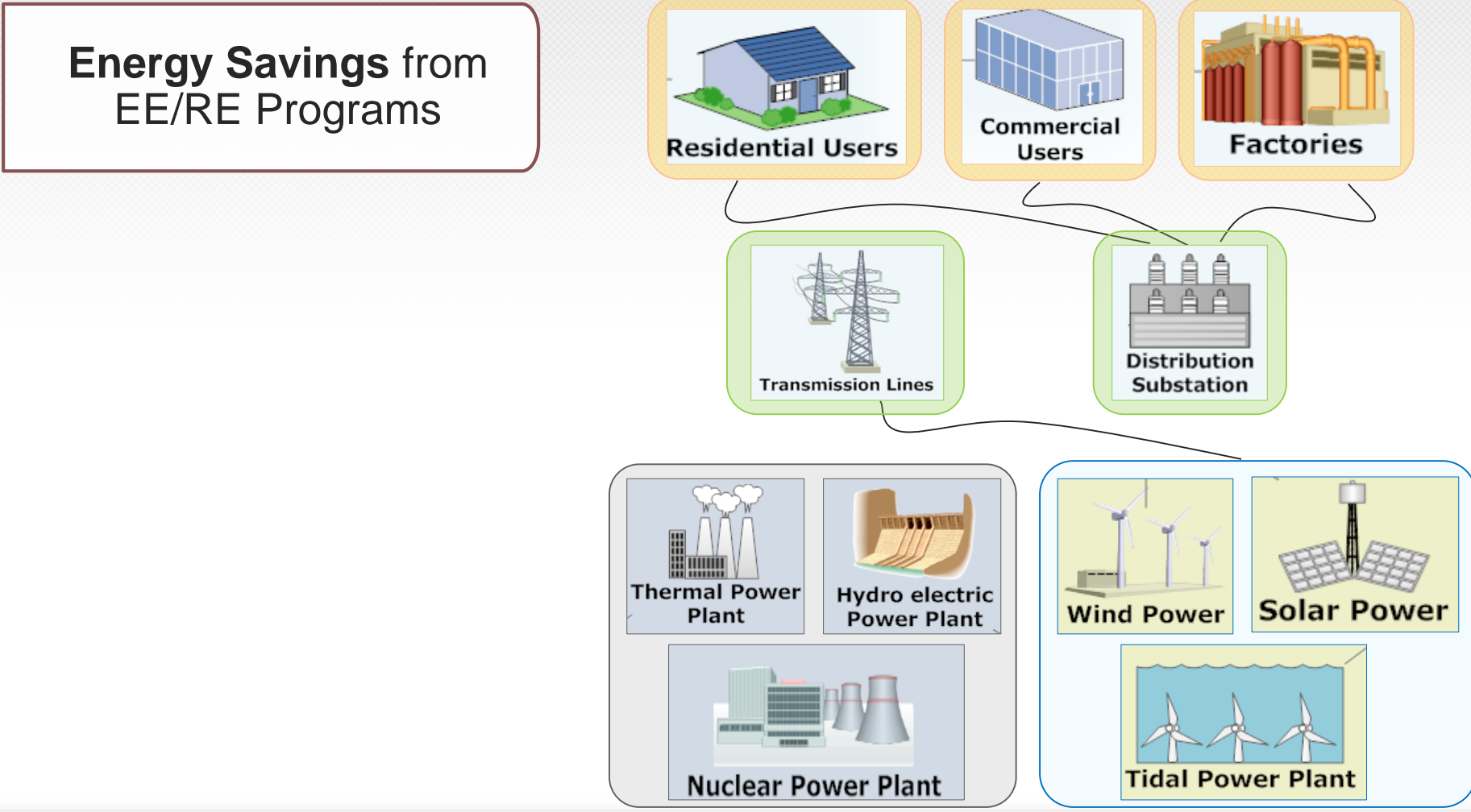
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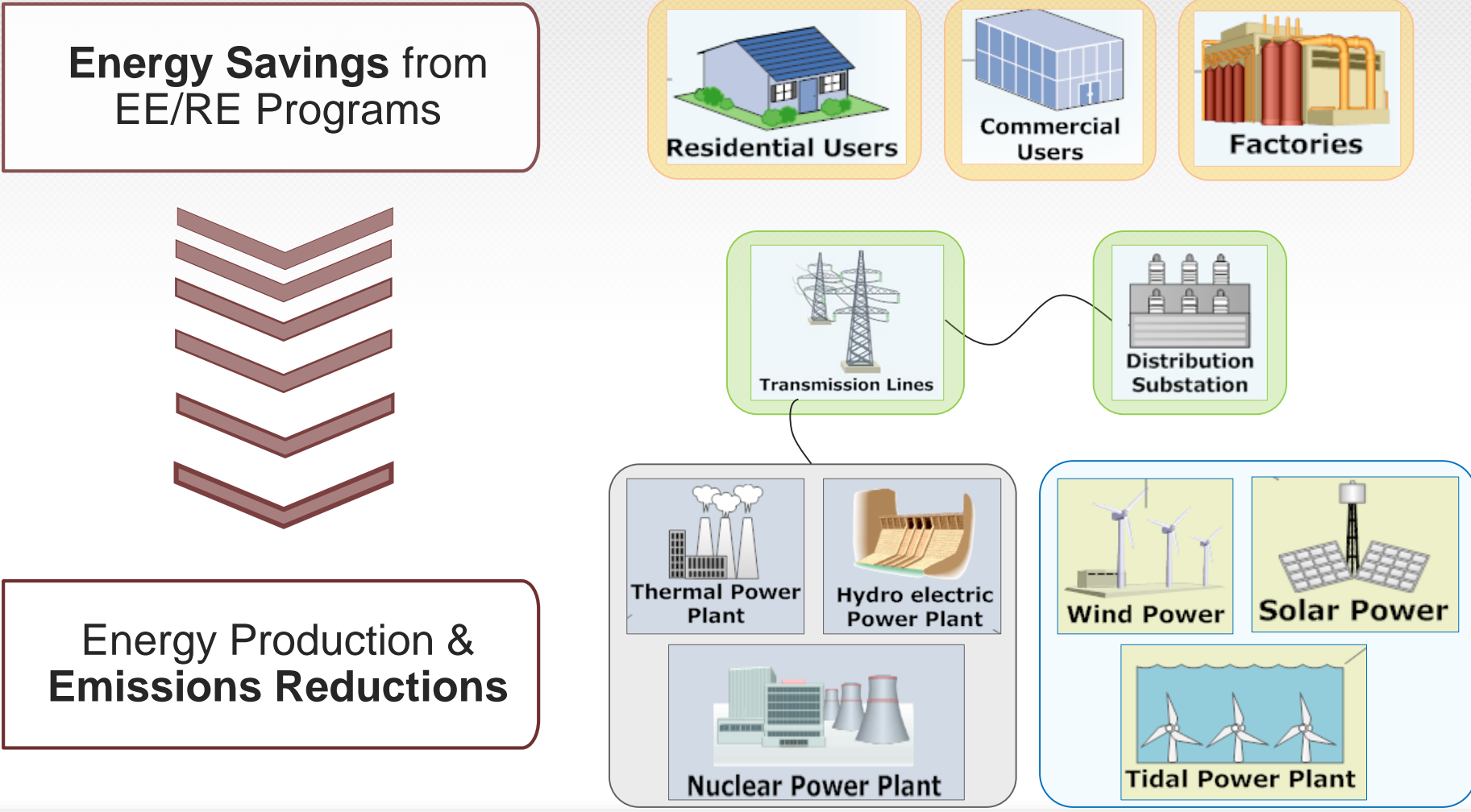
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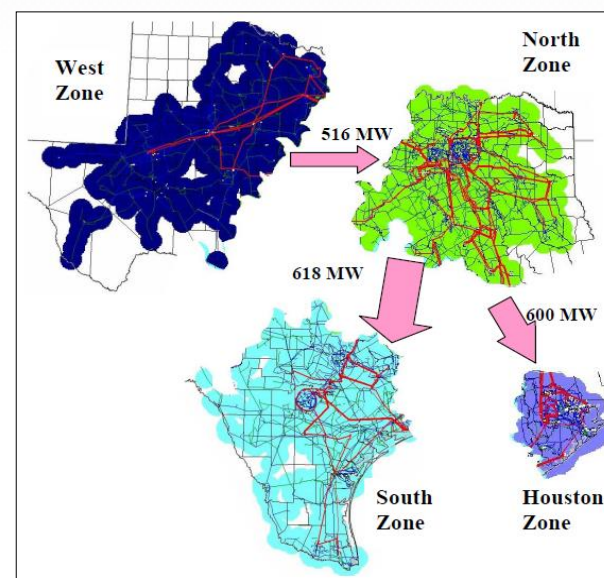
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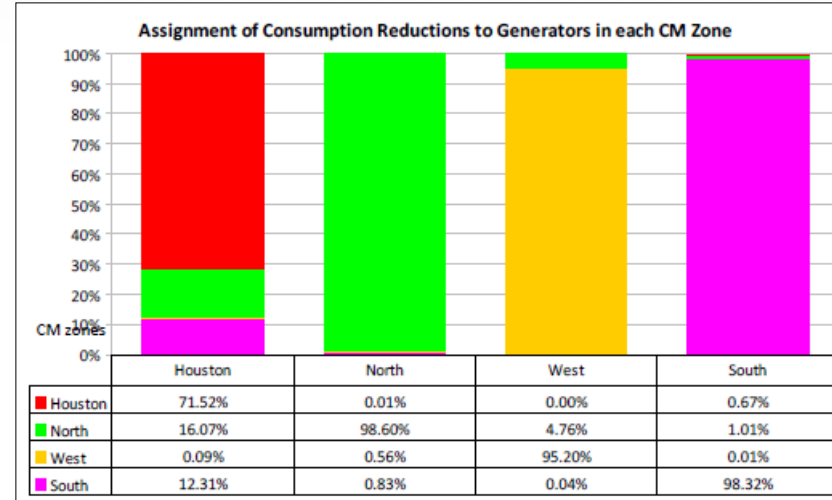
Area	County	H	CM Zones				Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
			E	N	W	S		
Houston-Galveston Area	Brazoria	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00	0.00
	Chambers	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00	0.00
	Fort Bend	0.0313463	0.00000000	0.00000000	0.00000002	0.00000000	0.0002937	0.00
	Galveston	0.0226620	0.00000000	0.00000029	0.00000001	0.00000000	0.0002123	0.00
	Harris	0.1486911	0.00000000	0.00000000	0.00000000	0.00000000	0.0013930	0.00
	Liberty	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
Beaumont/Port Arthur Area	Montgomery	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Waller	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Wichita	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Wichita	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Wichita	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Wichita	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
Dallas/Fort Worth Area	Denton	0.0001267	0.00000000	0.0000770	0.00000000	0.00000000	0.0000000	0.00
	Tarrant	0.0004742	0.00000000	0.0002089	0.00000000	0.0001405	0.0000297	0.00
	Ellis	0.0029920	0.00000000	0.0183544	0.00000000	0.0000885	0.0001873	0.00
	Johnson	0.0000000	0.00000000	0.0044512	0.00000000	0.0000215	0.0000000	0.00
	Kaufman	0.0000000	0.00000000	0.0000000	0.00000000	0.0000000	0.0000000	0.00
	Parker	0.0000000	0.00000000	0.0000000	0.00000000	0.0000000	0.0000000	0.00
El Paso Area	Rockwall	0.0000000	0.00000000	0.0000000	0.00000000	0.0000000	0.0000000	0.00
	Rockwall	0.0000000	0.00000000	0.0000000	0.00000000	0.0000000	0.0000000	0.00
	Rockwall	0.0000000	0.00000000	0.0000000	0.00000000	0.0000000	0.0000000	0.00
	Rockwall	0.0000000	0.00000000	0.0000000	0.00000000	0.0000000	0.0000000	0.00
	Rockwall	0.0000000	0.00000000	0.0000000	0.00000000	0.0000000	0.0000000	0.00
	Rockwall	0.0000000	0.00000000	0.0000000	0.00000000	0.0000000	0.0000000	0.00
San Antonio Area	Henderson	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Henderson	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Henderson	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Henderson	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Henderson	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Henderson	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
Austin Area	Hunt	0.0008846	0.00000000	0.0000706	0.00000000	0.0002273	0.0002823	0.00
	Hunt	0.0008846	0.00000000	0.0000706	0.00000000	0.0002273	0.0002823	0.00
	Hunt	0.0008846	0.00000000	0.0000706	0.00000000	0.0002273	0.0002823	0.00
	Hunt	0.0008846	0.00000000	0.0000706	0.00000000	0.0002273	0.0002823	0.00
	Hunt	0.0008846	0.00000000	0.0000706	0.00000000	0.0002273	0.0002823	0.00
	Hunt	0.0008846	0.00000000	0.0000706	0.00000000	0.0002273	0.0002823	0.00
Corpus Christi Area	Blanco	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Blanco	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Blanco	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Blanco	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Blanco	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Blanco	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
Victoria Area	Travis	0.0001785	0.00000000	0.0000349	0.00000000	0.0000000	0.0000000	0.00
	Travis	0.0001785	0.00000000	0.0000349	0.00000000	0.0000000	0.0000000	0.00
	Travis	0.0001785	0.00000000	0.0000349	0.00000000	0.0000000	0.0000000	0.00
	Travis	0.0001785	0.00000000	0.0000349	0.00000000	0.0000000	0.0000000	0.00
	Travis	0.0001785	0.00000000	0.0000349	0.00000000	0.0000000	0.0000000	0.00
	Travis	0.0001785	0.00000000	0.0000349	0.00000000	0.0000000	0.0000000	0.00
Other ERCOT counties	Wichita	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Wichita	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Wichita	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Wichita	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Wichita	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Wichita	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
Total		8.4414501	0.0000	0.4812863	0.0000	0.5345786	0.0000	0.00
Energy Savings (MWh)		0	0	0	0	0	0	0



Electricity Flows between CM Zones in ERCOT

Nox REDUCTIONS USING eGRID

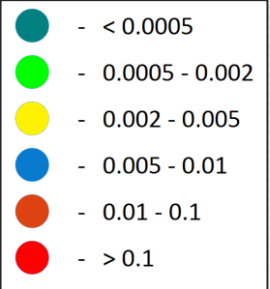
Area	County	H	N	W	S	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston- Galveston Area	Brazoria	0.00000000	0.00000000	0.00000000	0.00000000	0.00	0.00
	Chambers	0.00045000	0.00000000	0.00000000	0.00000000	0.0001916	0.00
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	Galveston	0.0226620	0.00000000	0.00000000	0.00000000	0.0002123	0.00
	Harris	0.1486911	0.00000000	0.00000000	0.00000000	0.0013936	0.00
	Liberty	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
Beaumont/Port Arthur Area	Montgomery	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Waller	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Waller	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Waller	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Waller	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Waller	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
Dallas/Fort Worth Area	Denton	0.0001267	0.00000000	0.00000000	0.00000000	0.0000079	0.00
	Tarrant	0.0004742	0.00000000	0.00000000	0.00000000	0.0000297	0.00
	Ellis	0.0029920	0.00000000	0.00000000	0.00000000	0.0001873	0.00
	Johnson	0.0002256	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Kaufman	0.0002183	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Parker	0.000012	0.00000000	0.00000000	0.00000000	0.0000000	0.00
El Paso Area	Rockwall	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Rockwall	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Rockwall	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Rockwall	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Rockwall	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Rockwall	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
San Antonio Area	Henderson	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Henderson	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Henderson	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Henderson	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Henderson	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Henderson	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
Austin Area	Hunt	0.00088463	0.00000000	0.00000000	0.00000000	0.0662823	0.00
	Hunt	0.00088463	0.00000000	0.00000000	0.00000000	0.0662823	0.00
	Hunt	0.00088463	0.00000000	0.00000000	0.00000000	0.0662823	0.00
	Hunt	0.00088463	0.00000000	0.00000000	0.00000000	0.0662823	0.00
	Hunt	0.00088463	0.00000000	0.00000000	0.00000000	0.0662823	0.00
	Hunt	0.00088463	0.00000000	0.00000000	0.00000000	0.0662823	0.00
North East Texas Area	Travis	0.0001785	0.00000000	0.00000000	0.00000000	0.0000077	0.00
	Travis	0.0001785	0.00000000	0.00000000	0.00000000	0.0000077	0.00
	Travis	0.0001785	0.00000000	0.00000000	0.00000000	0.0000077	0.00
	Travis	0.0001785	0.00000000	0.00000000	0.00000000	0.0000077	0.00
	Travis	0.0001785	0.00000000	0.00000000	0.00000000	0.0000077	0.00
	Travis	0.0001785	0.00000000	0.00000000	0.00000000	0.0000077	0.00
Corpus Christi Area	Williamson	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Williamson	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Williamson	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Williamson	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Williamson	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Williamson	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
Victoria Area	Gregg	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Gregg	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Gregg	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Gregg	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Gregg	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Gregg	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
Other ERCOT counties	Harrison	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Harrison	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Harrison	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Harrison	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Harrison	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
	Harrison	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00
Total		8.4414501	0.00000000	0.00000000	0.00000000	0.6829349	0.00
Energy Savings (MWh)		0	0	0	0	0	0



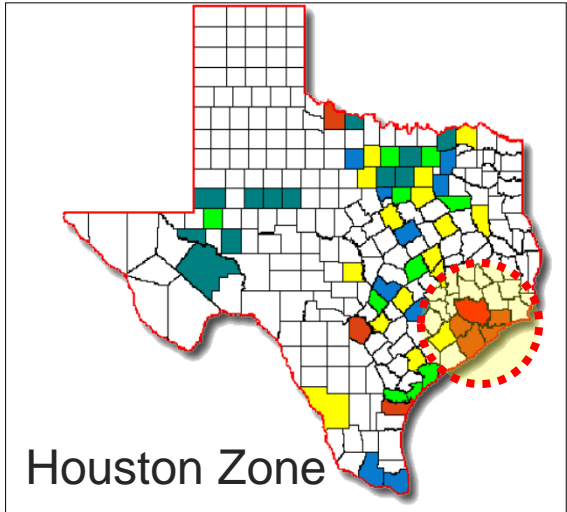
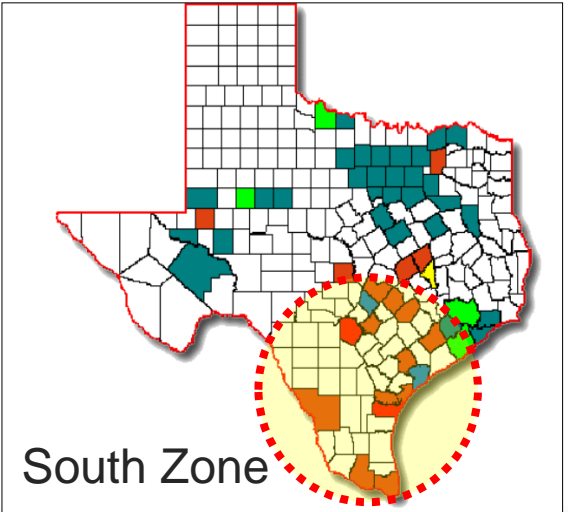
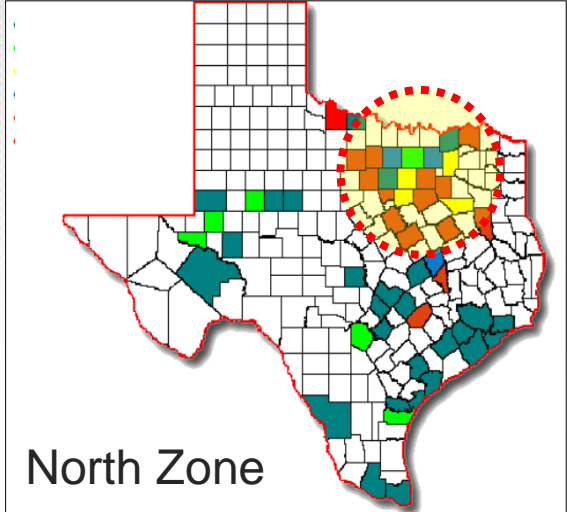
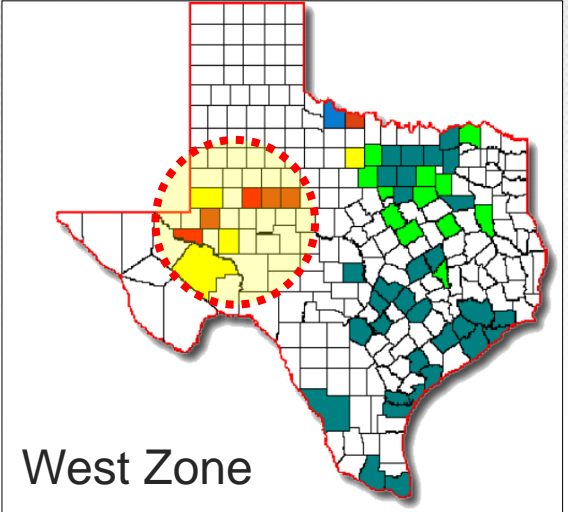
Assignment of Consumption Reductions to Generators in Each CM Zone

NO_x REDUCTIONS USING eGRID

2010 Annual eGrid for NO_x Emissions

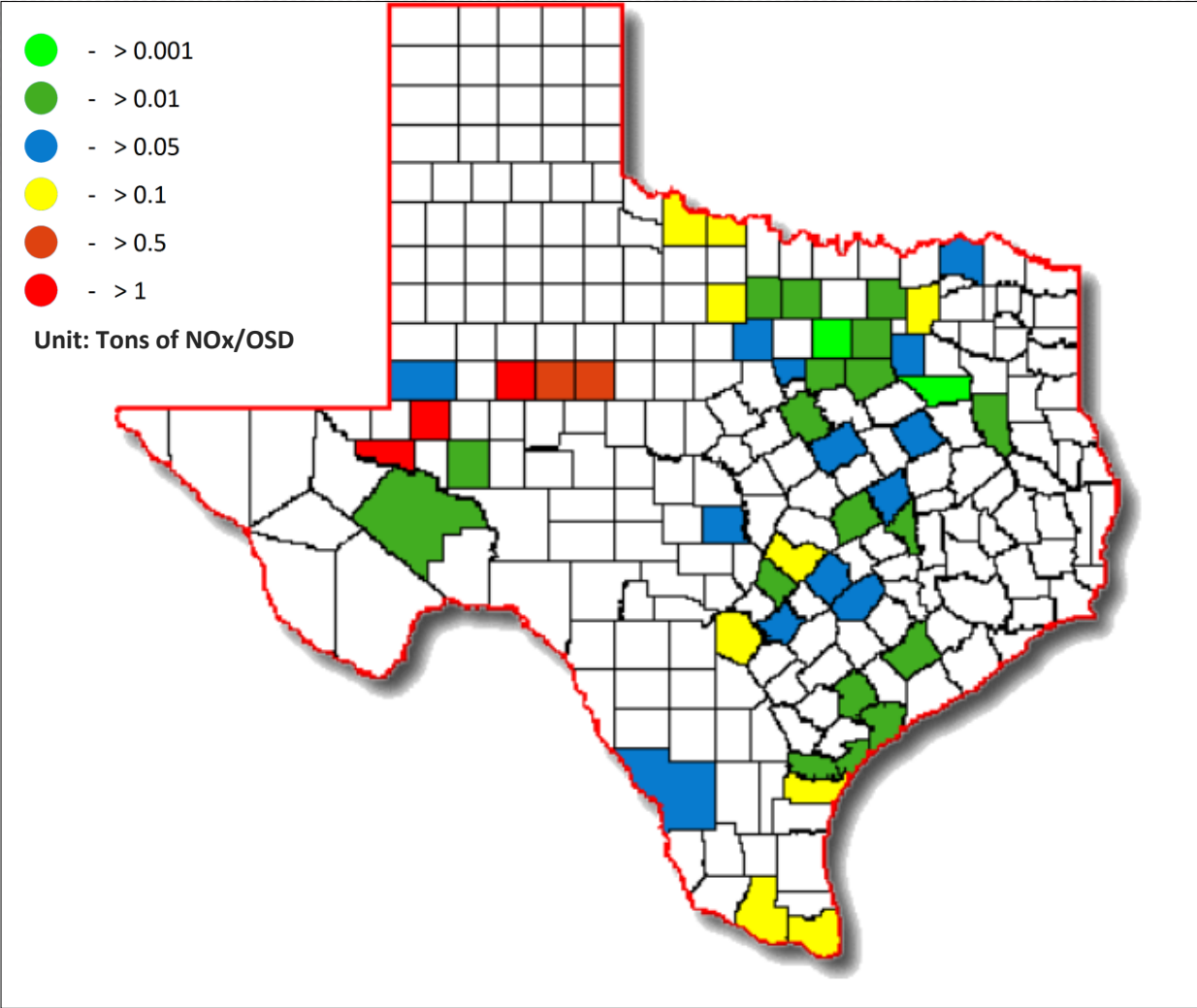


Unit: lbs of NO_x/MWh



NO_x REDUCTIONS USING eGRID

2010 OSD eGrid for NO_x Emissions



NO_x REDUCTIONS USING eGRID

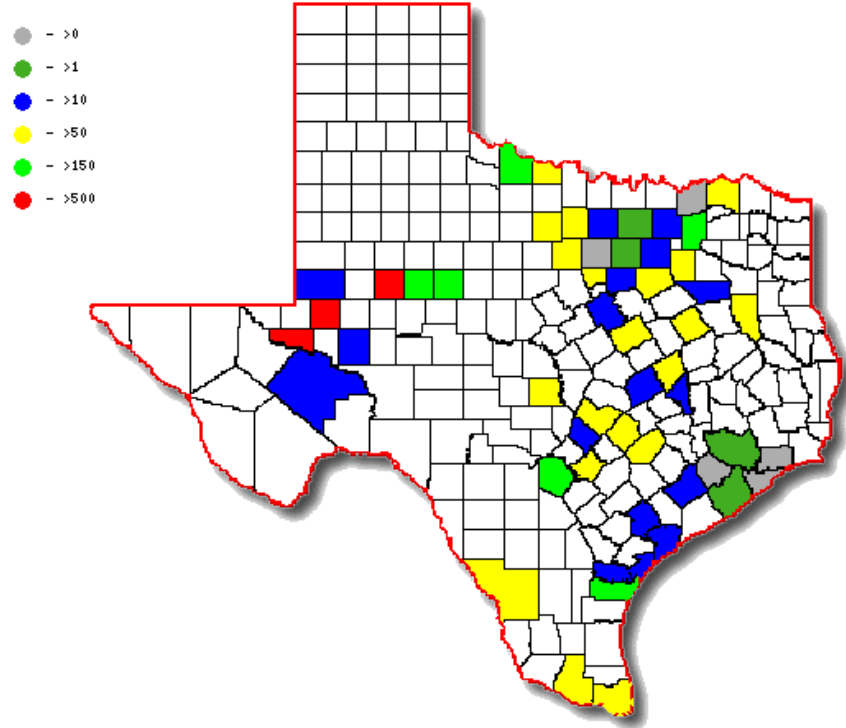
Calculation of NO_x Emissions from **Wind Power** Using 2010 eGRID

Annual NO_x Reductions

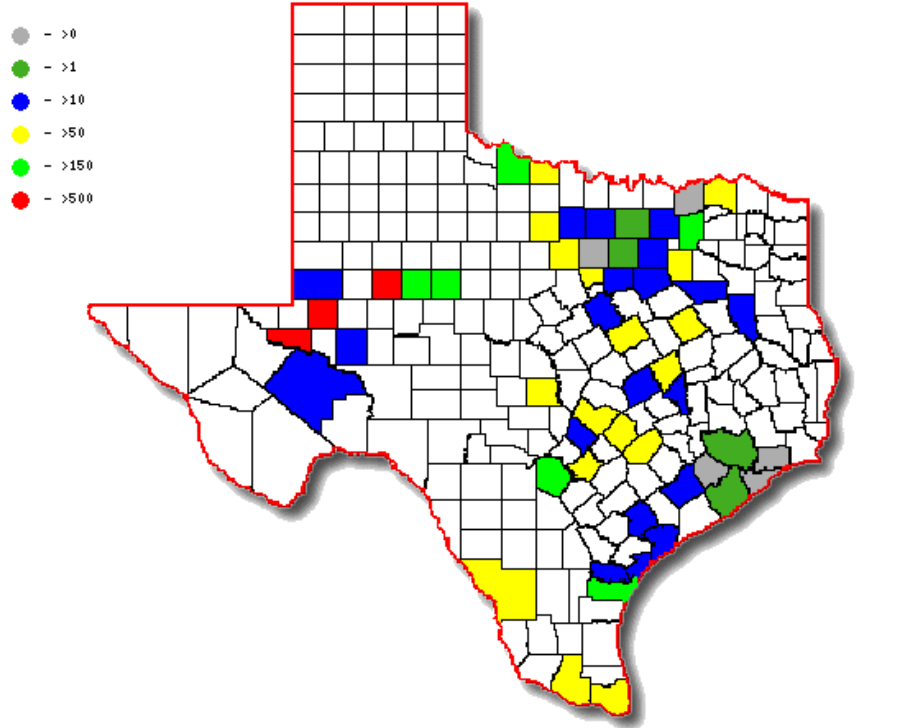
2014 Measured (Wind Power only)

2008 Baseline (Wind Power only)

Measured 2014 Annual NO_x Reduction From Wind Power (tons/yr)



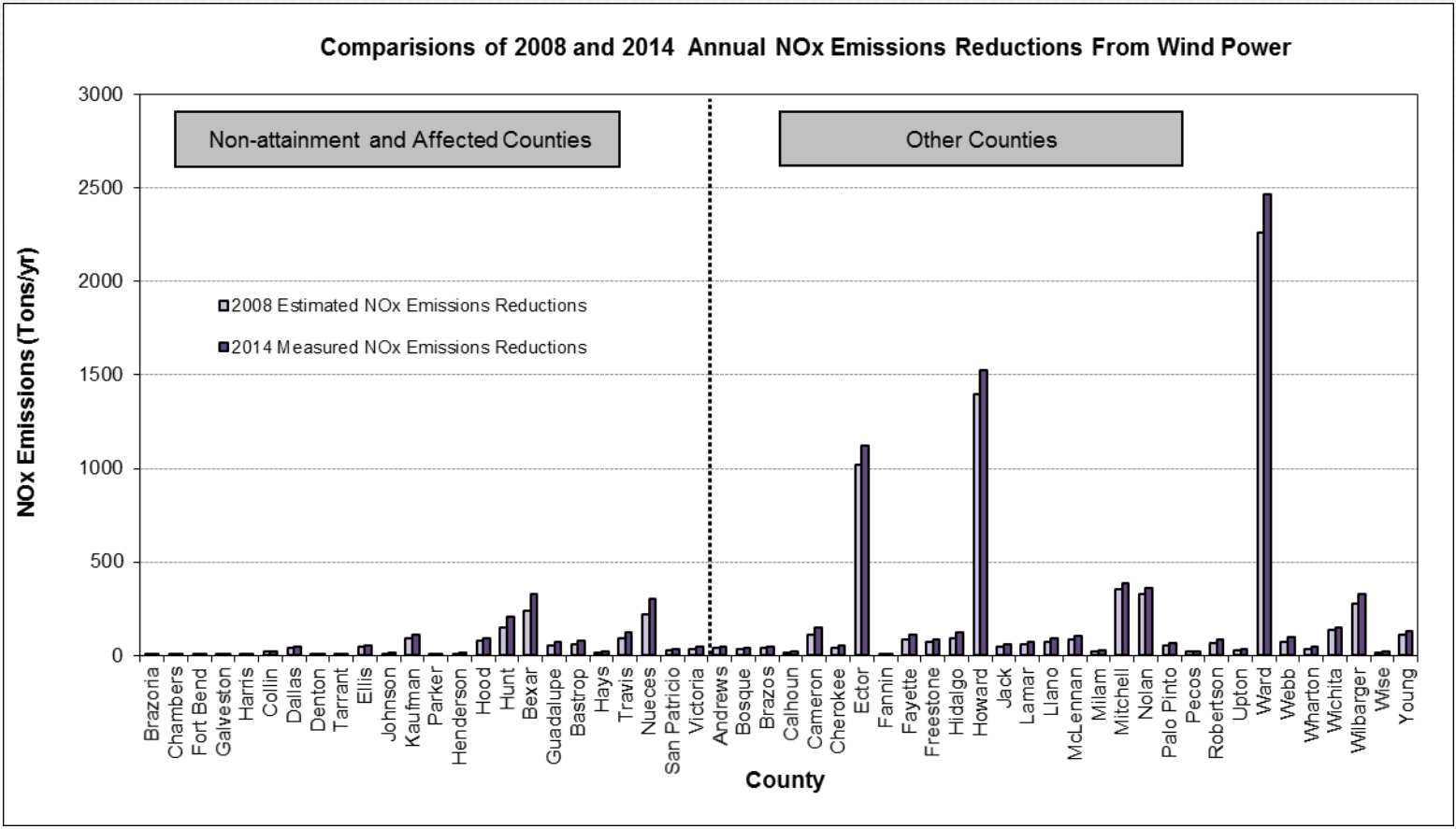
Estimated 2008 Annual NO_x Reduction From Wind Power (tons/yr)



NOx REDUCTIONS USING eGRID

Calculation of NOx Emissions from **Wind Power** Using 2010 eGRID

Annual NOx Reductions
Comarisions of 2008 and 2014 Annual NOx Emissions



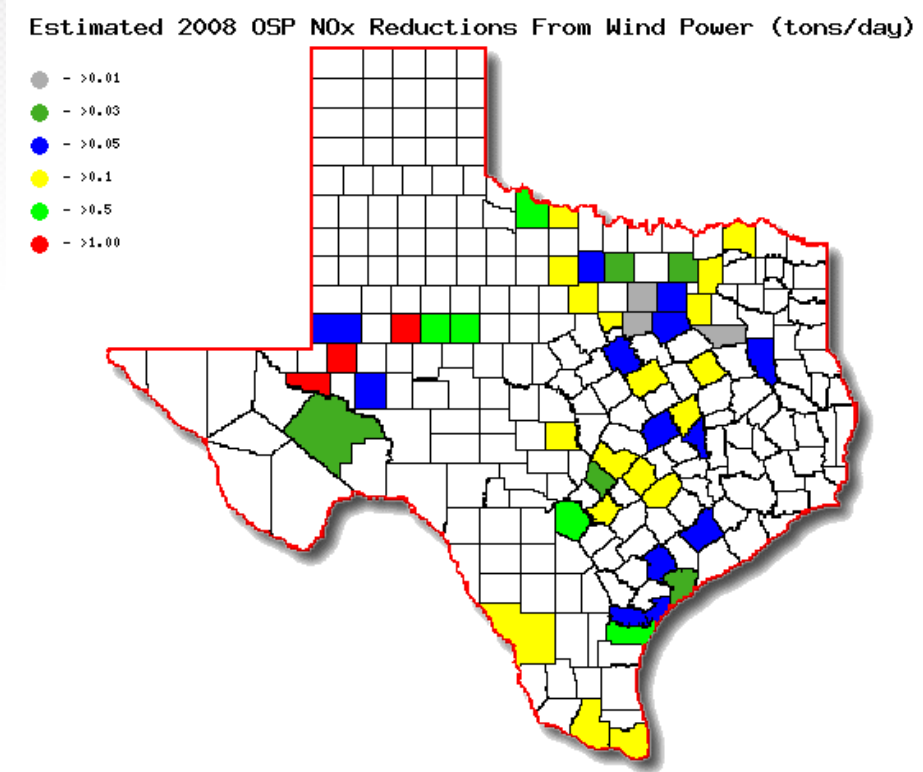
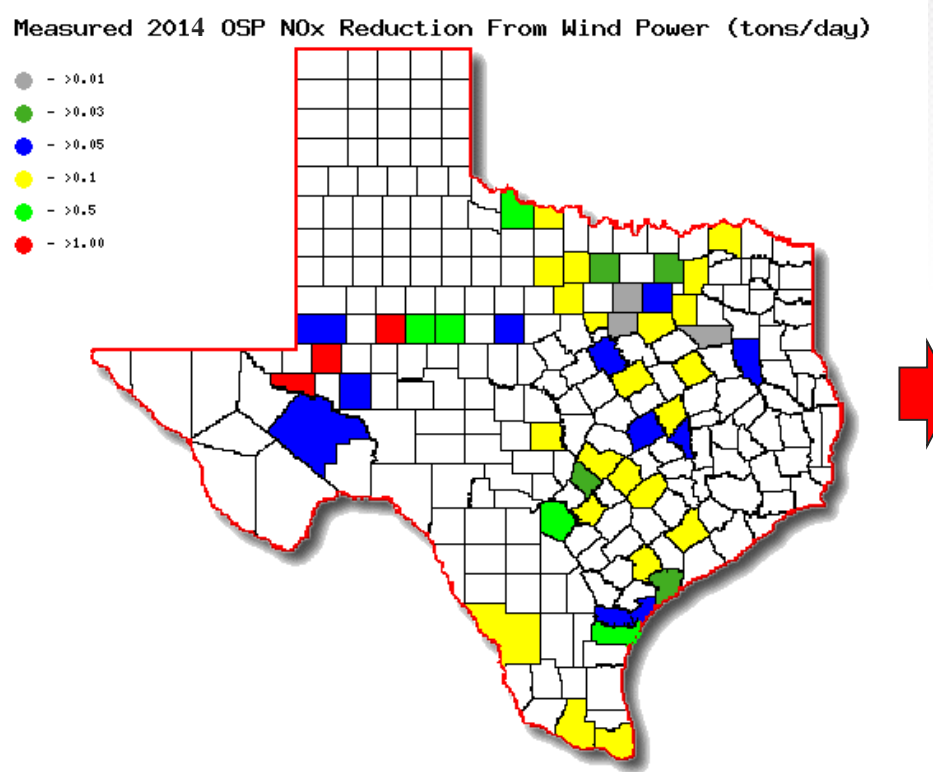
NOx REDUCTIONS USING eGRID

Calculation of NOx Emissions from **Wind Power** Using 2010 eGRID

OSP NOx Reductions

2014 Measured (Wind Power only)

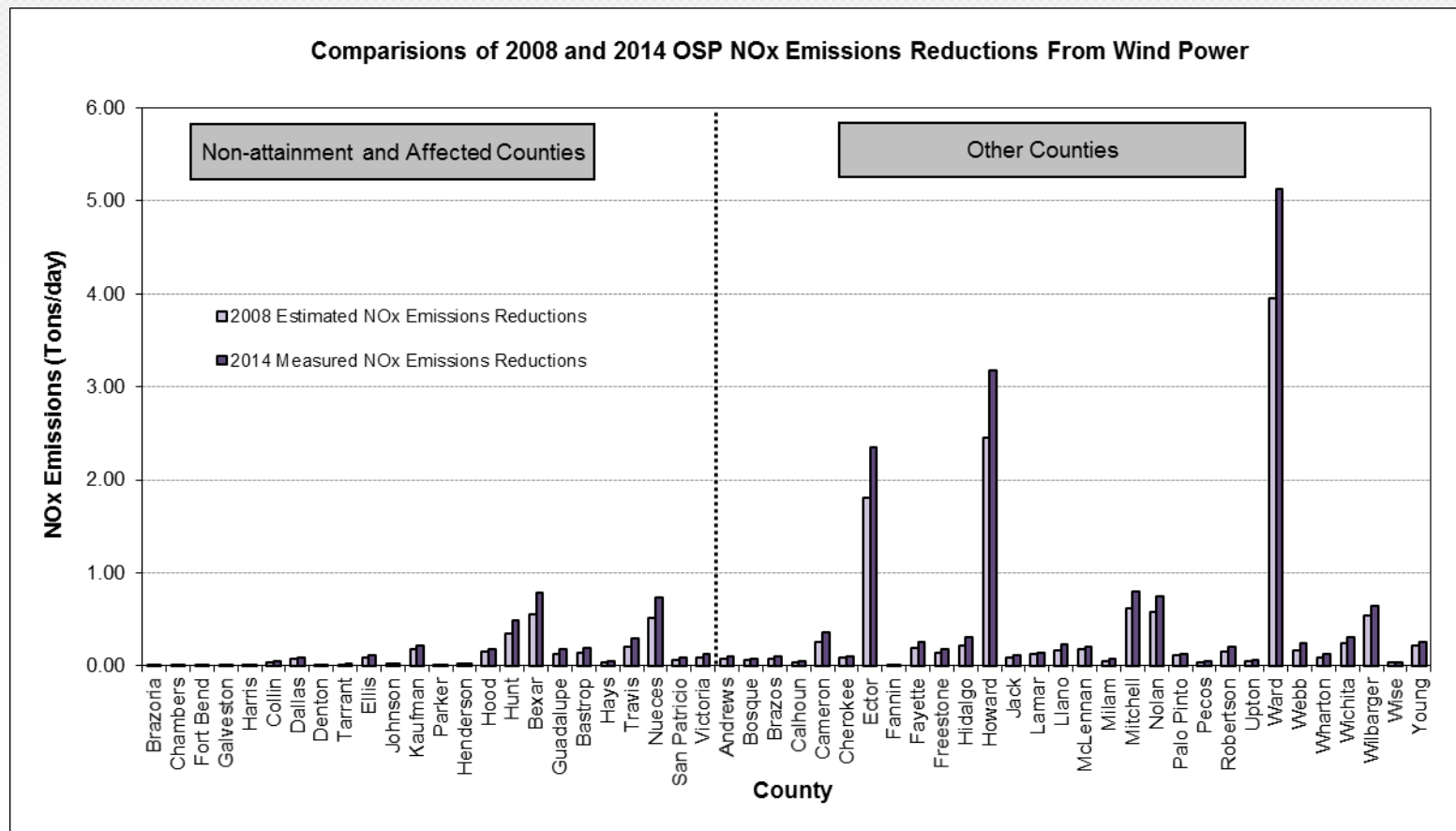
2008 Baseline (Wind Power only)



NOx REDUCTIONS USING eGRID

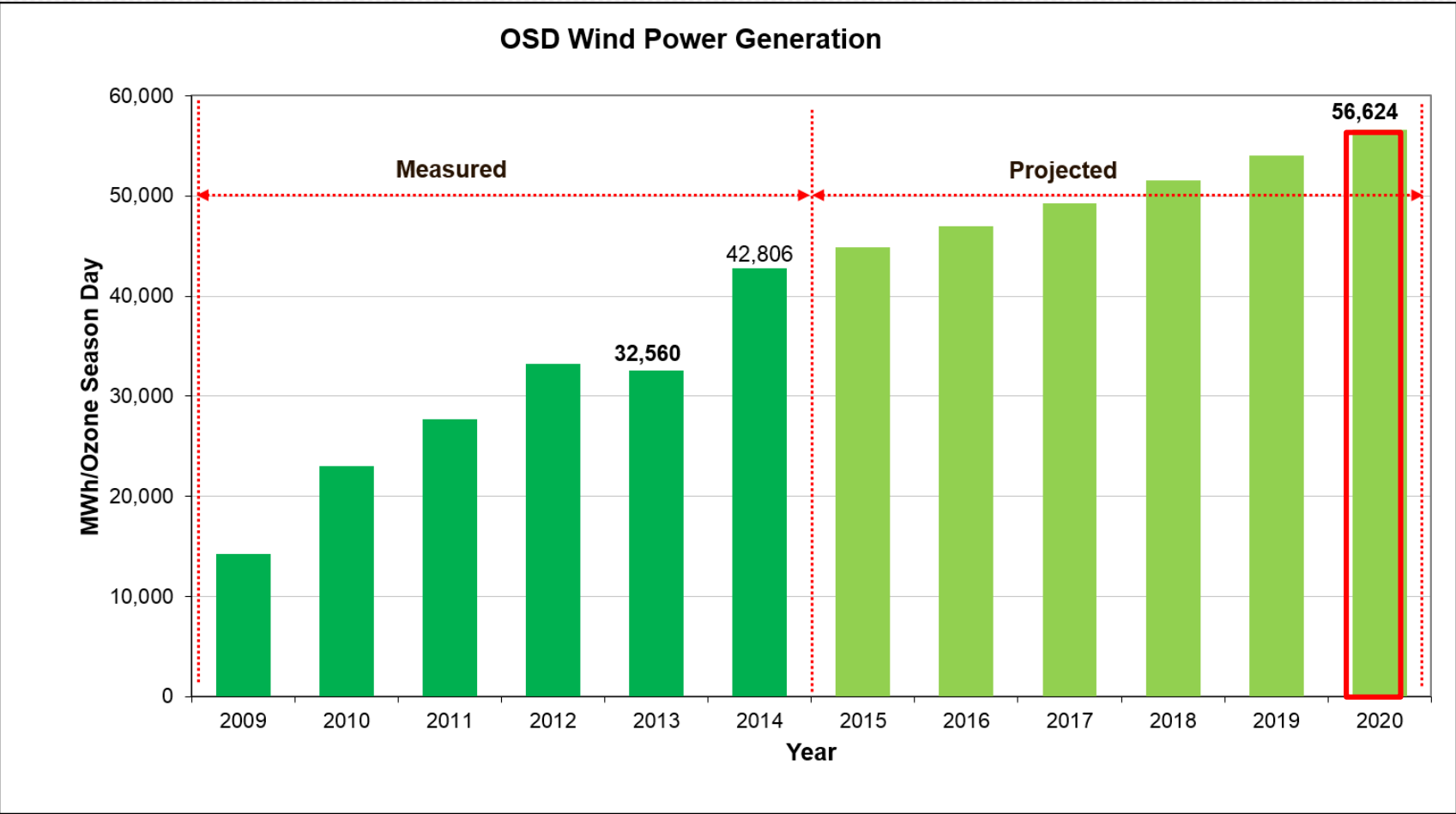
Calculation of NOx Emissions from **Wind Power** Using 2010 eGRID

Comparisons of 2008 and 2014 OSP NOx Emissions



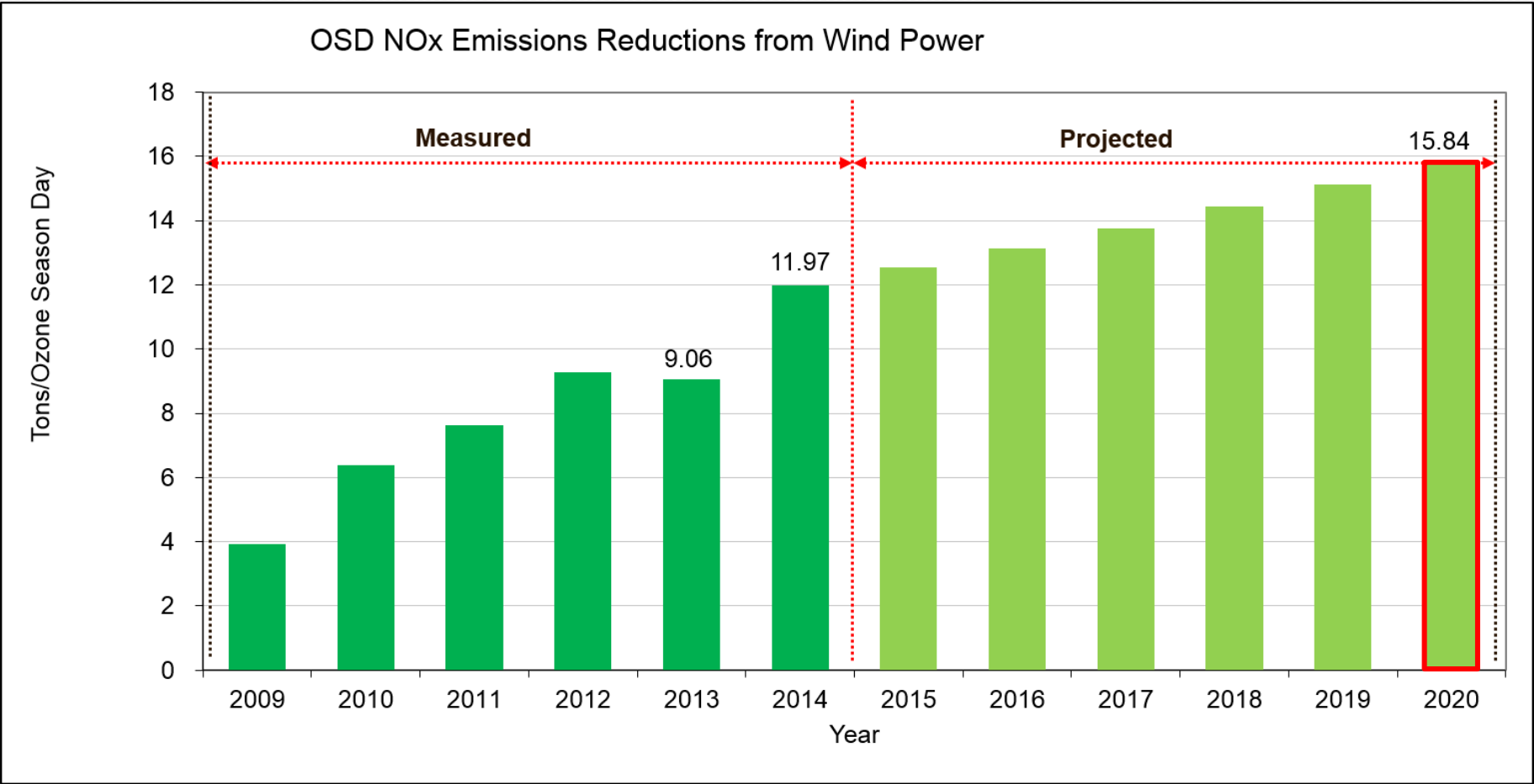
NOx REDUCTIONS FROM WIND POWER

OSD Power Generation and NOx Emissions Reductions (2008 base year)



NOx REDUCTIONS FROM WIND POWER

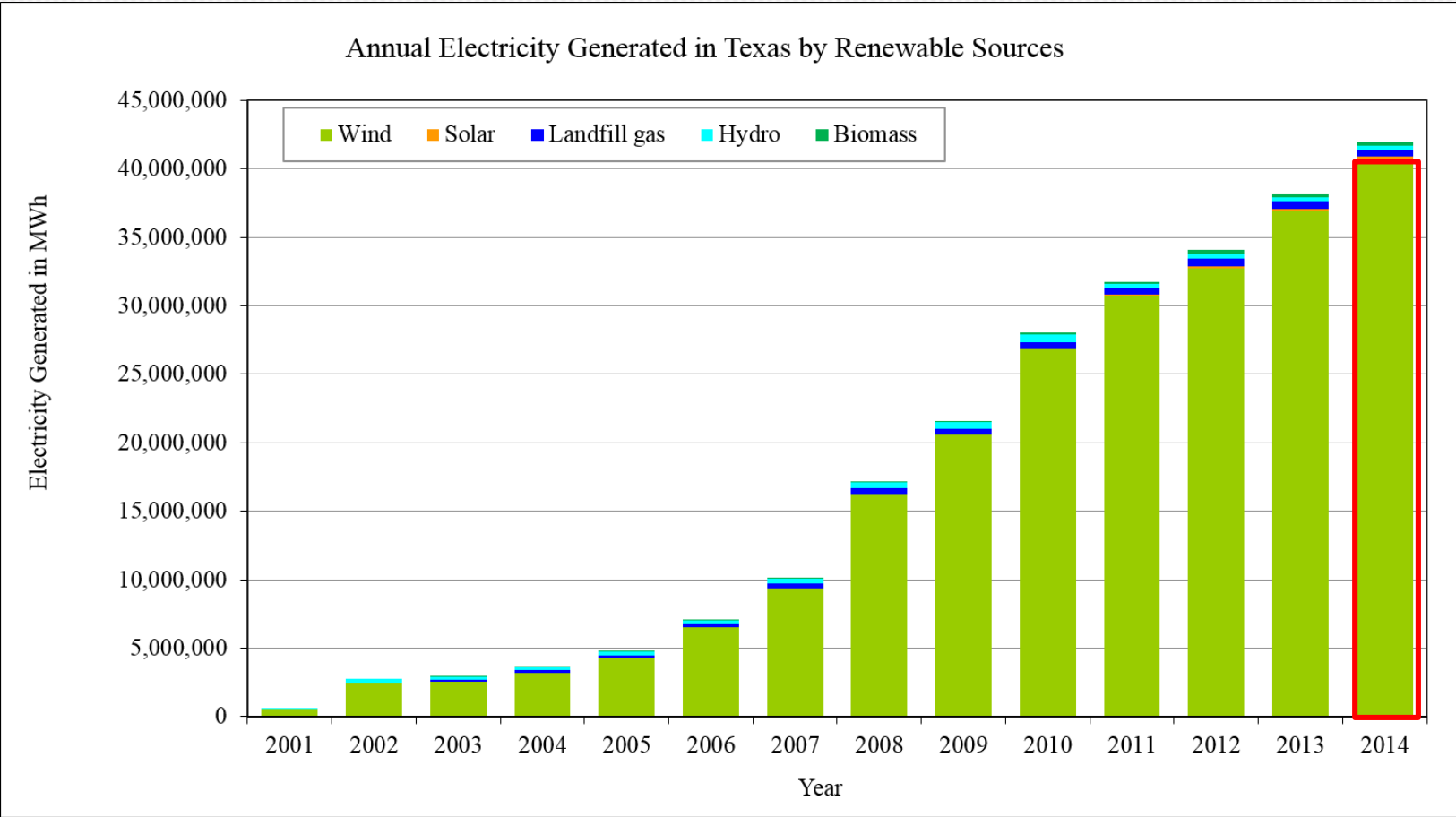
OSD Power Generation and NOx Emissions Reductions (2008 base year)



SAVINGS FROM OTHER RENEWABLES (2001-2014)

Renewables: Biomass, Hydro, Landfill Gas, Solar, Wind

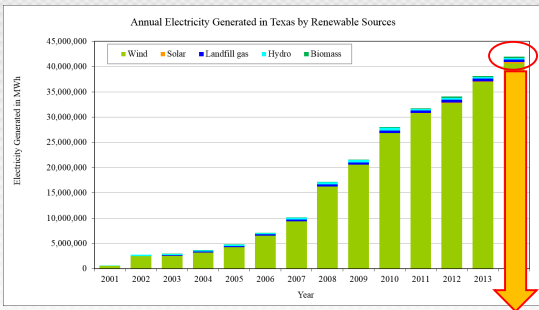
✓ Wind energy is the largest portion



SAVINGS FROM OTHER RENEWABLES (2001-2014)

Renewables: Biomass, Hydro, Landfill Gas, Solar, Wind

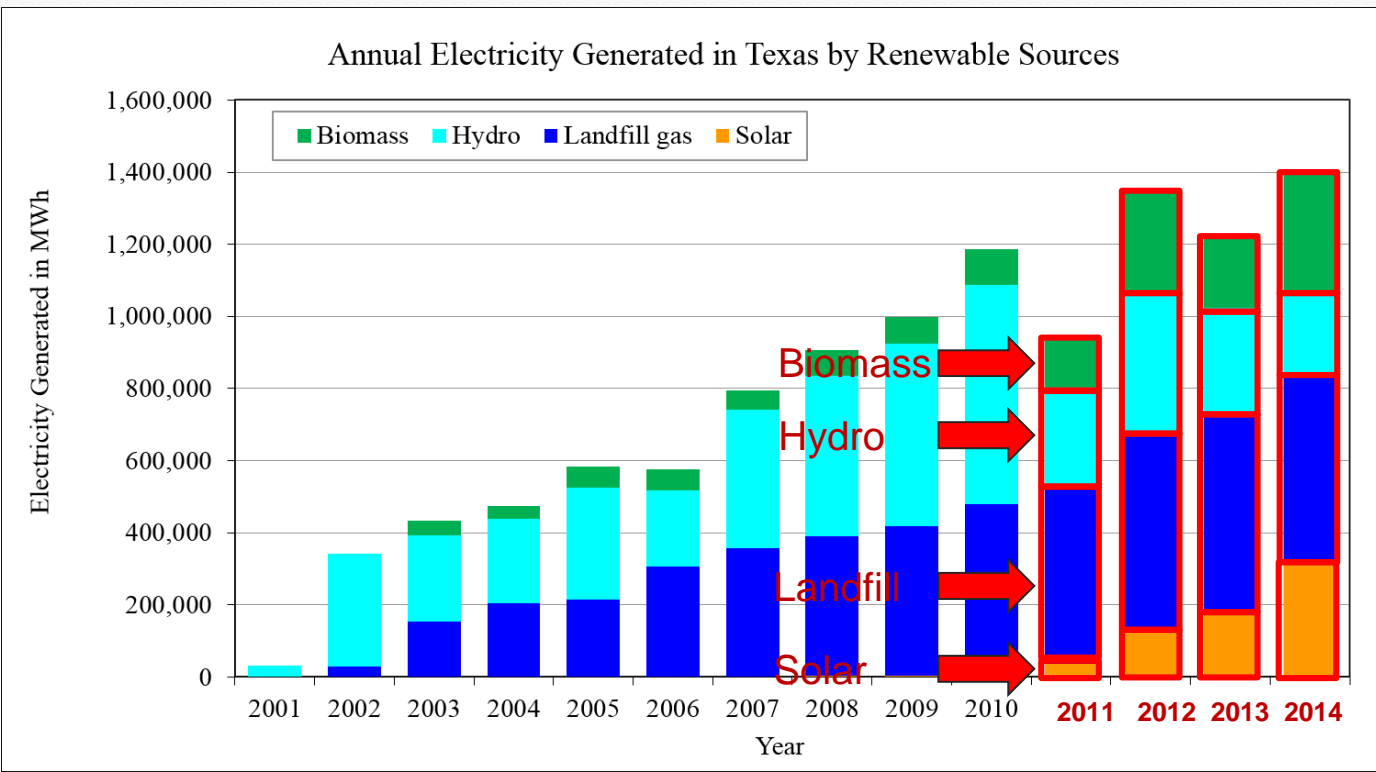
✓ Wind energy is the largest portion



Excluding Wind

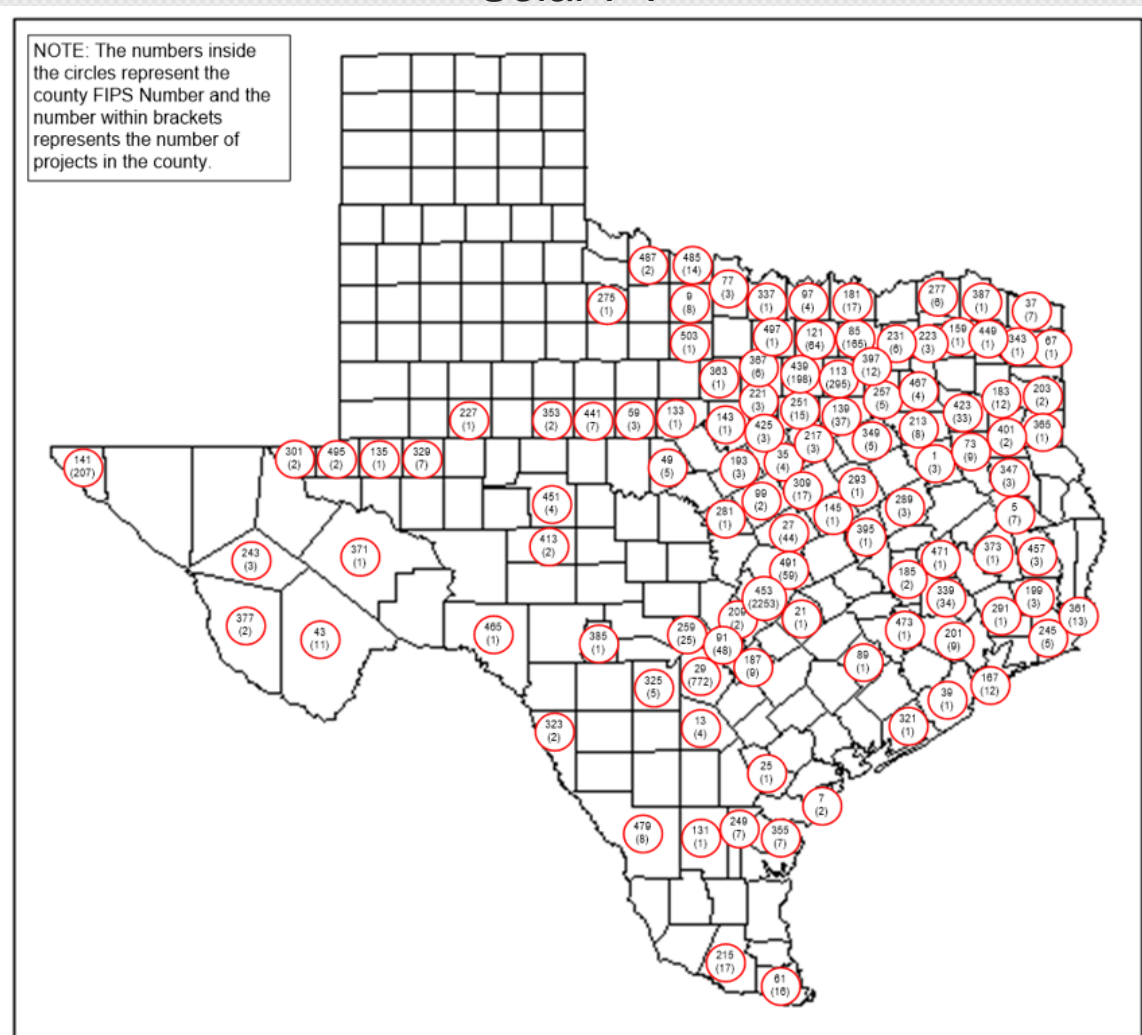
For the last 4 years

- ✓ Solar has increased considerably
- ✓ Landfill has been steady
- ✓ Hydro has increased/decreased
- ✓ Biomass has increased/decreased



RENEWABLE PROJECTS IN TEXAS (2014)

Solar PV



Renewables*:

Solar PV (4,647 projects)



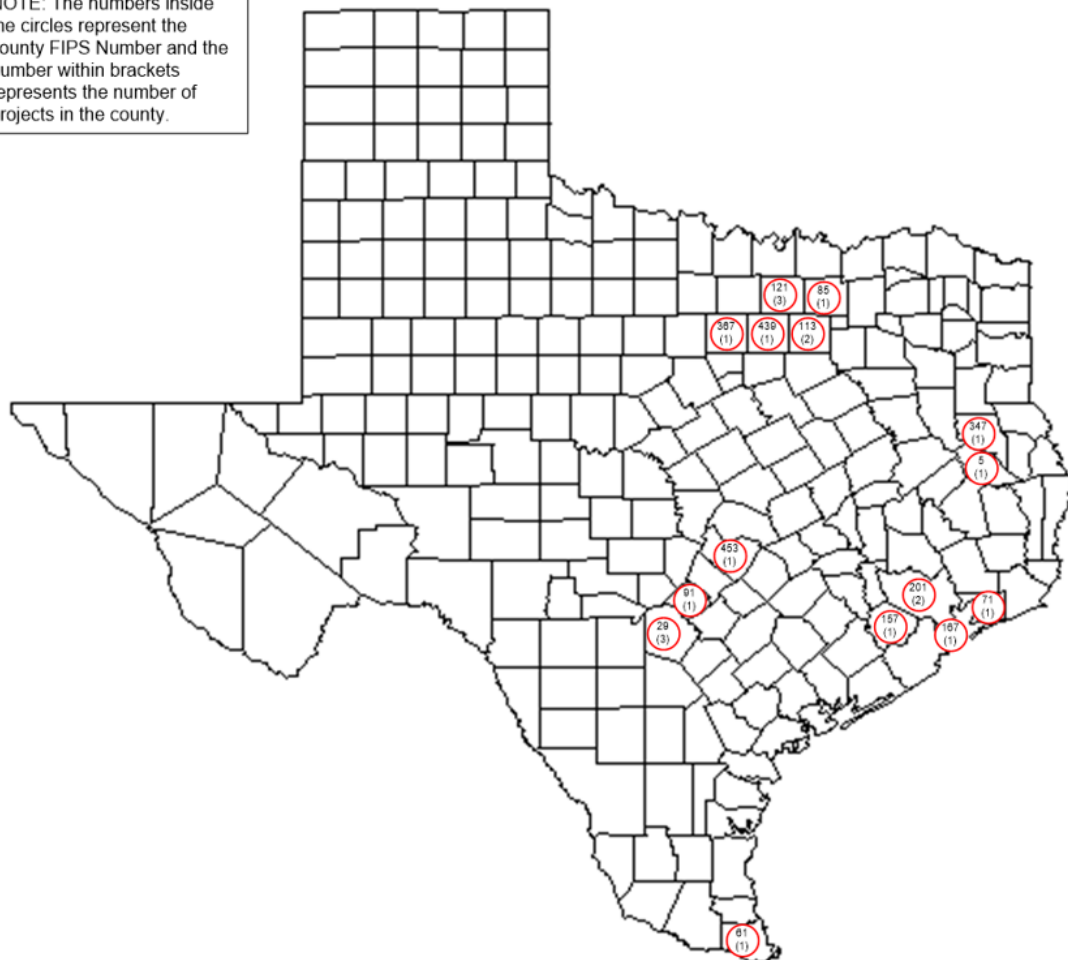
<https://openpv.nrel.gov>

* Included renewable projects if their information/data are available

RENEWABLE PROJECTS IN TEXAS (2014)

Biomass

NOTE: The numbers inside the circles represent the county FIPS Number and the number within brackets represents the number of projects in the county.



Renewables*:

Solar PV (4,647 projects)

Biomass (20 projects)

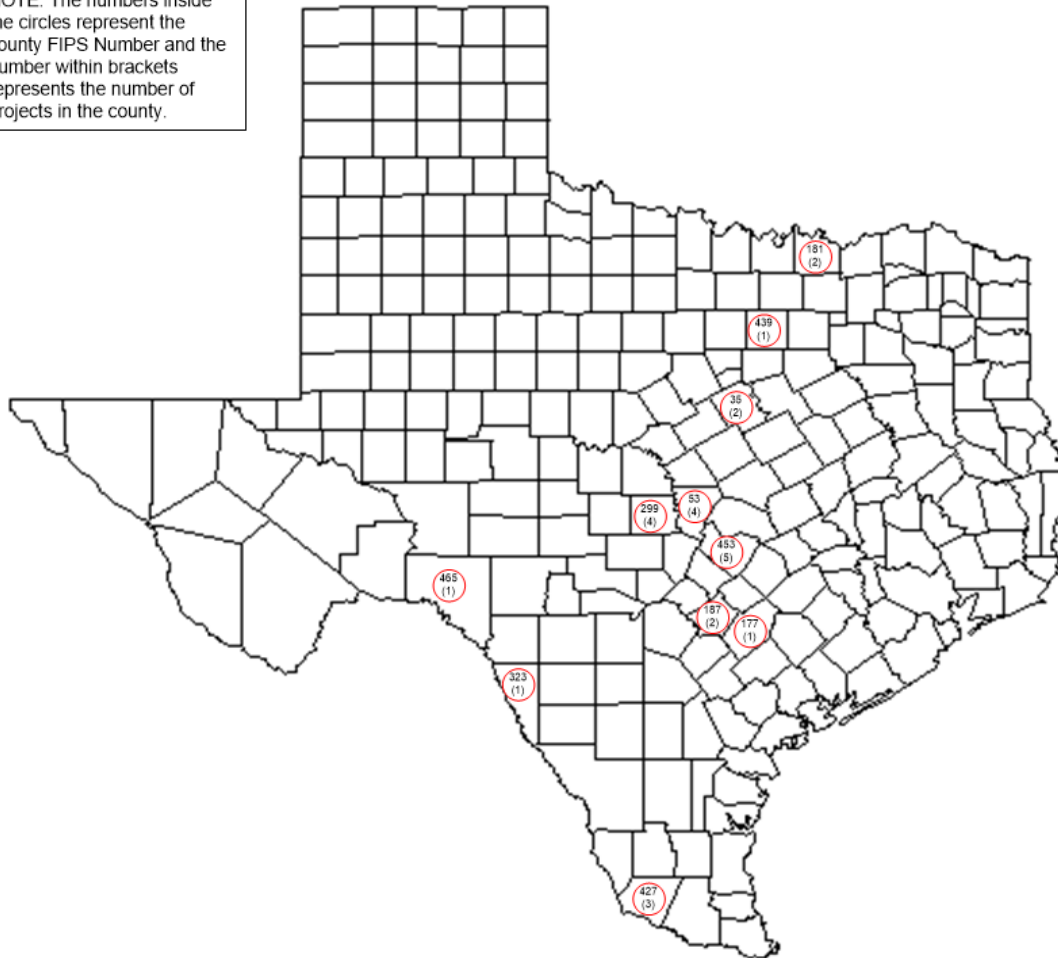
* Included renewable projects if their information/data are available



RENEWABLE PROJECTS IN TEXAS (2014)

Hydro

NOTE: The numbers inside the circles represent the county FIPS Number and the number within brackets represents the number of projects in the county.



Renewables*:

Solar PV (4,647 projects)

Biomass (20 projects)

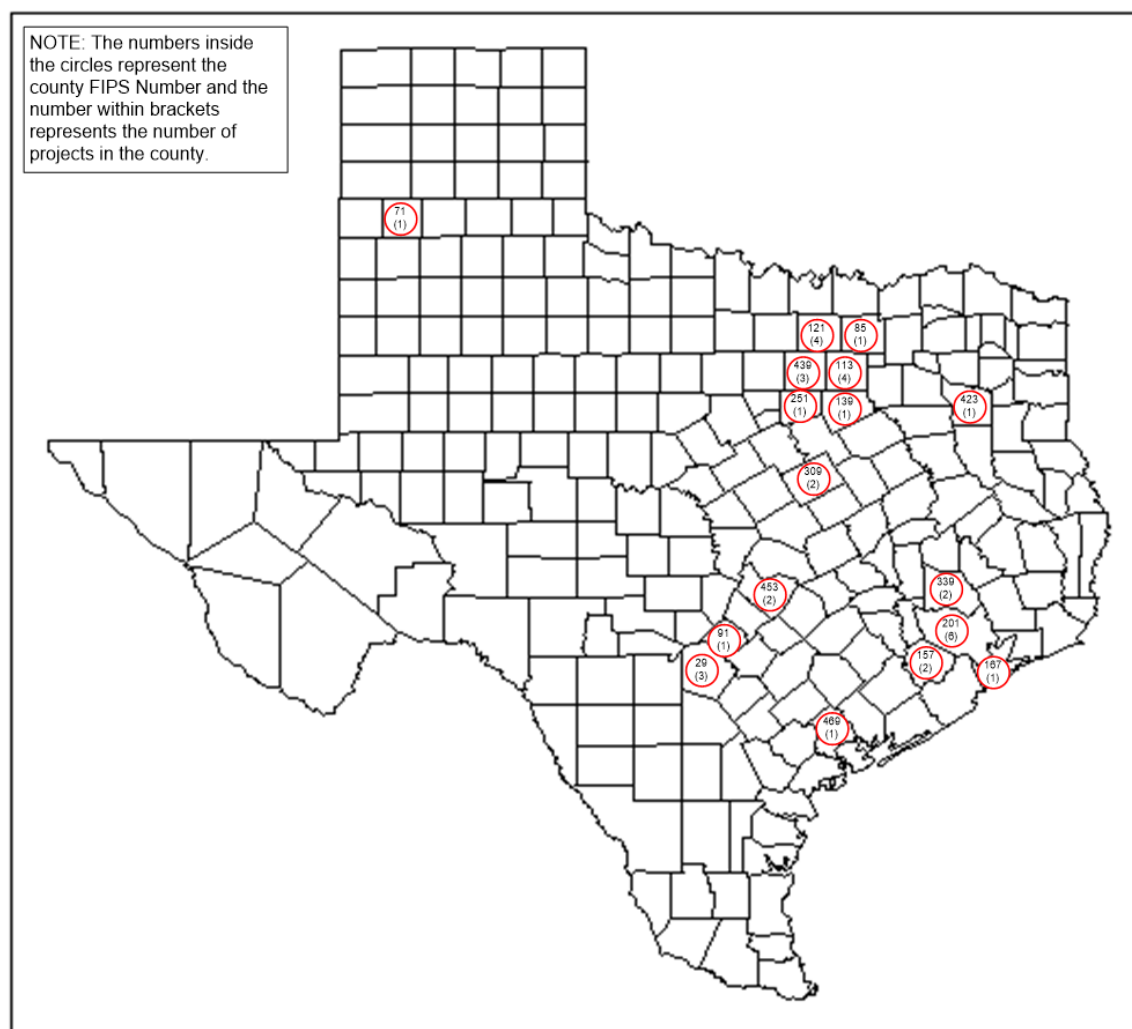
Hydro (27 projects)



* Included renewable projects if their information/data are available

RENEWABLE PROJECTS IN TEXAS (2014)

Landfill Gas



Renewables*:

Solar PV (4,647 projects)

Biomass (20 projects)

Hydro (27 projects)

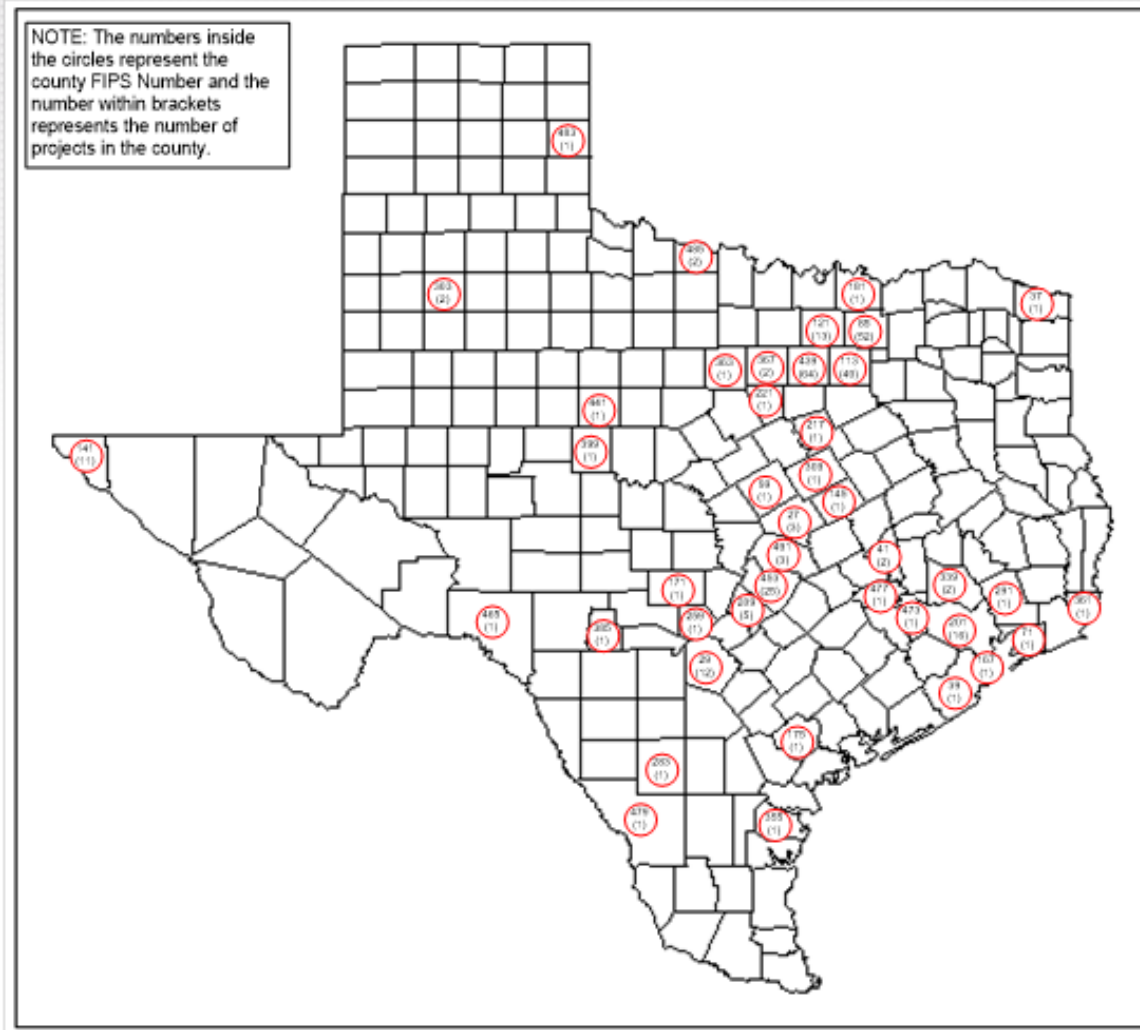
Landfill Gas (34 projects)

* Included renewable projects if their information/data are available



RENEWABLE PROJECTS IN TEXAS (2014)

Geothermal



* Included renewable projects if their information/data are available

Renewables*:

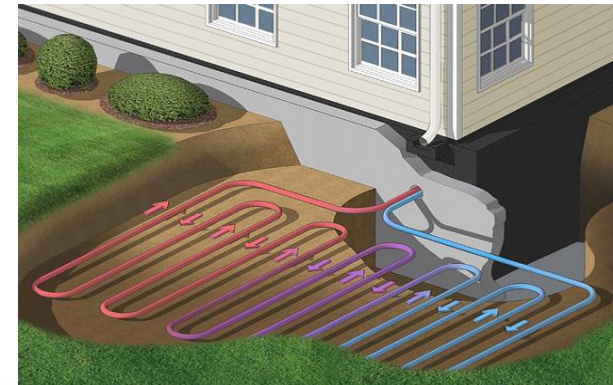
Solar PV (4,647 projects)

Biomass (20 projects)

Hydro (27 projects)

Landfill Gas (34 projects)

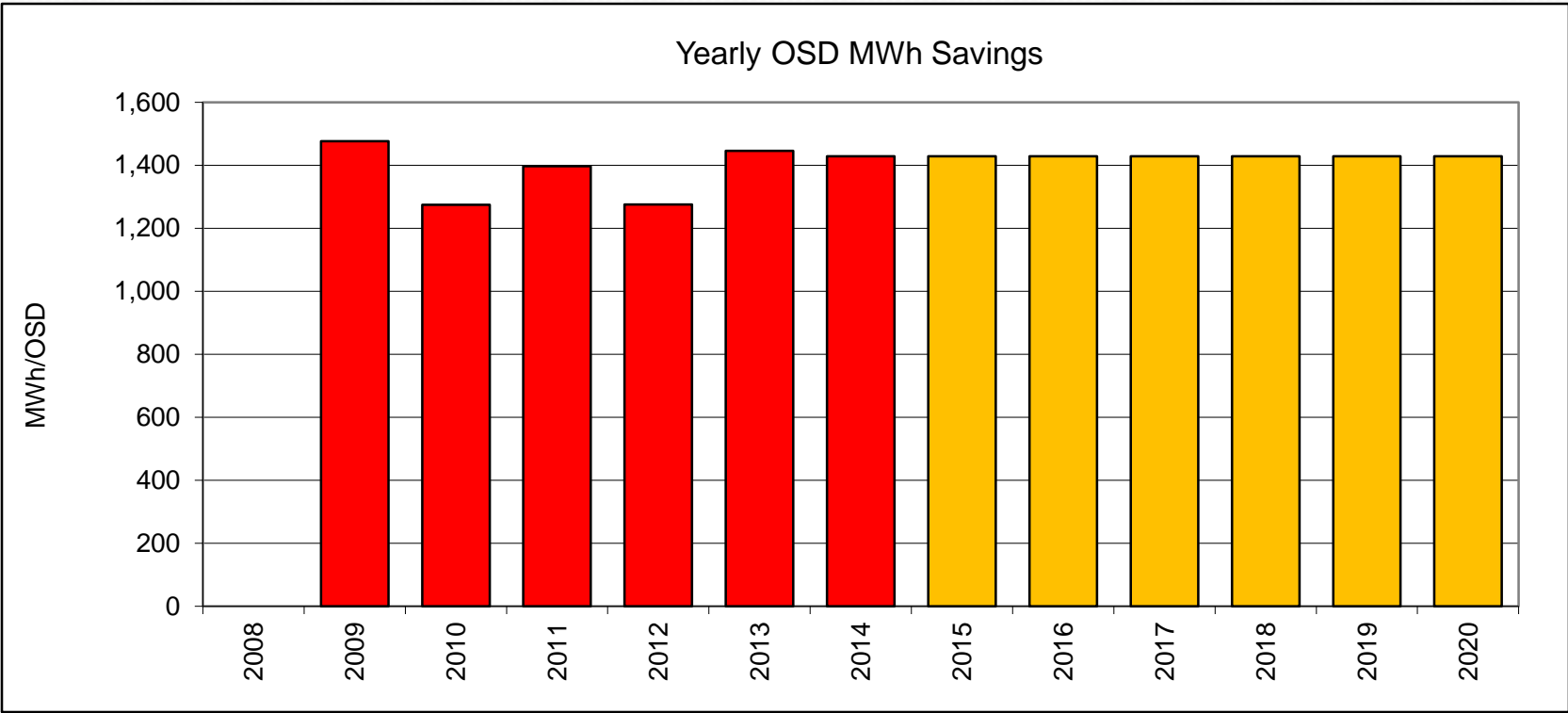
Geothermal (286 projects)



ENERGY SAVINGS FROM PUC SB7

PUC SB7 Savings and Projections

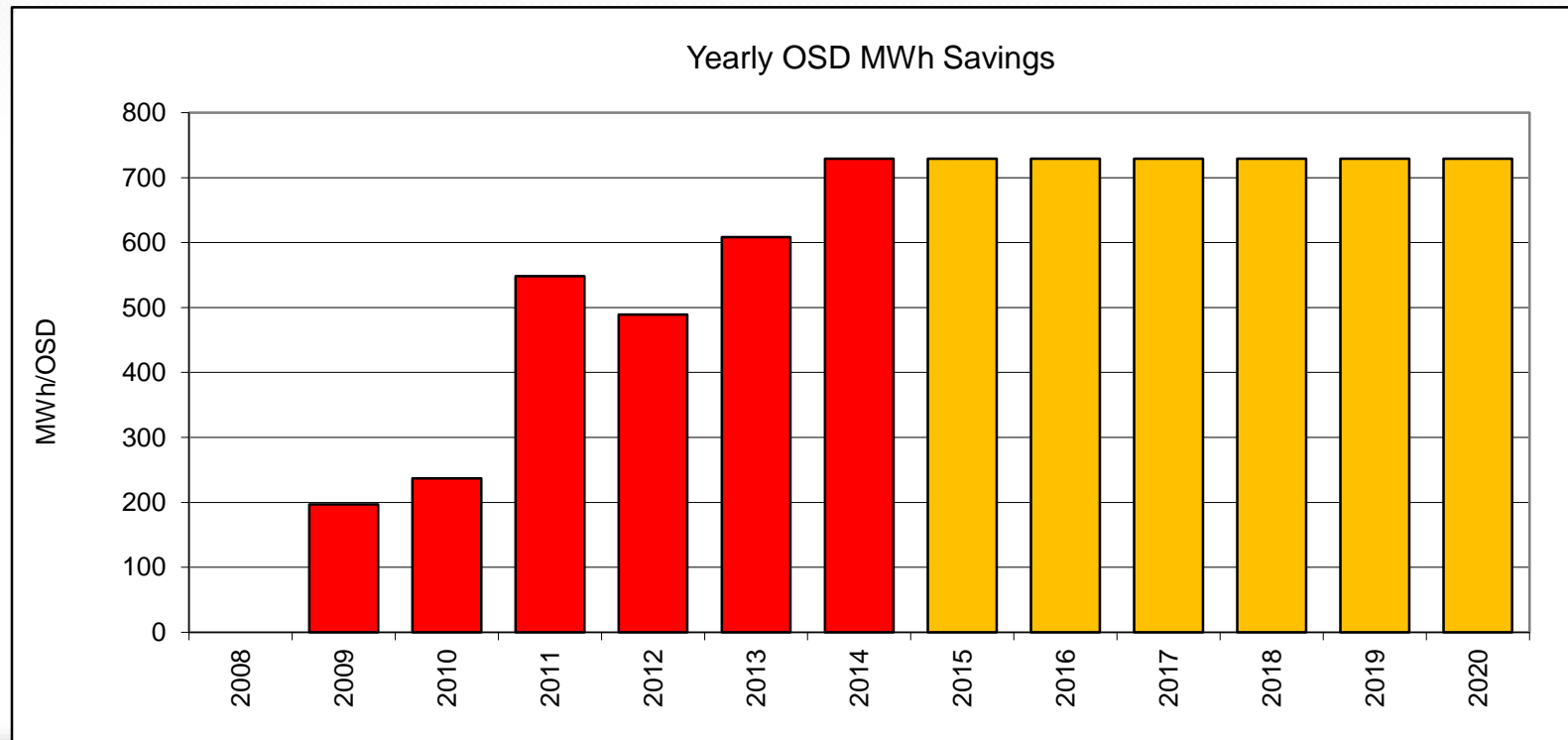
- The Public Utility Commission of Texas (PUC) Senate Bill 7 program includes their incentive and rebates programs managed by the different Utilities for Texas.
- These include the Residential Energy Efficiency Programs (REEP) as well as the Commercial & Industrial Standard Offer Programs.



ENERGY SAVINGS FROM SECO

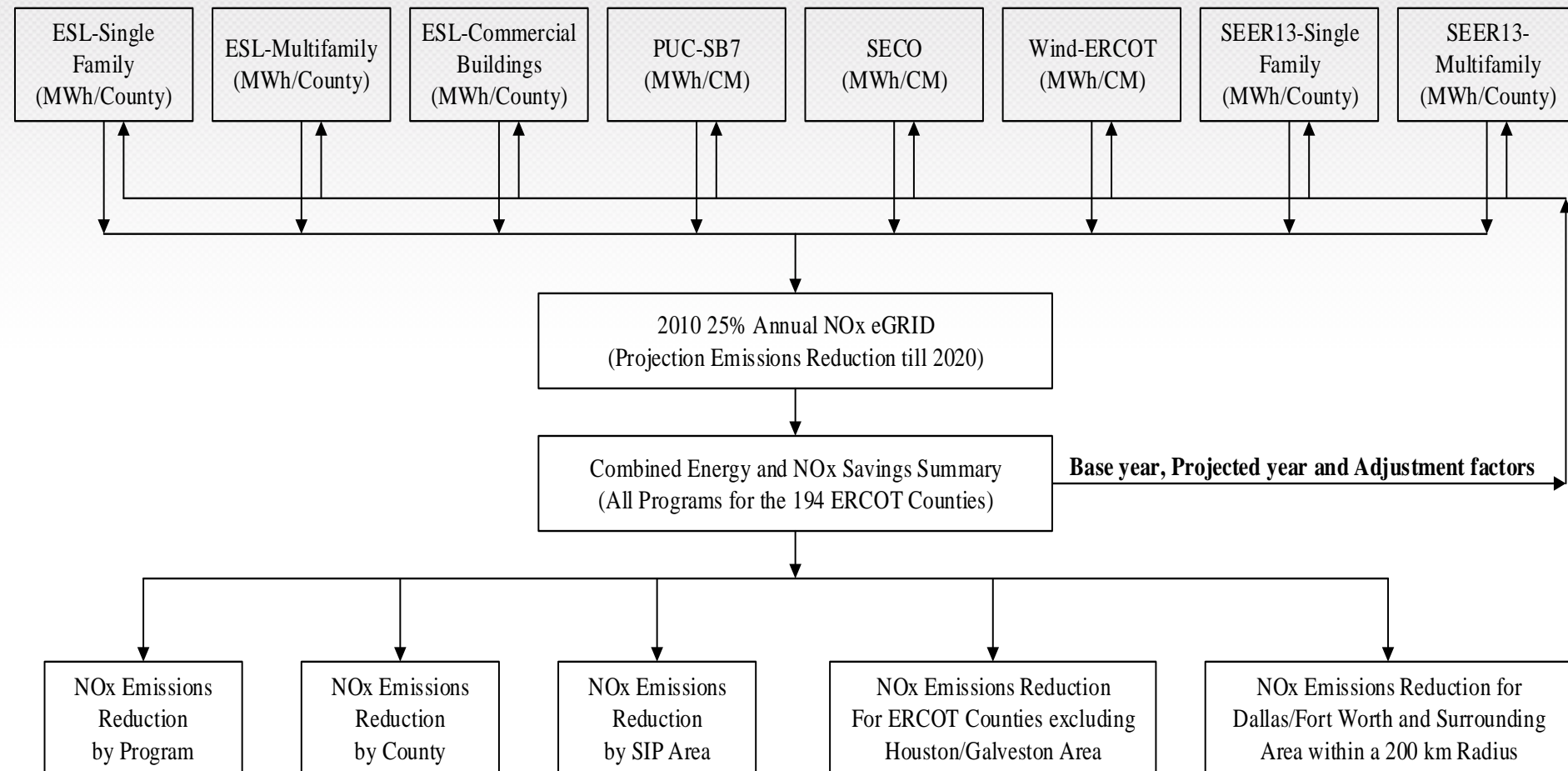
SECO Savings and Projections

- The Texas State Energy Conservation Office (SECO) funds energy-efficiency programs directed towards school districts, government agencies, city and county governments, private industries and residential energy consumers.
- The annual electricity savings are obtained from SECO's energy conservation projects reported by political subdivisions for 47 counties.



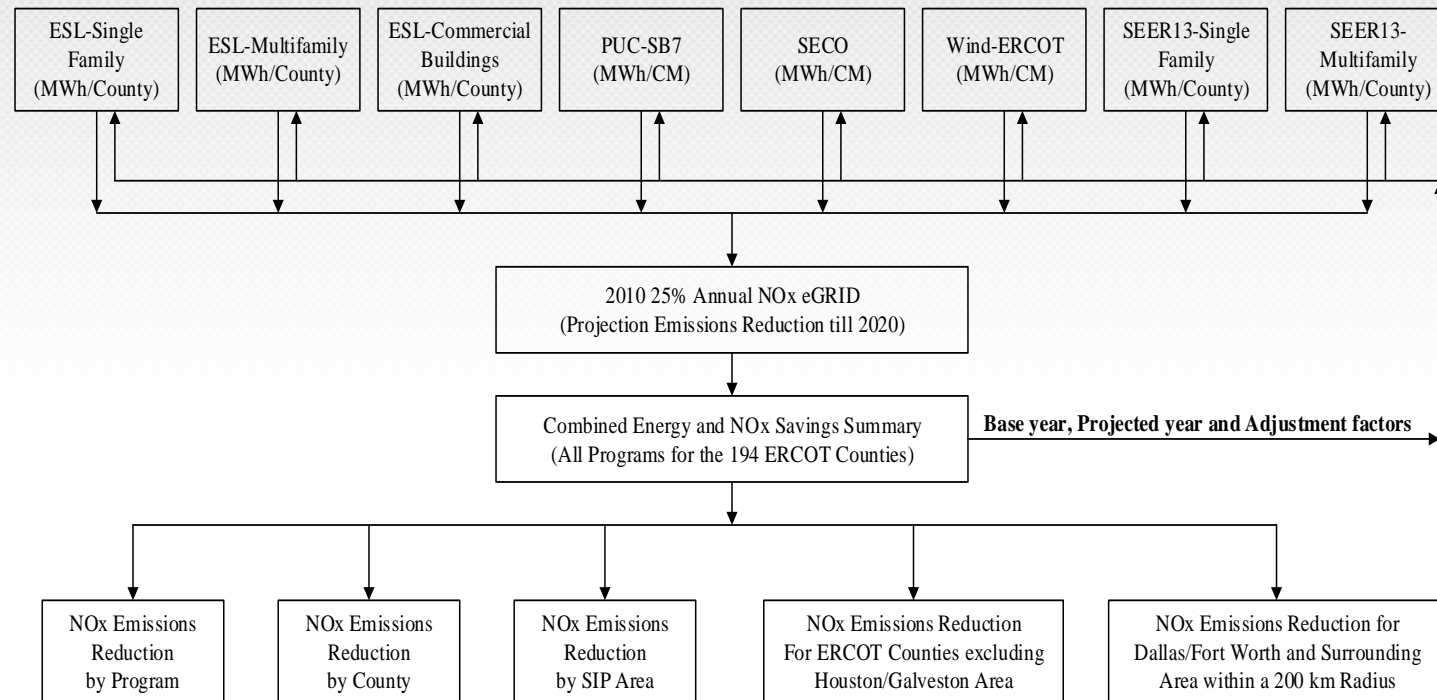
INTEGRATED NO_x EMISSIONS REDUCTION

Integrated Emissions Savings Across Agencies To Report Savings To TCEQ and EPA



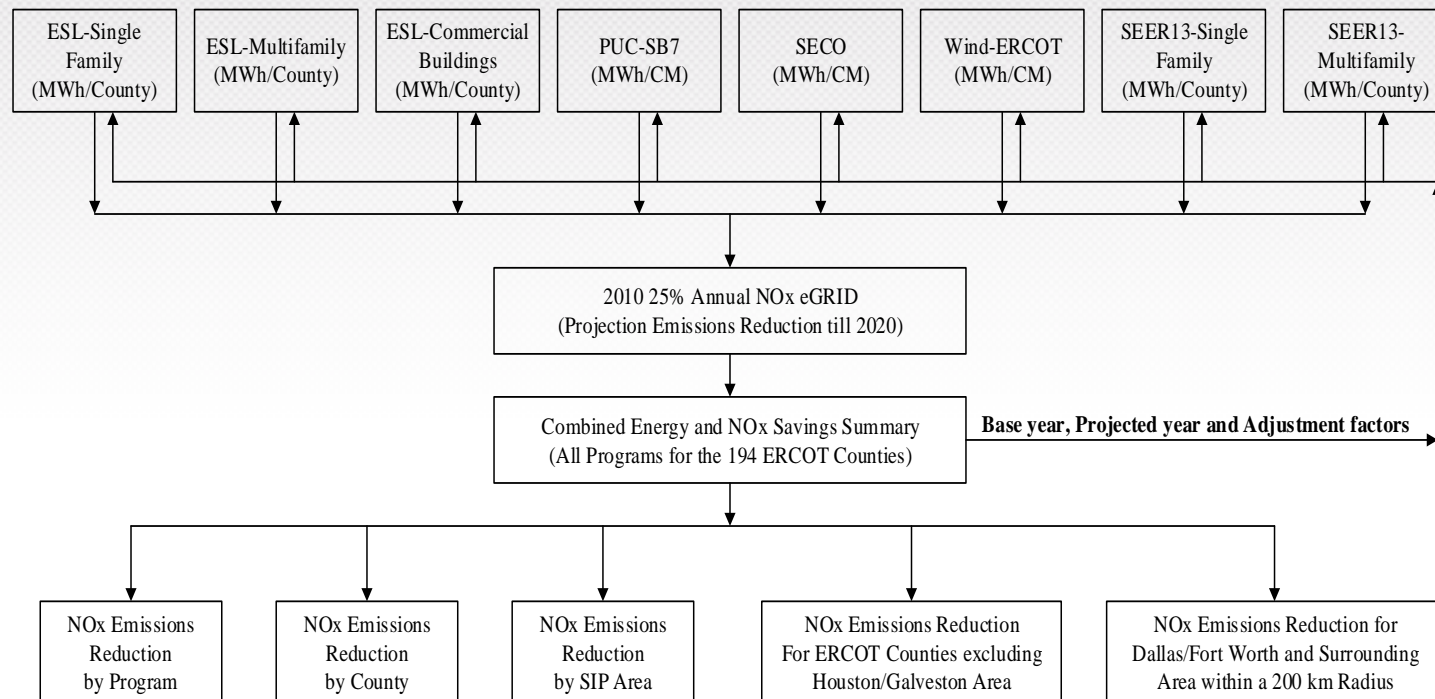
INTEGRATED NO_x EMISSIONS REDUCTION

Integrated Emissions Savings Across Agencies To Report Savings To TCEQ and EPA



INTEGRATED NO_x EMISSIONS REDUCTION

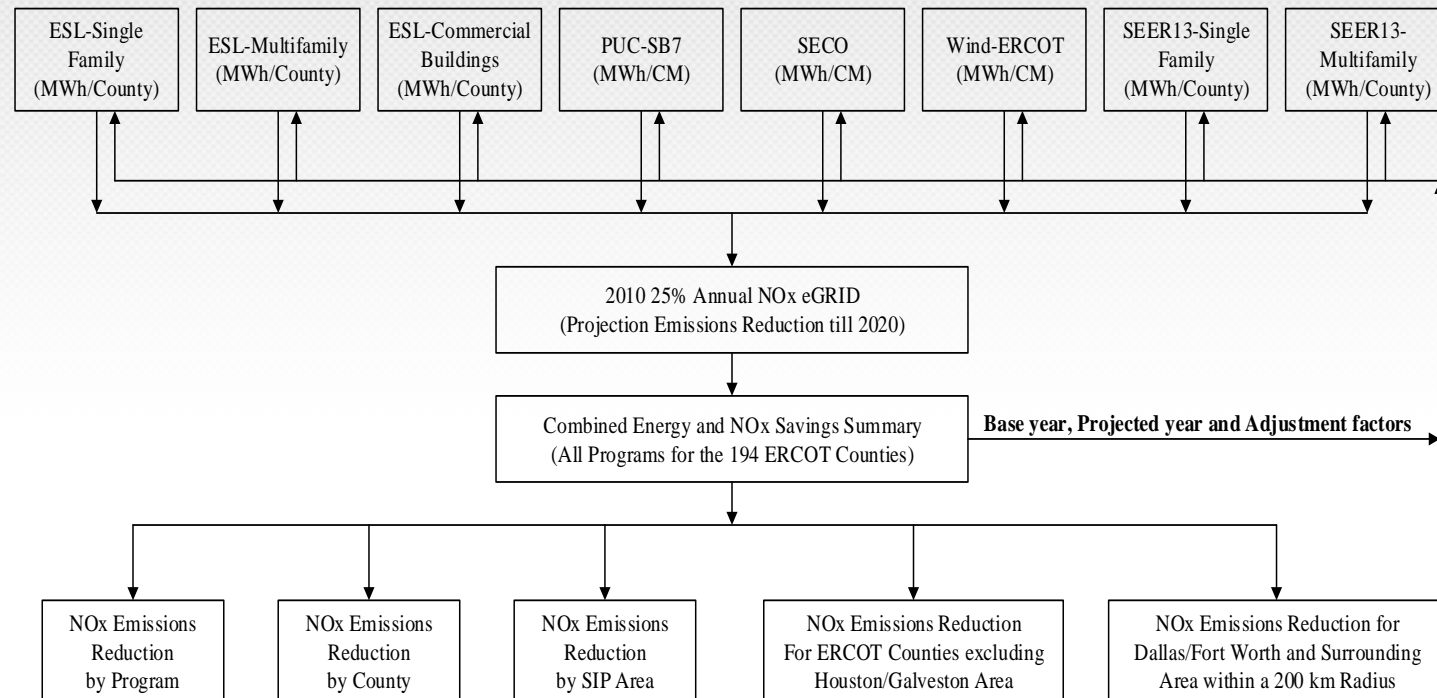
Integrated Emissions Savings Across Agencies To Report Savings To TCEQ and EPA



INTEGRATED NO_x EMISSIONS REDUCTION

Integrated Emissions Savings Across Agencies To Report Savings To TCEQ and EPA

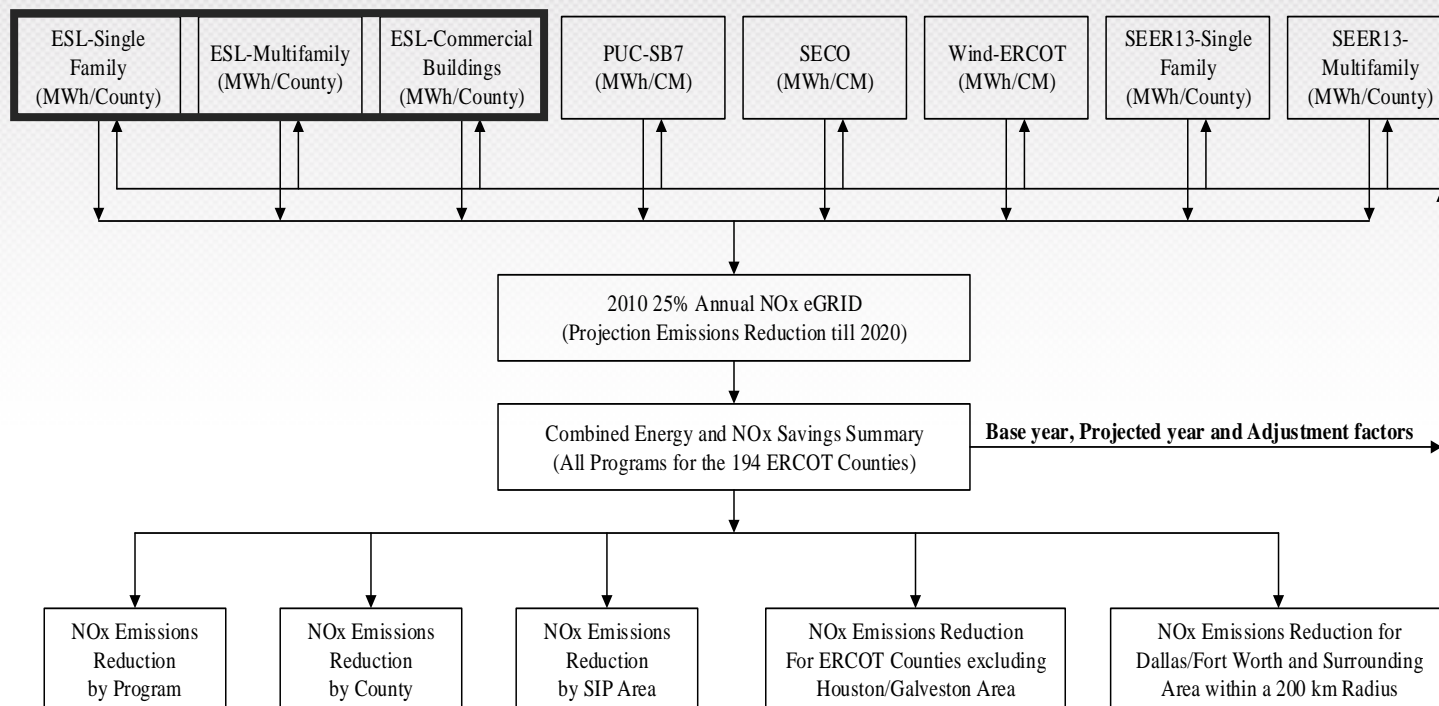
State agencies included:



INTEGRATED NO_x EMISSIONS REDUCTION

Integrated Emissions Savings Across Agencies To Report Savings To TCEQ and EPA

State agencies included:
- **TEES/ESL**

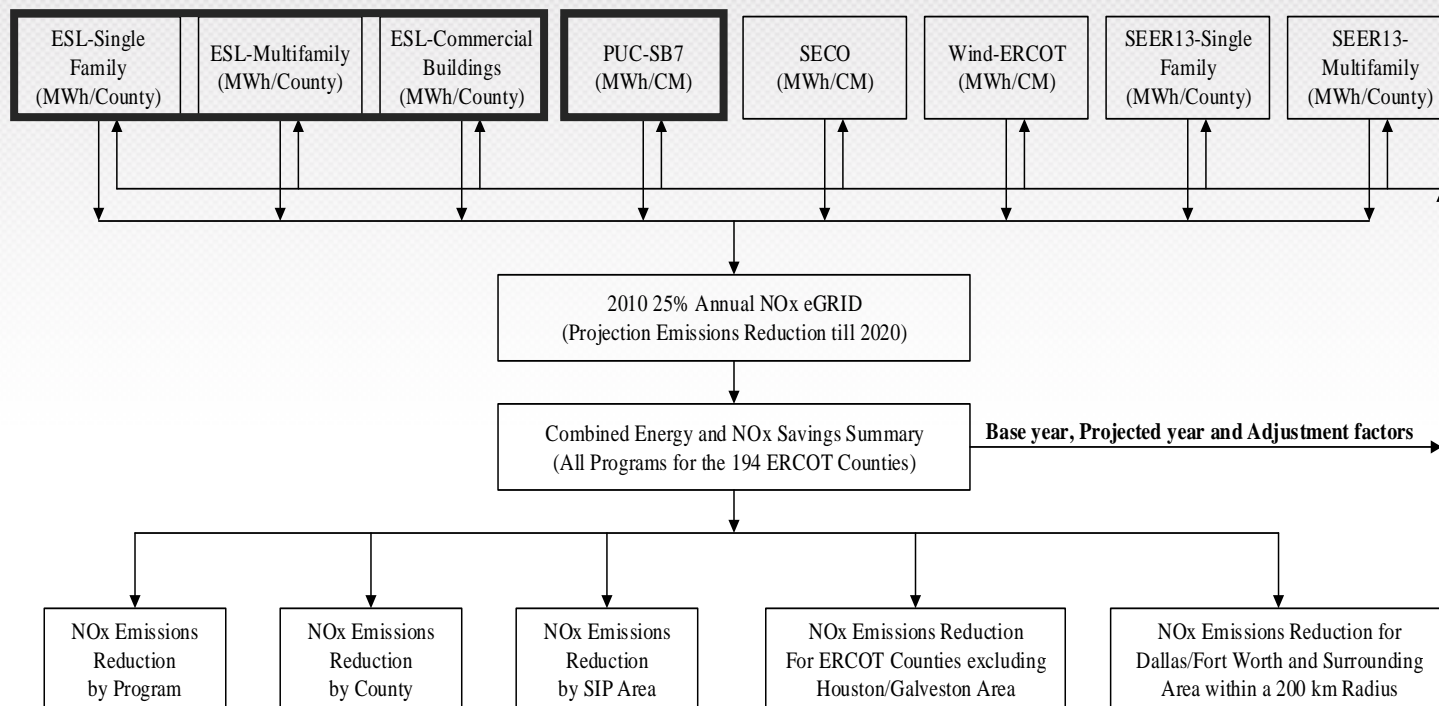


INTEGRATED NO_x EMISSIONS REDUCTION

Integrated Emissions Savings Across Agencies To Report Savings To TCEQ and EPA

State agencies included:

- TEES/ESL
- PUC

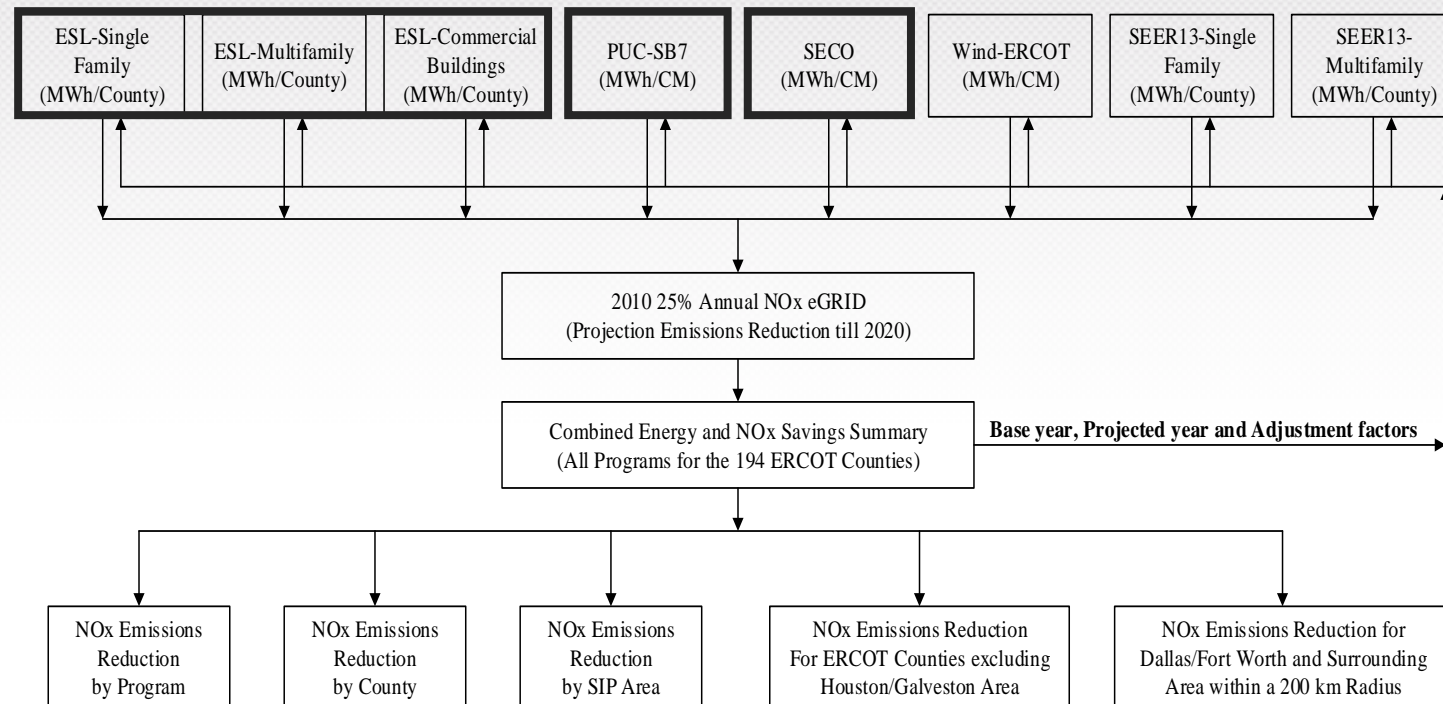


INTEGRATED NO_x EMISSIONS REDUCTION

Integrated Emissions Savings Across Agencies To Report Savings To TCEQ and EPA

State agencies included:

- TEES/ESL
- PUC
- SECO

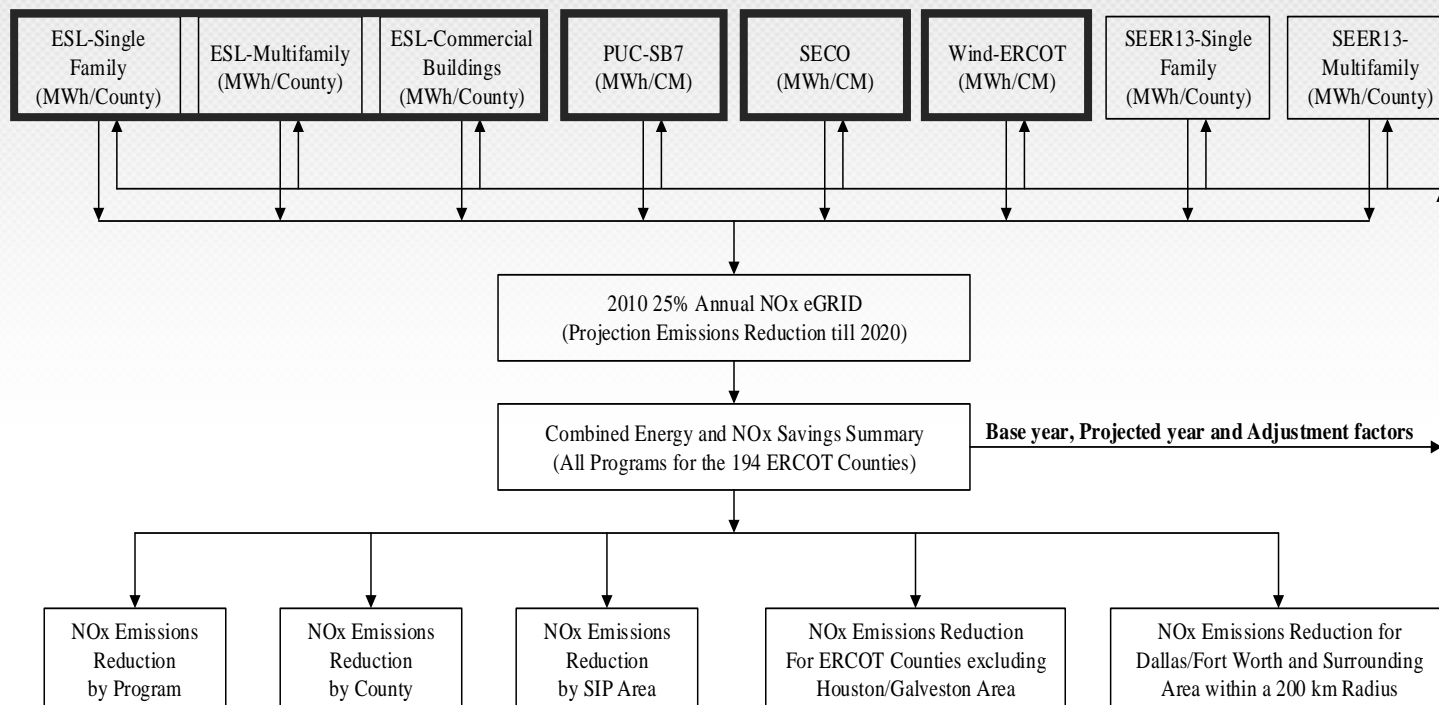


INTEGRATED NO_x EMISSIONS REDUCTION

Integrated Emissions Savings Across Agencies To Report Savings To TCEQ and EPA

State agencies included:

- TEES/ESL
- PUC
- SECO
- ERCOT/Wind

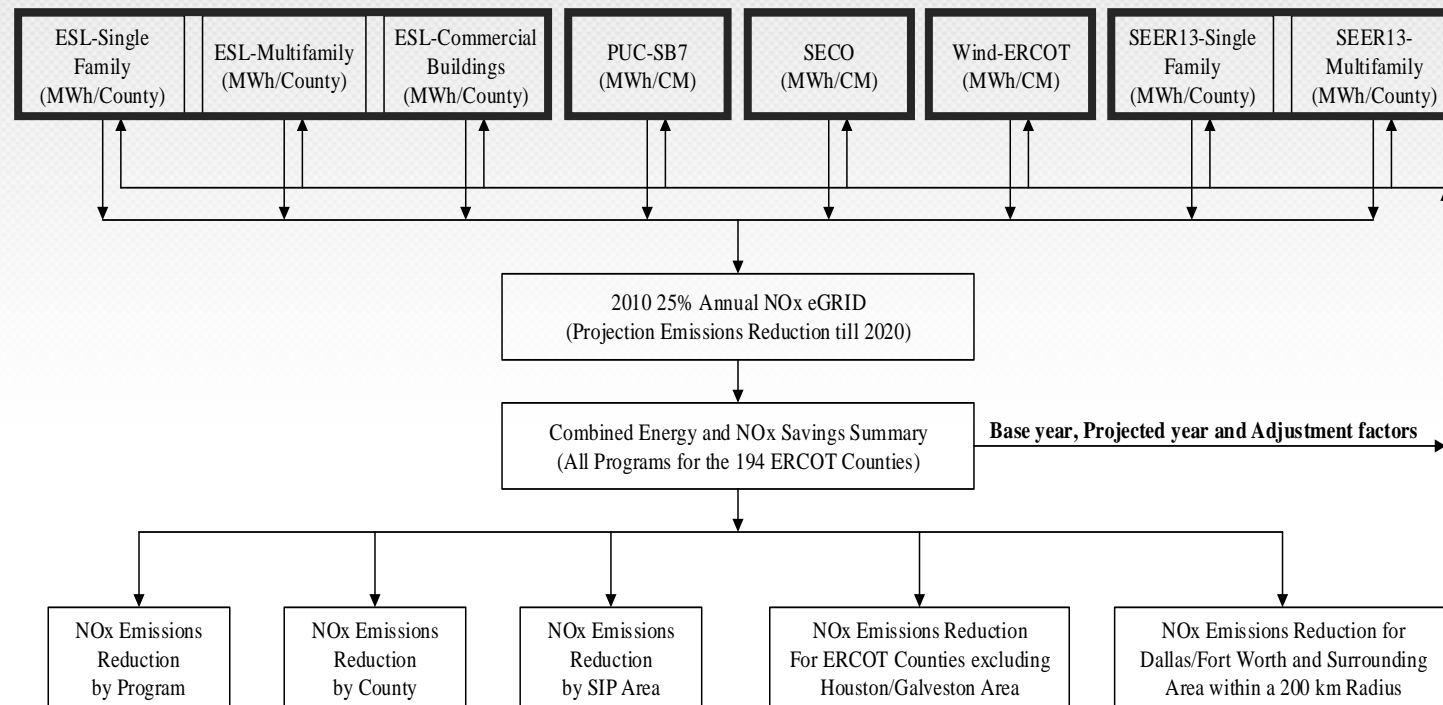


INTEGRATED NO_x EMISSIONS REDUCTION

Integrated Emissions Savings Across Agencies To Report Savings To TCEQ and EPA

State agencies included:

- TEES/ESL
- PUC
- SECO
- ERCOT/Wind
- SEER 13/14
- Single/Multifamily

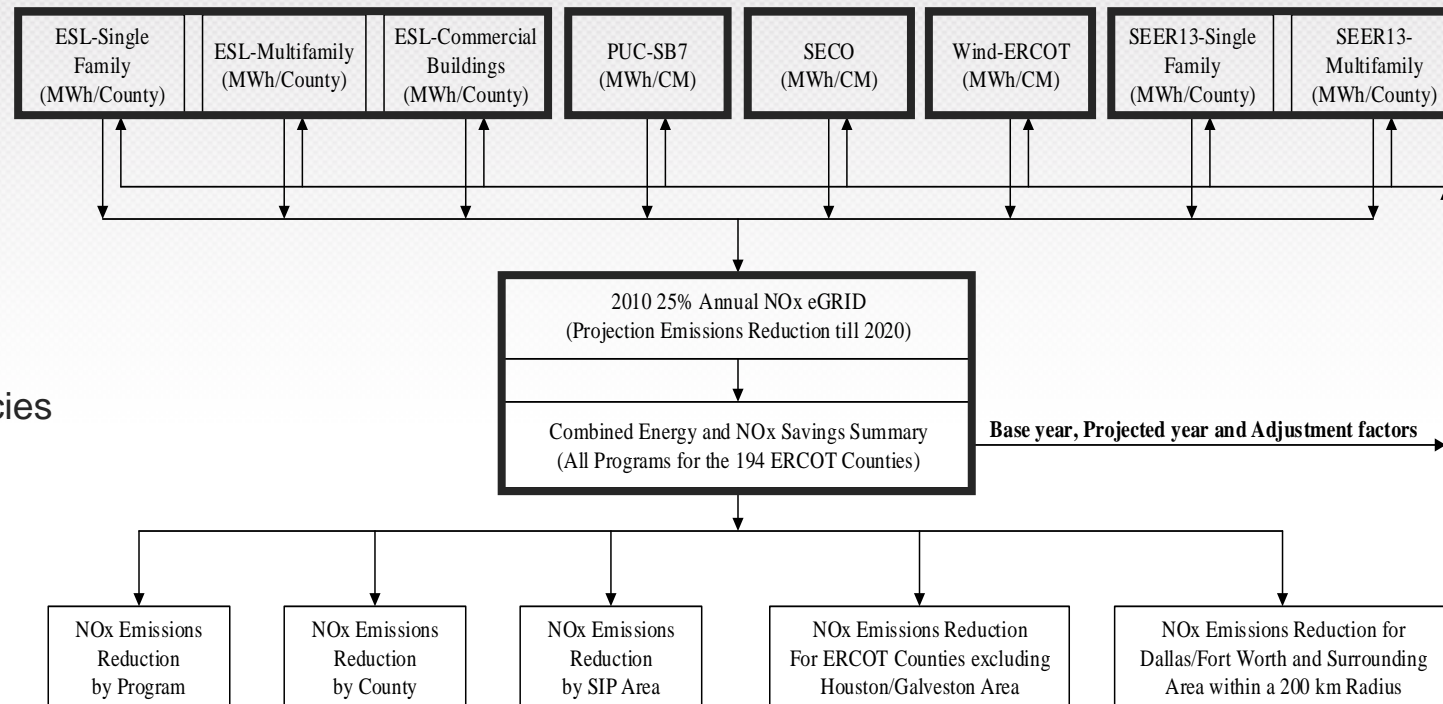


INTEGRATED NO_x EMISSIONS REDUCTION

Integrated Emissions Savings Across Agencies To Report Savings To TCEQ and EPA

State agencies included:

- **TEES/ESL**
- **PUC**
- **SECO**
- **ERCOT/Wind**
- **SEER 13/14**
- Single/Multifamily**



Total savings across agencies

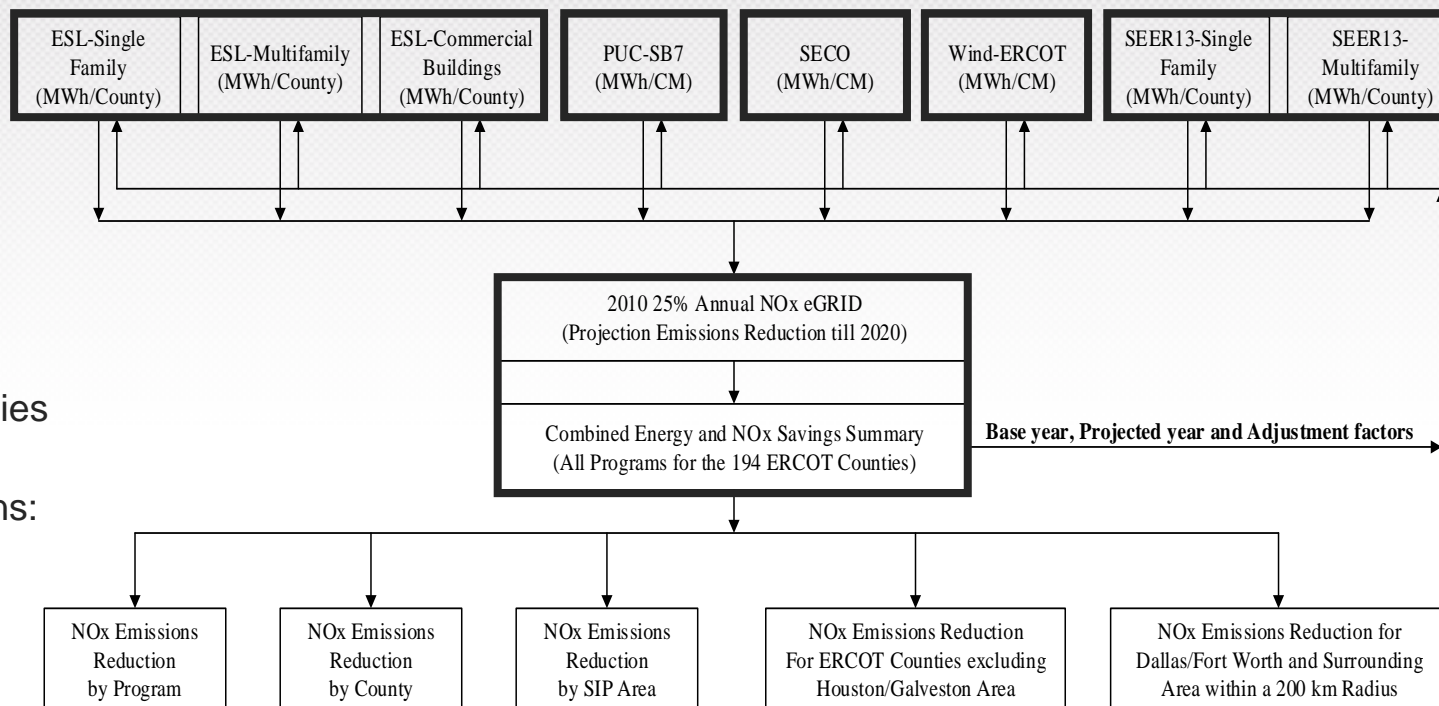


INTEGRATED NO_x EMISSIONS REDUCTION

Integrated Emissions Savings Across Agencies To Report Savings To TCEQ and EPA

State agencies included:

- **TEES/ESL**
- **PUC**
- **SECO**
- **ERCOT/Wind**
- **SEER 13/14**
- Single/Multifamily**



Total savings across agencies

Annual emissions reductions:

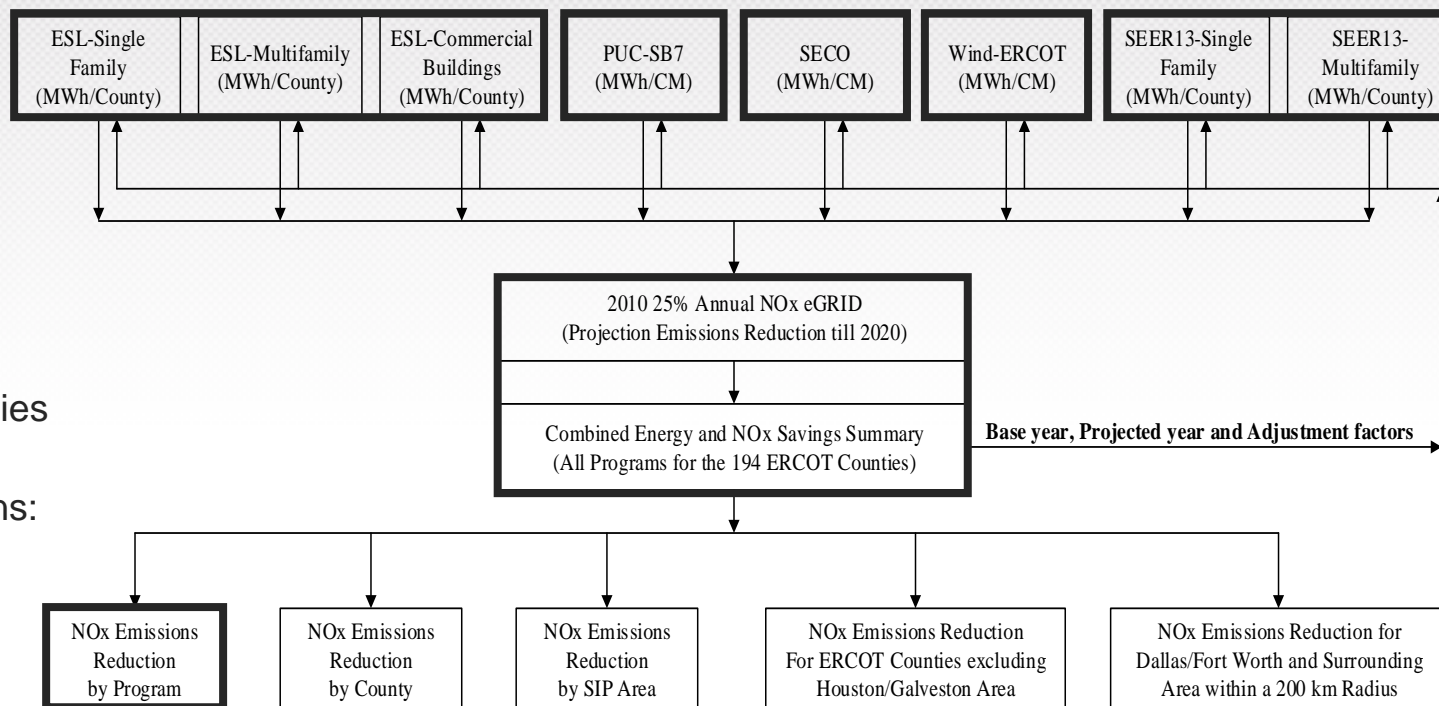


INTEGRATED NO_x EMISSIONS REDUCTION

Integrated Emissions Savings Across Agencies To Report Savings To TCEQ and EPA

State agencies included:

- **TEES/ESL**
- **PUC**
- **SECO**
- **ERCOT/Wind**
- **SEER 13/14**
- Single/Multifamily**



Total savings across agencies

Annual emissions reductions:

- **By program**

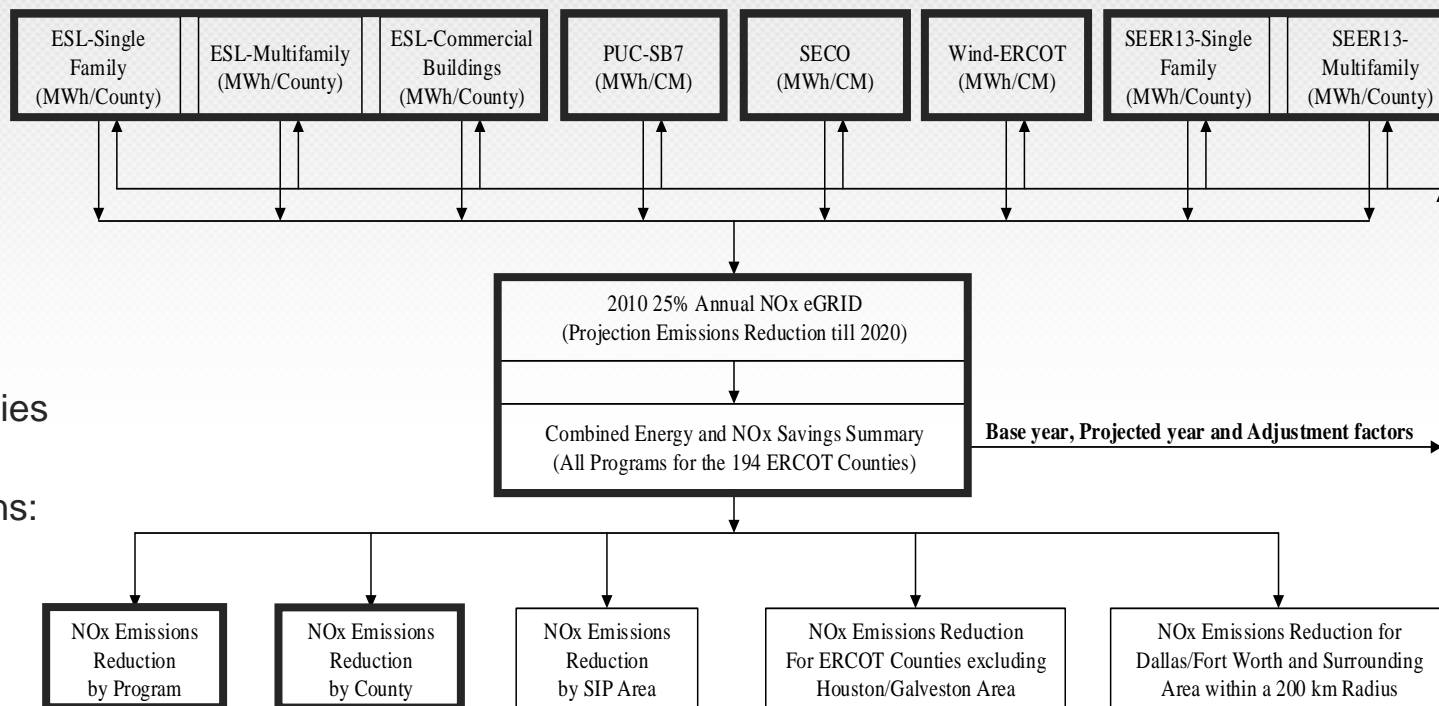


INTEGRATED NO_x EMISSIONS REDUCTION

Integrated Emissions Savings Across Agencies To Report Savings To TCEQ and EPA

State agencies included:

- **TEES/ESL**
- **PUC**
- **SECO**
- **ERCOT/Wind**
- **SEER 13/14**
- Single/Multifamily**



Total savings across agencies

Annual emissions reductions:

- **By program**
- **By county**

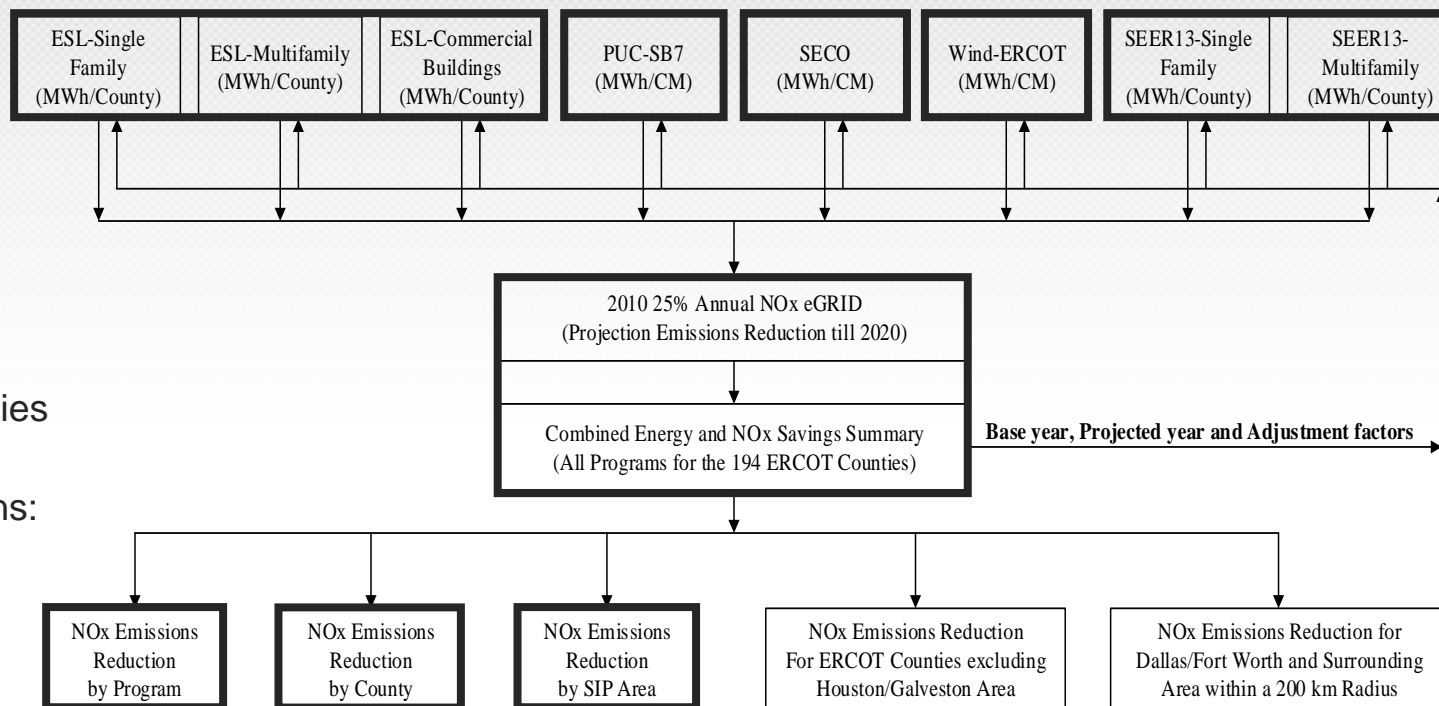


INTEGRATED NO_x EMISSIONS REDUCTION

Integrated Emissions Savings Across Agencies To Report Savings To TCEQ and EPA

State agencies included:

- **TEES/ESL**
- **PUC**
- **SECO**
- **ERCOT/Wind**
- **SEER 13/14**
- Single/Multifamily**



Total savings across agencies

Annual emissions reductions:

- **By program**
- **By county**
- **By SIP area**

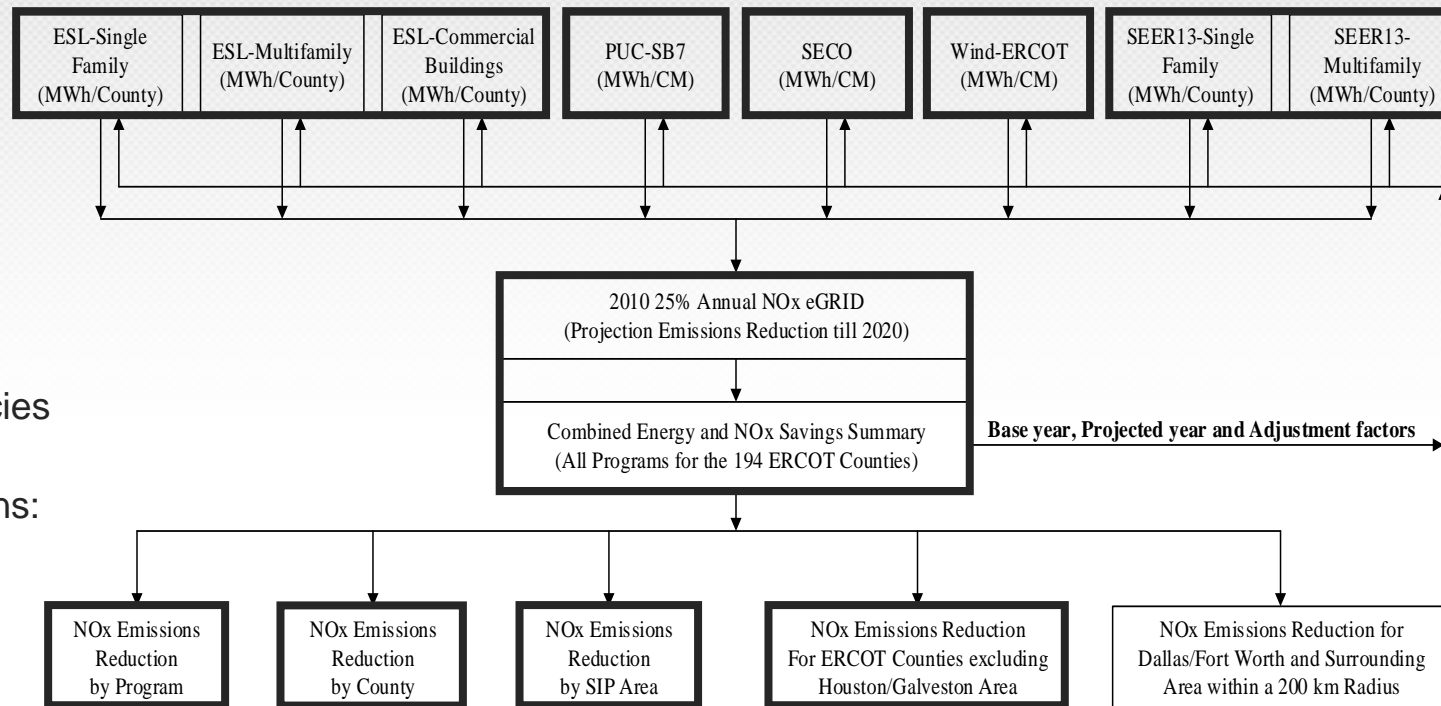


INTEGRATED NO_x EMISSIONS REDUCTION

Integrated Emissions Savings Across Agencies To Report Savings To TCEQ and EPA

State agencies included:

- **TEES/ESL**
- **PUC**
- **SECO**
- **ERCOT/Wind**
- **SEER 13/14**
- Single/Multifamily**



Total savings across agencies

Annual emissions reductions:

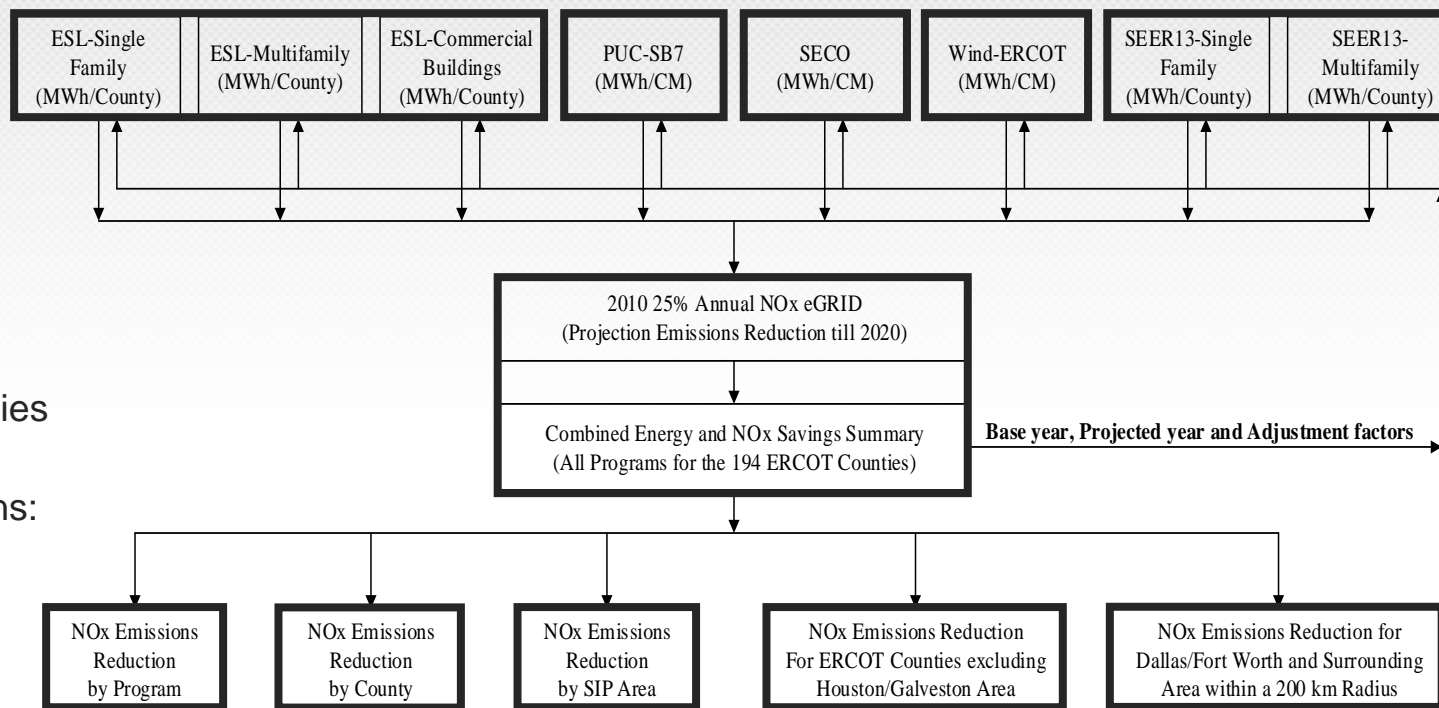
- **By program**
- **By county**
- **By SIP area**
- **By ERCOT counties**

INTEGRATED NO_x EMISSIONS REDUCTION

Integrated Emissions Savings Across Agencies To Report Savings To TCEQ and EPA

State agencies included:

- TEES/ESL
- PUC
- SECO
- ERCOT/Wind
- SEER 13/14
- Single/Multifamily



Total savings across agencies

Annual emissions reductions:

- By program
- By county
- By SIP area
- By ERCOT counties
- By City and Surrounding Area within a 200km Radius

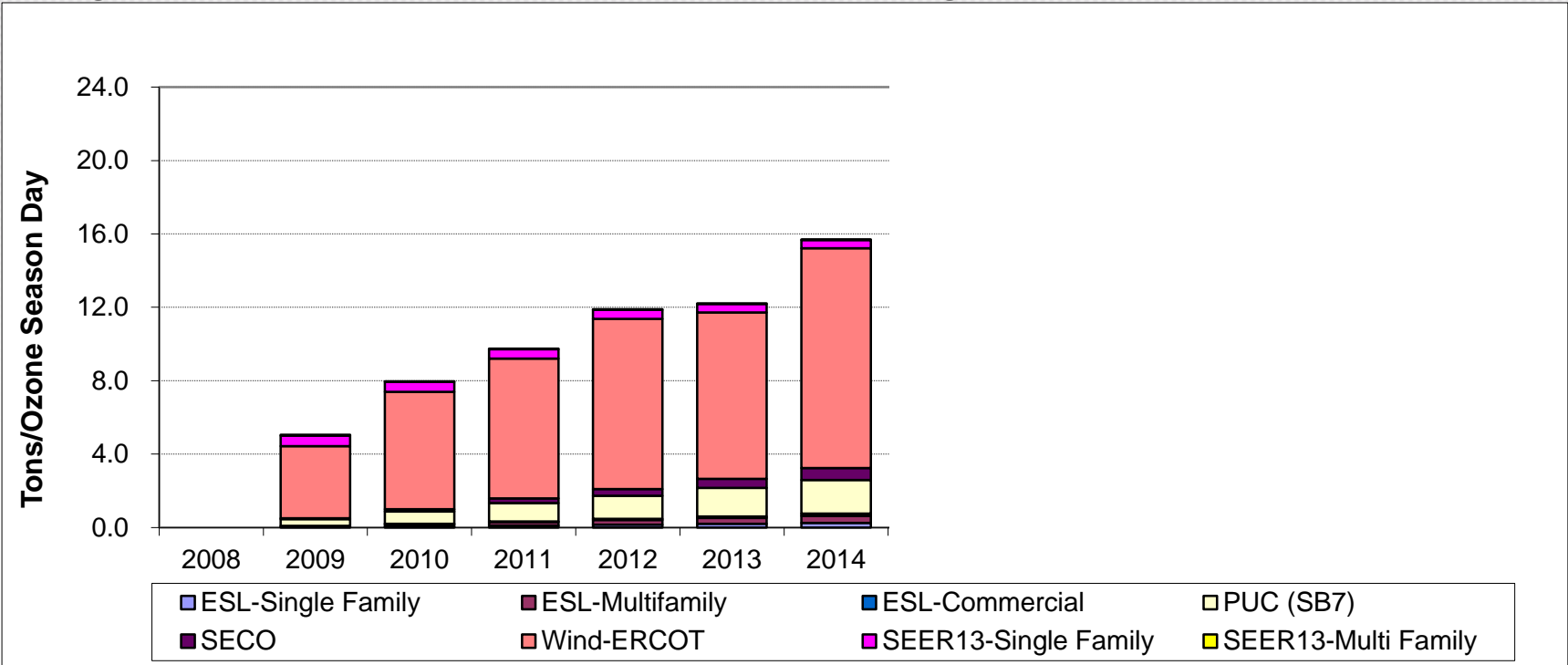


INTEGRATED NO_x EMISSIONS REDUTION (2008 Baseyear)

2014 Integrated OSD NO_x Emissions Reduction Using new 2010 eGrid

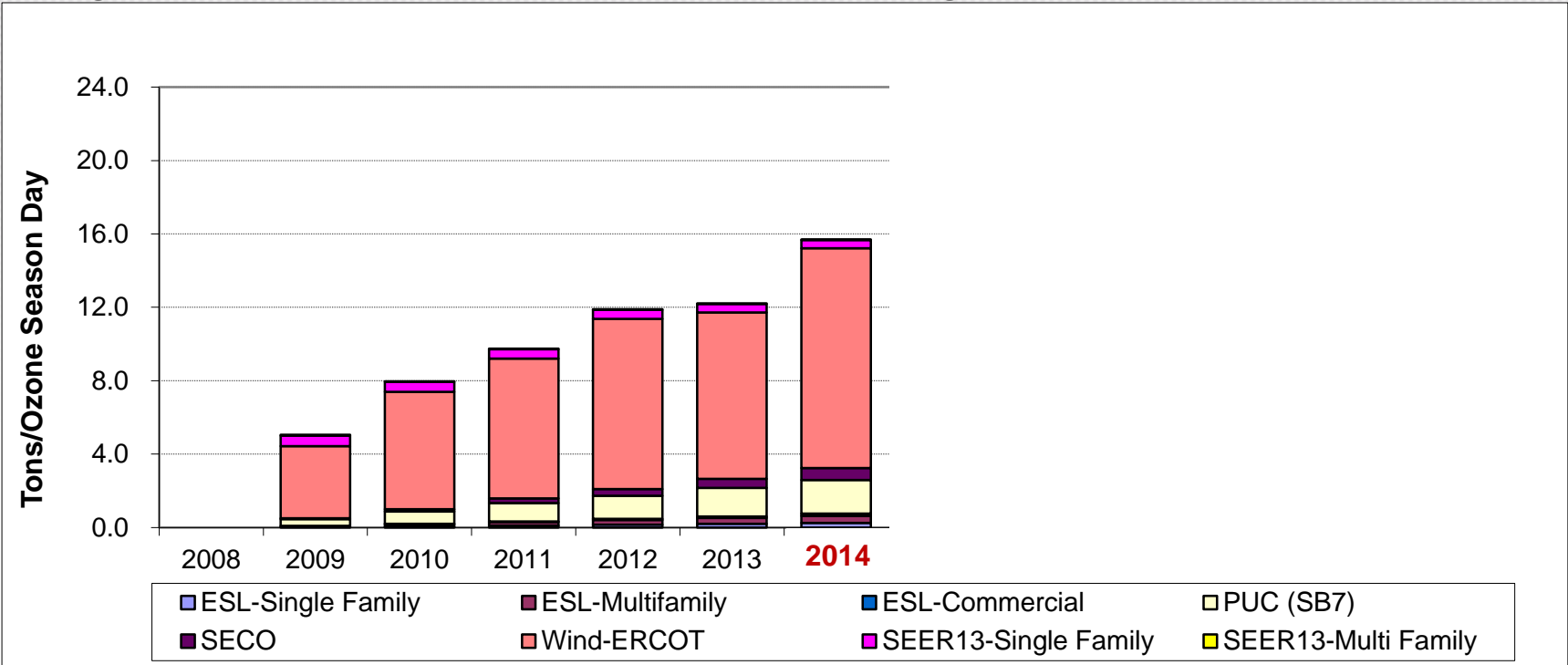
INTEGRATED NO_x EMISSIONS REDUTION (2008 Baseyear)

2014 Integrated OSD NO_x Emissions Reduction Using new 2010 eGrid



INTEGRATED NO_x EMISSIONS REDUTION (2008 Baseyear)

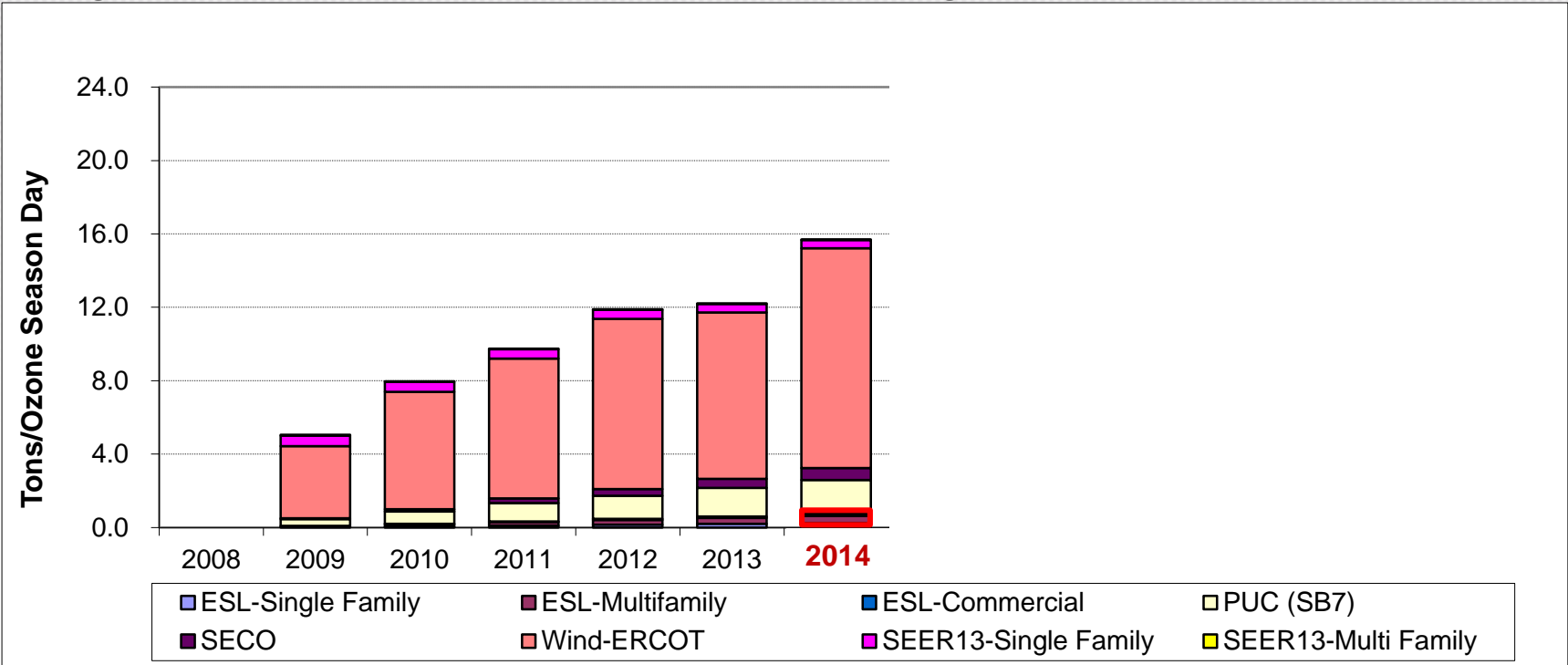
2014 Integrated OSD NO_x Emissions Reduction Using new 2010 eGrid



2014 integrated OSD NO_x emissions reduction

INTEGRATED NO_x EMISSIONS REDUTION (2008 Baseyear)

2014 Integrated OSD NO_x Emissions Reduction Using new 2010 eGrid

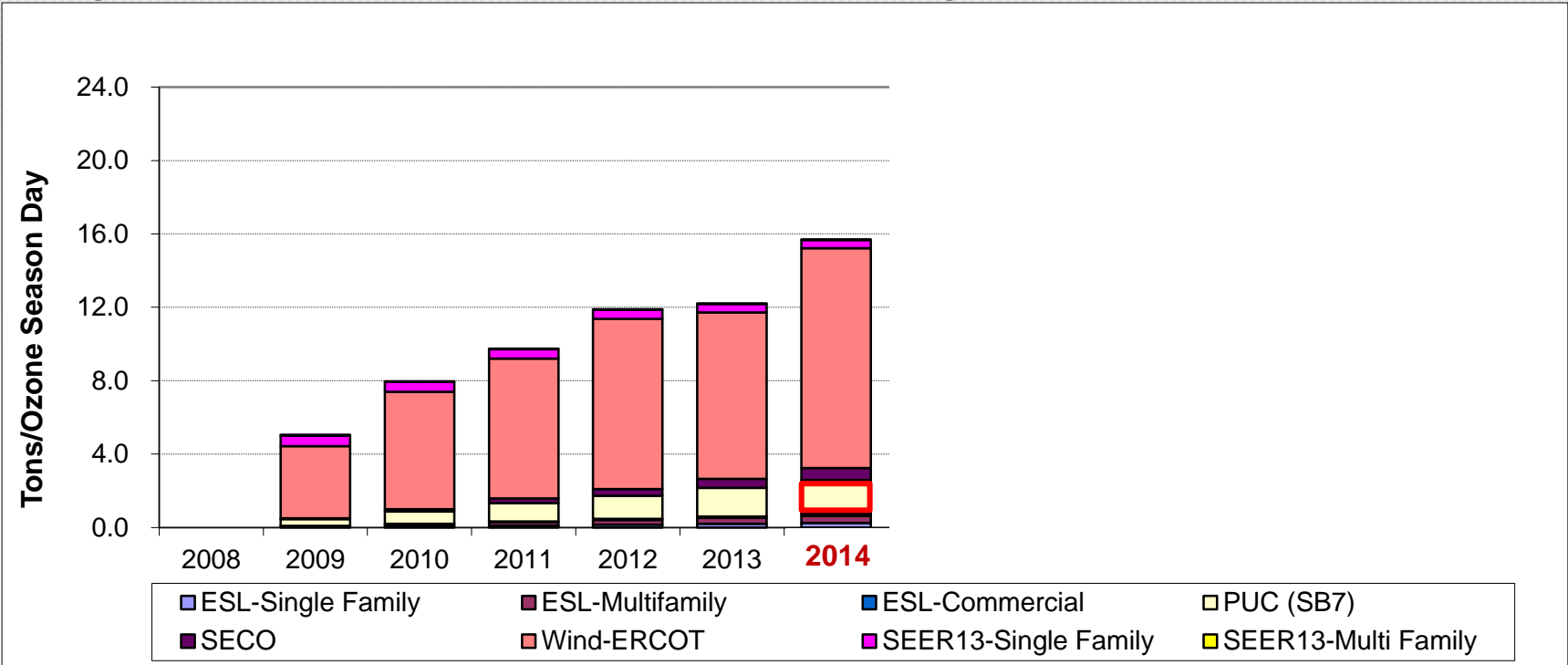


2014 integrated OSD NO_x emissions reduction

- ESL Code Compliance (0.76 tons/day)

INTEGRATED NO_x EMISSIONS REDUTION (2008 Baseyear)

2014 Integrated OSD NO_x Emissions Reduction Using new 2010 eGrid

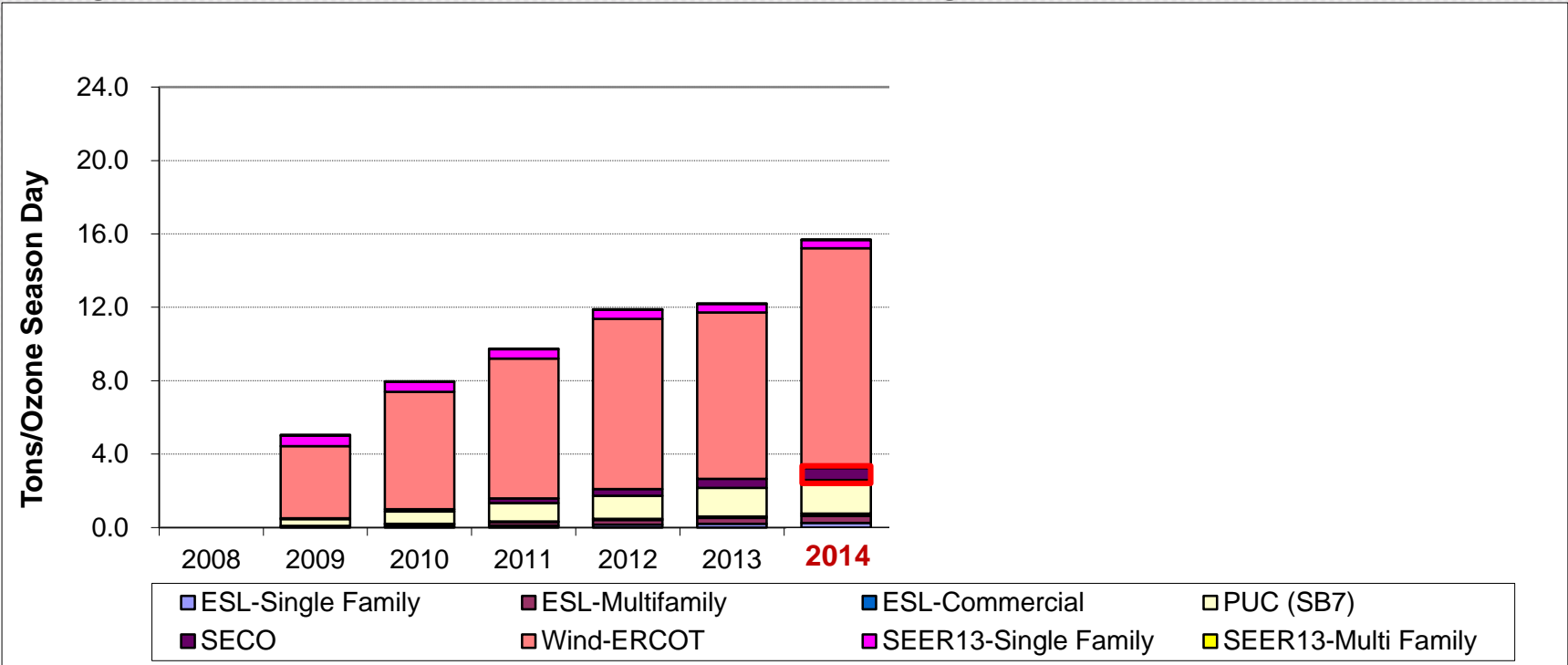


2014 integrated OSD NO_x emissions reduction

- ESL Code Compliance (0.76 tons/day)
- PUC SB7 programs (1.83 tons/day)

INTEGRATED NO_x EMISSIONS REDUTION (2008 Baseyear)

2014 Integrated OSD NO_x Emissions Reduction Using new 2010 eGrid

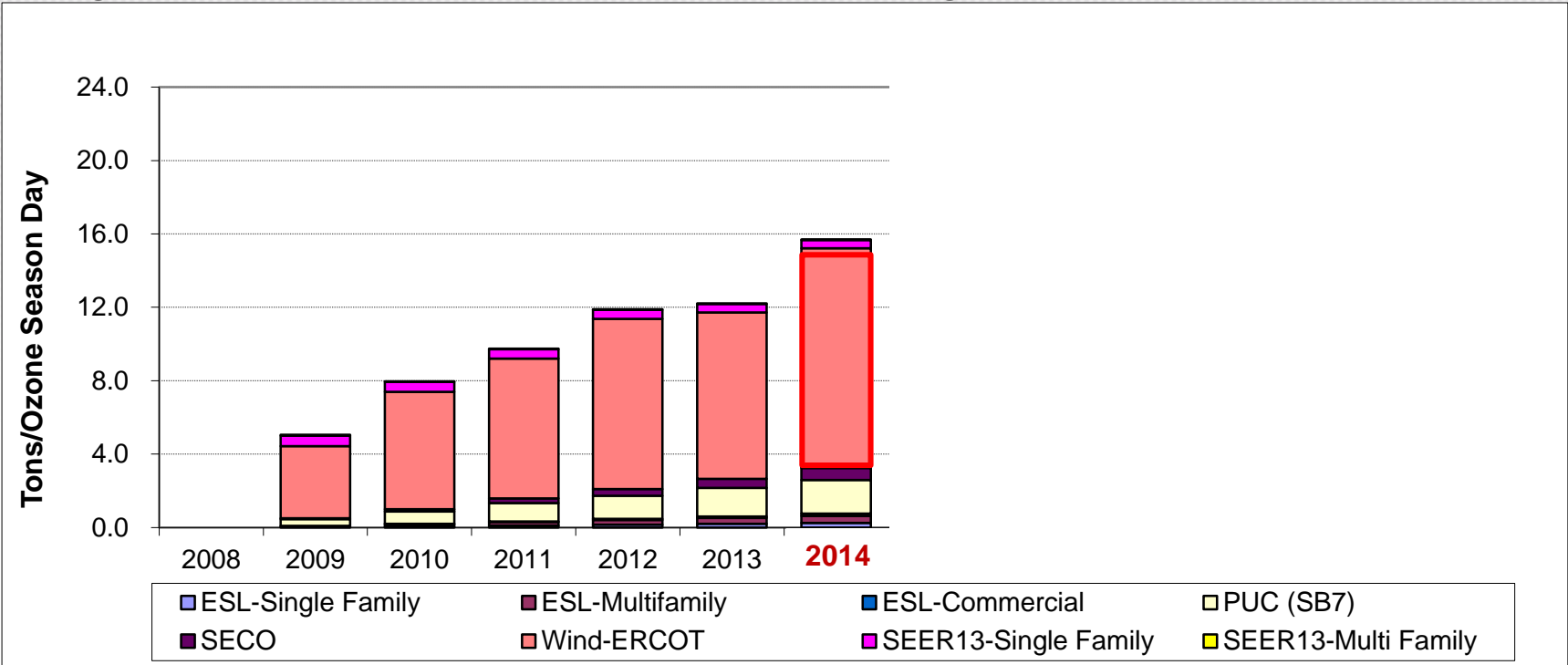


2014 integrated OSD NO_x emissions reduction

- ESL Code Compliance (0.76 tons/day)
- PUC SB7 programs (1.83 tons/day)
- SECO Political Sub. (0.66 tons/day)

INTEGRATED NO_x EMISSIONS REDUTION (2008 Baseyear)

2014 Integrated OSD NO_x Emissions Reduction Using new 2010 eGrid

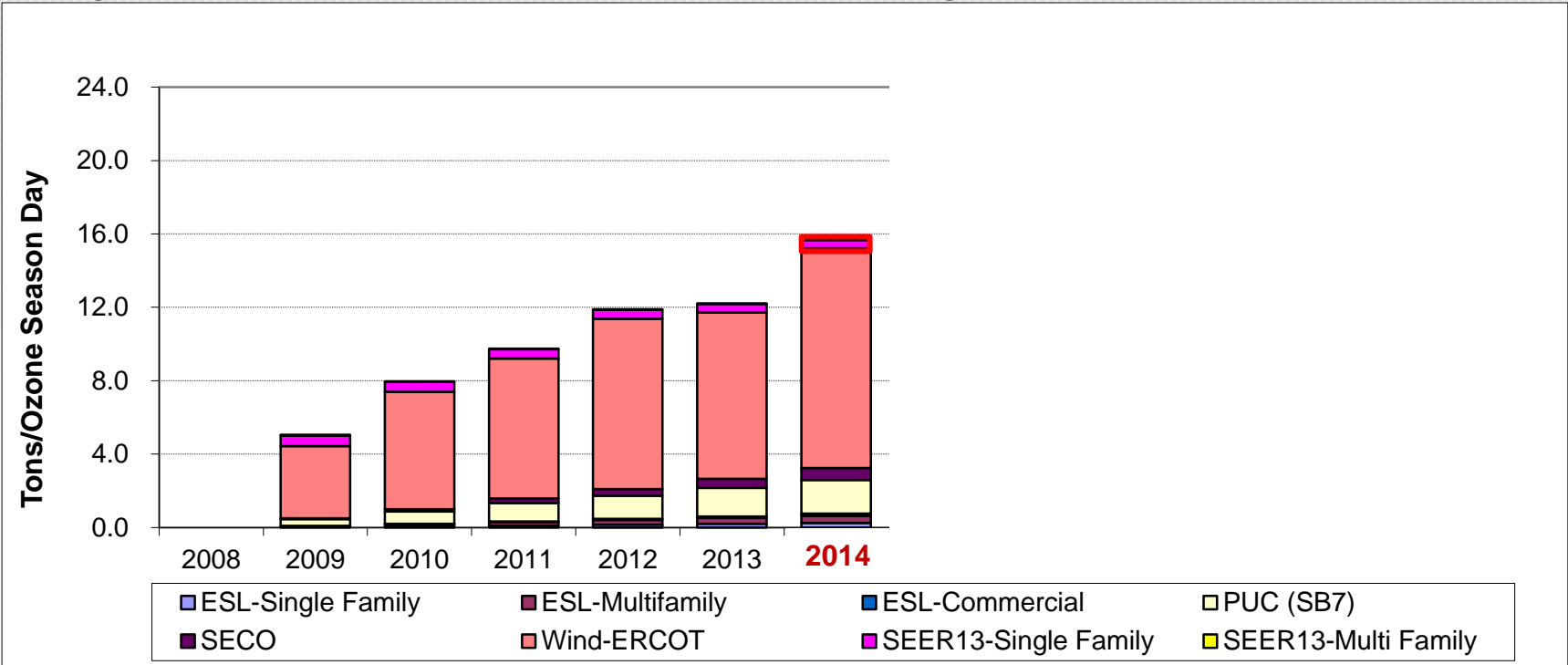


2014 integrated OSD NO_x emissions reduction

- ESL Code Compliance (0.76 tons/day)
- PUC SB7 programs (1.83 tons/day)
- SECO Political Sub. (0.66 tons/day)
- Green Power (Wind) (11.97 tons/day)

INTEGRATED NO_x EMISSIONS REDUTION (2008 Baseyear)

2014 Integrated OSD NO_x Emissions Reduction Using new 2010 eGrid

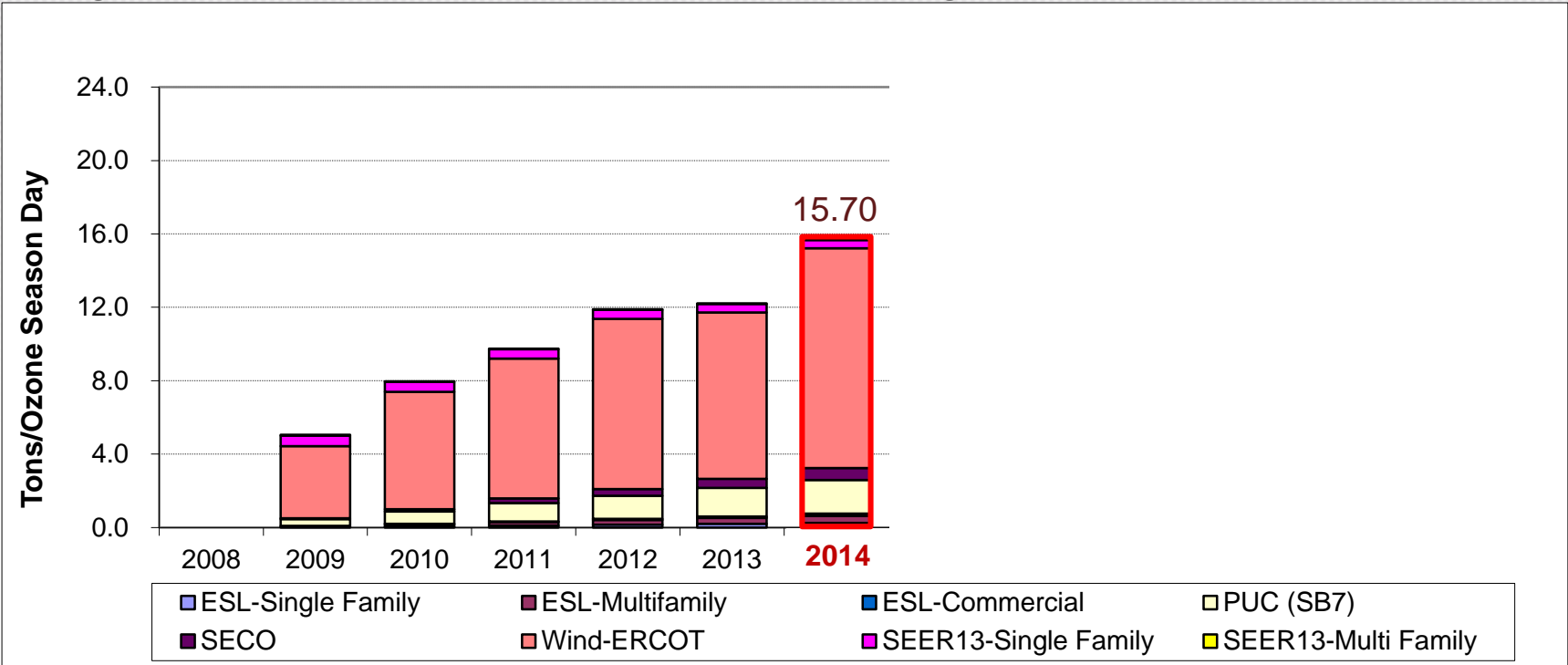


2014 integrated OSD NO_x emissions reduction

- ESL Code Compliance (0.76 tons/day)
- PUC SB7 programs (1.83 tons/day)
- SECO Political Sub. (0.66 tons/day)
- Green Power (Wind) (11.97 tons/day)
- Residential AC Retrofits (0.48 tons/day)

INTEGRATED NO_x EMISSIONS REDUTION (2008 Baseyear)

2014 Integrated OSD NO_x Emissions Reduction Using new 2010 eGrid

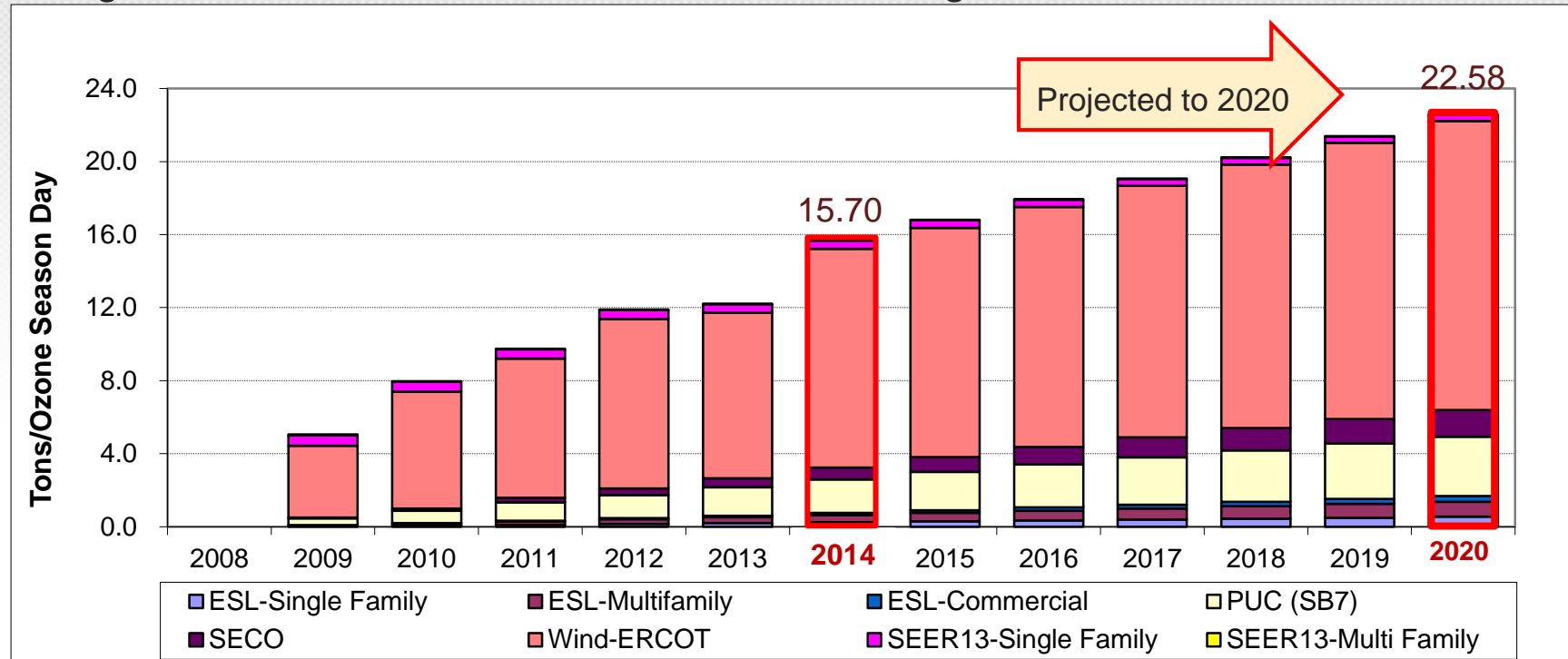


2014 integrated OSD NO_x emissions reduction

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- Residential AC Retrofits (0.48 tons/day)
- **Total (2013) (15.70 tons/day)**

INTEGRATED NO_x EMISSIONS REDUTION (2008 Baseyear)

2014 Integrated OSD NO_x Emissions Reduction Using new 2010 eGrid



2014 integrated OSD NO_x emissions reduction

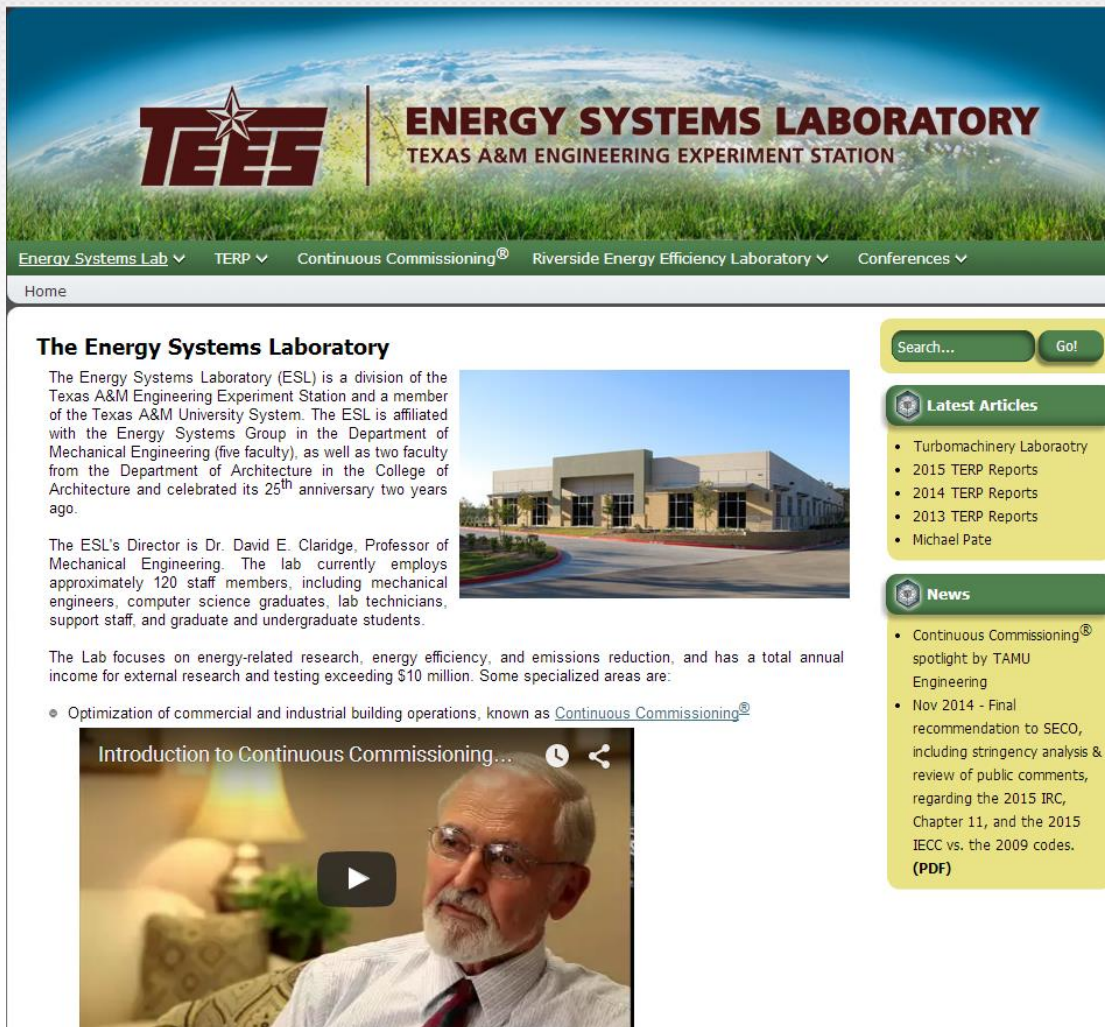
- ESL Code Compliance (0.76 tons/day)
- PUC SB7 programs (1.83 tons/day)
- SECO Political Sub. (0.66 tons/day)
- Green Power (Wind) (11.97 tons/day)
- Residential AC Retrofits (0.48 tons/day)
- **Total (2013) (15.70 tons/day)**

2020 integrated OSD NO_x emissions reduction

- ESL Code Compliance (1.68 tons/day)
- PUC SB7 programs (3.24 tons/day)
- SECO Political Sub. (1.46 tons/day)
- Green Power (Wind) (15.84 tons/day)
- Residential AC Retrofits (0.35 tons/day)
- **Total (2020) (22.58 tons/day)**

REPORTS AND PAPERS: TERP

ESL Homepage: <http://esl.eslwin.tamu.edu/>



The screenshot shows the homepage of the Energy Systems Laboratory (ESL). The header features the TEES logo and the text "ENERGY SYSTEMS LABORATORY TEXAS A&M ENGINEERING EXPERIMENT STATION". Below the header is a navigation bar with links: "Energy Systems Lab", "TERP", "Continuous Commissioning", "Riverside Energy Efficiency Laboratory", and "Conferences". The main content area is titled "The Energy Systems Laboratory" and includes a paragraph about the lab's affiliation and a photograph of the lab building. To the right of the text is a search bar and a "Go!" button. Below the search bar are two sections: "Latest Articles" and "News". The "Latest Articles" section lists four items: "Turbomachinery Laboratory", "2015 TERP Reports", "2014 TERP Reports", "2013 TERP Reports", and "Michael Pate". The "News" section lists two items: "Continuous Commissioning spotlight by TAMU Engineering" and "Nov 2014 - Final recommendation to SECO, including stringency analysis & review of public comments, regarding the 2015 IRC, Chapter 11, and the 2015 IECC vs. the 2009 codes. (PDF)". At the bottom left, there is a video player titled "Introduction to Continuous Commissioning..." showing a man speaking.

The Energy Systems Laboratory

The Energy Systems Laboratory (ESL) is a division of the Texas A&M Engineering Experiment Station and a member of the Texas A&M University System. The ESL is affiliated with the Energy Systems Group in the Department of Mechanical Engineering (five faculty), as well as two faculty from the Department of Architecture in the College of Architecture and celebrated its 25th anniversary two years ago.

The ESL's Director is Dr. David E. Claridge, Professor of Mechanical Engineering. The lab currently employs approximately 120 staff members, including mechanical engineers, computer science graduates, lab technicians, support staff, and graduate and undergraduate students.

The Lab focuses on energy-related research, energy efficiency, and emissions reduction, and has a total annual income for external research and testing exceeding \$10 million. Some specialized areas are:

- Optimization of commercial and industrial building operations, known as [Continuous Commissioning](#)

Introduction to Continuous Commissioning...

Latest Articles

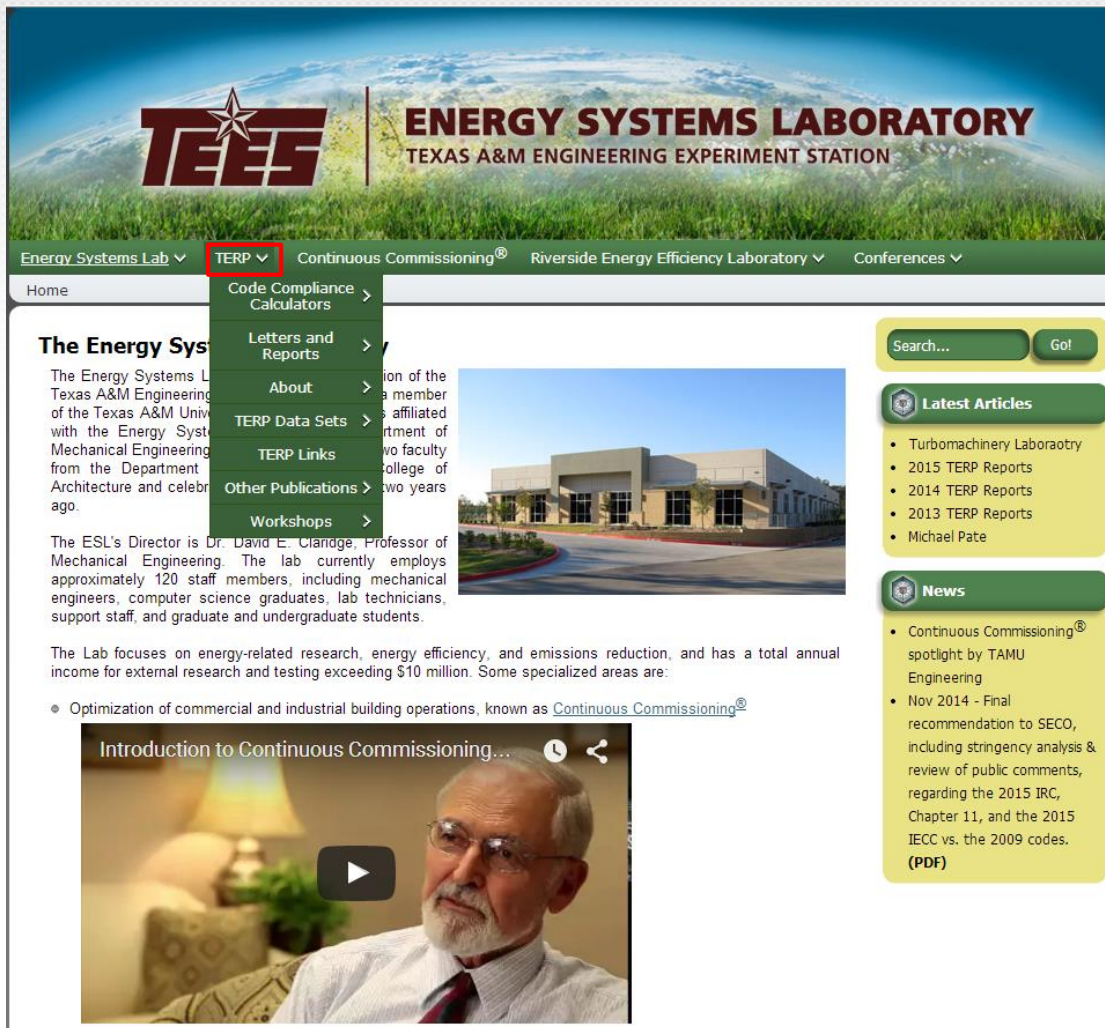
- Turbomachinery Laboratory
- 2015 TERP Reports
- 2014 TERP Reports
- 2013 TERP Reports
- Michael Pate

News

- Continuous Commissioning[®] spotlight by TAMU Engineering
- Nov 2014 - Final recommendation to SECO, including stringency analysis & review of public comments, regarding the 2015 IRC, Chapter 11, and the 2015 IECC vs. the 2009 codes. (PDF)

REPORTS AND PAPERS: TERP

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ENERGY SYSTEMS LABORATORY
TEXAS A&M ENGINEERING EXPERIMENT STATION

Energy Systems Lab ▾ **TERP ▾** Continuous Commissioning® Riverside Energy Efficiency Laboratory ▾ Conferences ▾

Home

The Energy Systems Laboratory

The Energy Systems Laboratory is a member of the Texas A&M Engineering Experiment Station, affiliated with the Energy Systems Laboratory, Department of Mechanical Engineering, from the Department of Architecture and celebrated its 20th anniversary in 2014.

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Introduction to Continuous Commissioning...

Latest Articles

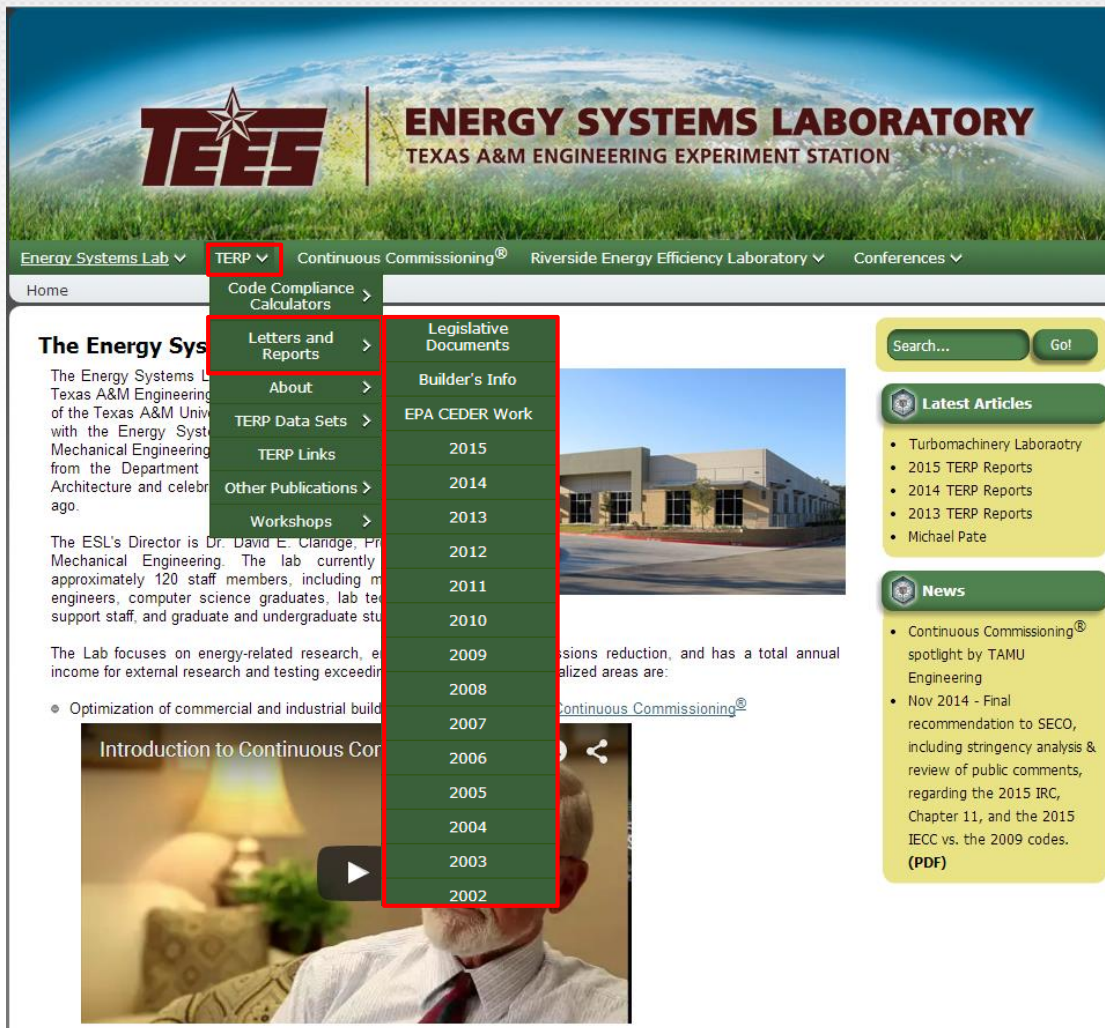
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REPORTS AND PAPERS: TERP

Reports: 2002 through 2013



The screenshot shows the Energy Systems Laboratory website. The header features the TEES logo and the text "ENERGY SYSTEMS LABORATORY TEXAS A&M ENGINEERING EXPERIMENT STATION". The navigation bar includes links for "Energy Systems Lab", "TERP", "Continuous Commissioning", "Riverside Energy Efficiency Laboratory", and "Conferences". The "TERP" menu is expanded, showing a list of reports from 2002 to 2013. The "Latest Articles" section lists "Turbomachinery Laboratory", "2015 TERP Reports", "2014 TERP Reports", "2013 TERP Reports", and "Michael Pate". The "News" section lists "Continuous Commissioning", "spotlight by TAMU Engineering", and "Nov 2014 - Final recommendation to SECO, including stringency analysis & review of public comments, regarding the 2015 IRC, Chapter 11, and the 2015 IECC vs. the 2009 codes. (PDF)".

ENERGY SYSTEMS LABORATORY
TEXAS A&M ENGINEERING EXPERIMENT STATION

Energy Systems Lab ▾ **TERP ▾** Continuous Commissioning® Riverside Energy Efficiency Laboratory ▾ Conferences ▾

Home

The Energy Sys

The Energy Systems Laboratory is a part of the Texas A&M Engineering Experiment Station, which is part of the Texas A&M University System. The Energy Systems Laboratory is a part of the Texas A&M Engineering Experiment Station, which is part of the Texas A&M University System. The Energy Systems Laboratory is a part of the Texas A&M Engineering Experiment Station, which is part of the Texas A&M University System.

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The Lab focuses on energy-related research, energy efficiency, emissions reduction, and has a total annual income for external research and testing exceeding \$1 million.

• Optimization of commercial and industrial buildings

Introduction to Continuous Commissioning®

Code Compliance Calculators ▾

Letters and Reports ▾

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TERP Links

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Legislative Documents

Builder's Info

EPA CEDER Work

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Go!

Latest Articles

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- 2015 TERP Reports
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News

- Continuous Commissioning® spotlight by TAMU Engineering
- Nov 2014 - Final recommendation to SECO, including stringency analysis & review of public comments, regarding the 2015 IRC, Chapter 11, and the 2015 IECC vs. the 2009 codes. (PDF)

REPORTS AND PAPERS: TERP

Reports: 2002 through 2013

2014 Reports:

- Comparing the **residential** provisions of the 2015 IECC with the 2012 IECC

ESL-TR-14-08-01

COMPARING THE RESIDENTIAL PROVISIONS OF THE 2015 IECC WITH THE CORRESPONDING PROVISIONS OF THE 2012 IECC FOR SINGLE FAMILY RESIDENTIAL CONSTRUCTION IN TEXAS

A Report

Jean Michelmore, PhD
Jana Carter Ballman, PhD, P.E.
Shirley Fitts
Jeff S. Roberts, PhD, P.E.
Roberta Yandell, P.E.

August 2014

ENERGY SYSTEMS LABORATORY

TEXAS A&M ENGINEERING EXPERIMENT STATION

[Commissioning®](#)
[Riverside Energy Efficiency Laboratory ▾](#)
[Conferences ▾](#)

Legislative Documents

Builder's Info

CEDER Work

- 2015
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- 2002

The Lab focuses on energy-related research, e income for external research and testing exceeding \$1 million annually.

• Optimization of commercial and industrial buildings

Introduction to Continuous Commissioning

Latest Articles

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- 2015 TERP Reports
- 2014 TERP Reports
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News

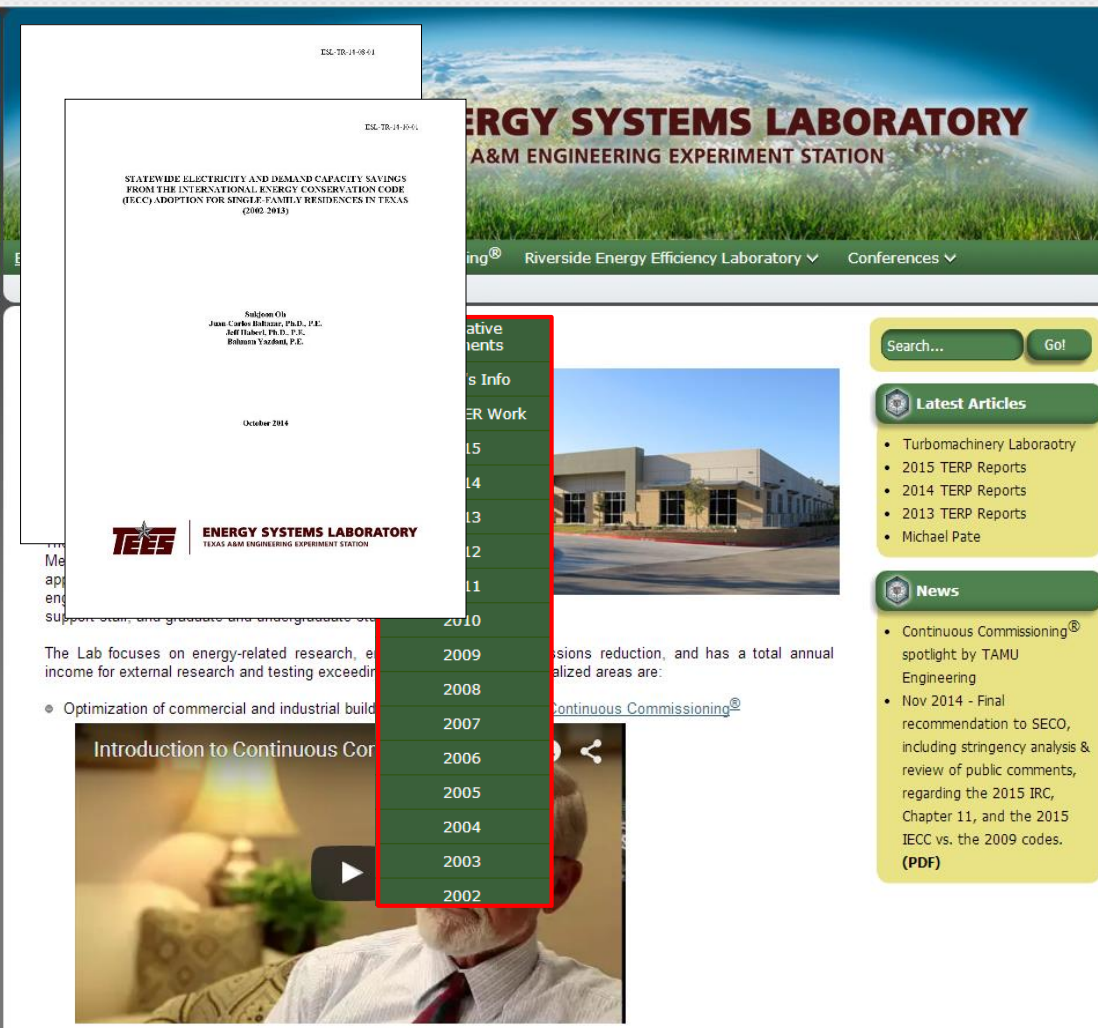
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REPORTS AND PAPERS: TERP

Reports: 2002 through 2013

2014 Reports:

- Comparing the **residential** provisions of the 2015 IECC with the 2012 IECC
- Statewide electricity and demand capacity savings from the IECC



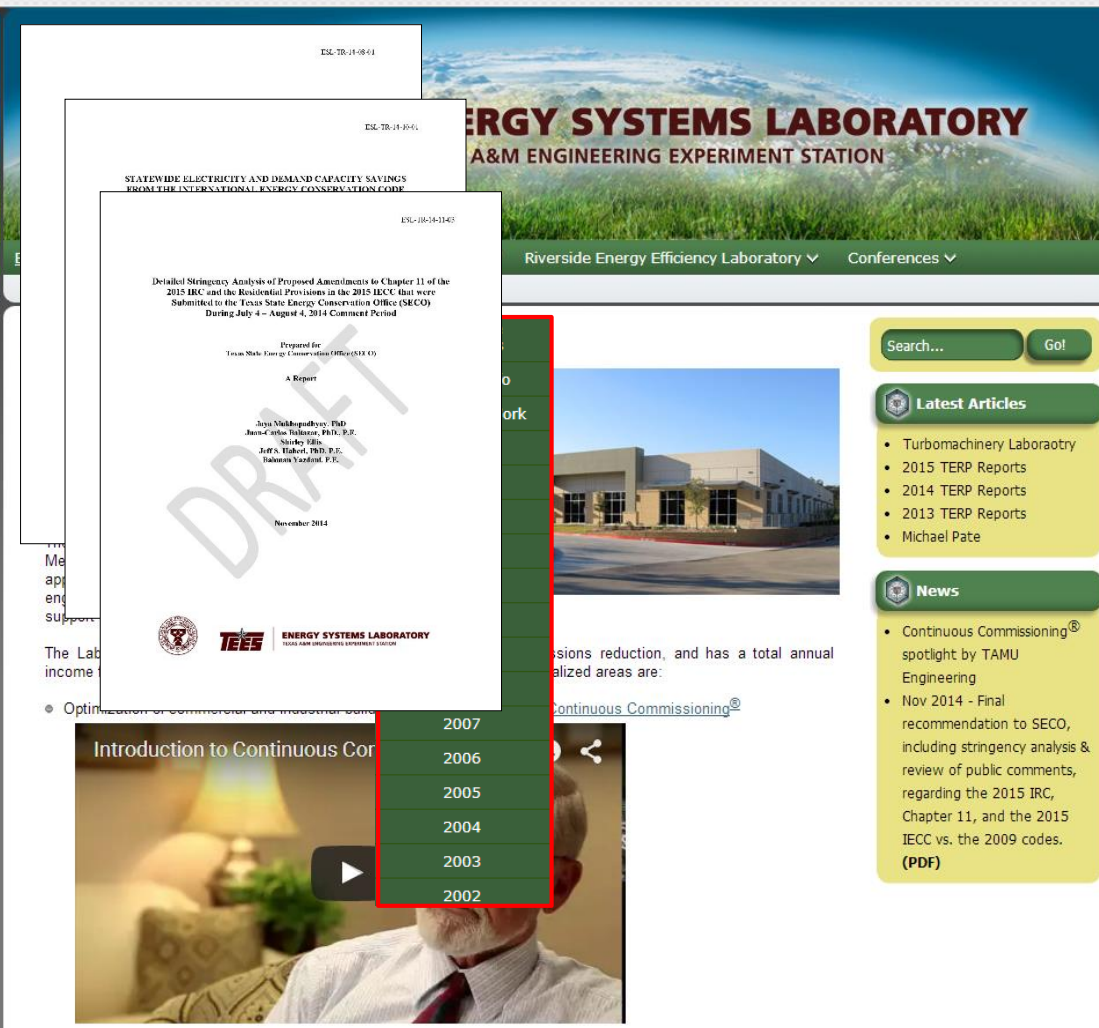
The screenshot shows the Energy Systems Laboratory website. A report titled "STATEWIDE ELECTRICITY AND DEMAND CAPACITY SAVINGS FROM THE INTERNATIONAL ENERGY CONSERVATION CODE (IECC) ADOPTION FOR SINGLE-FAMILY RESIDENCES IN TEXAS (2002-2013)" is highlighted. The report is by Soliman Oti, Juan Carlos Balboa, Ph.D., P.E., Jeff Hubert, Ph.D., P.E., and Balboa Yarbrough, P.E. It was published in October 2014. The website also features a sidebar with a list of years from 2002 to 2015, a search bar, and sections for "Latest Articles" and "News".

REPORTS AND PAPERS: TERP

Reports: 2002 through 2013

2014 Reports:

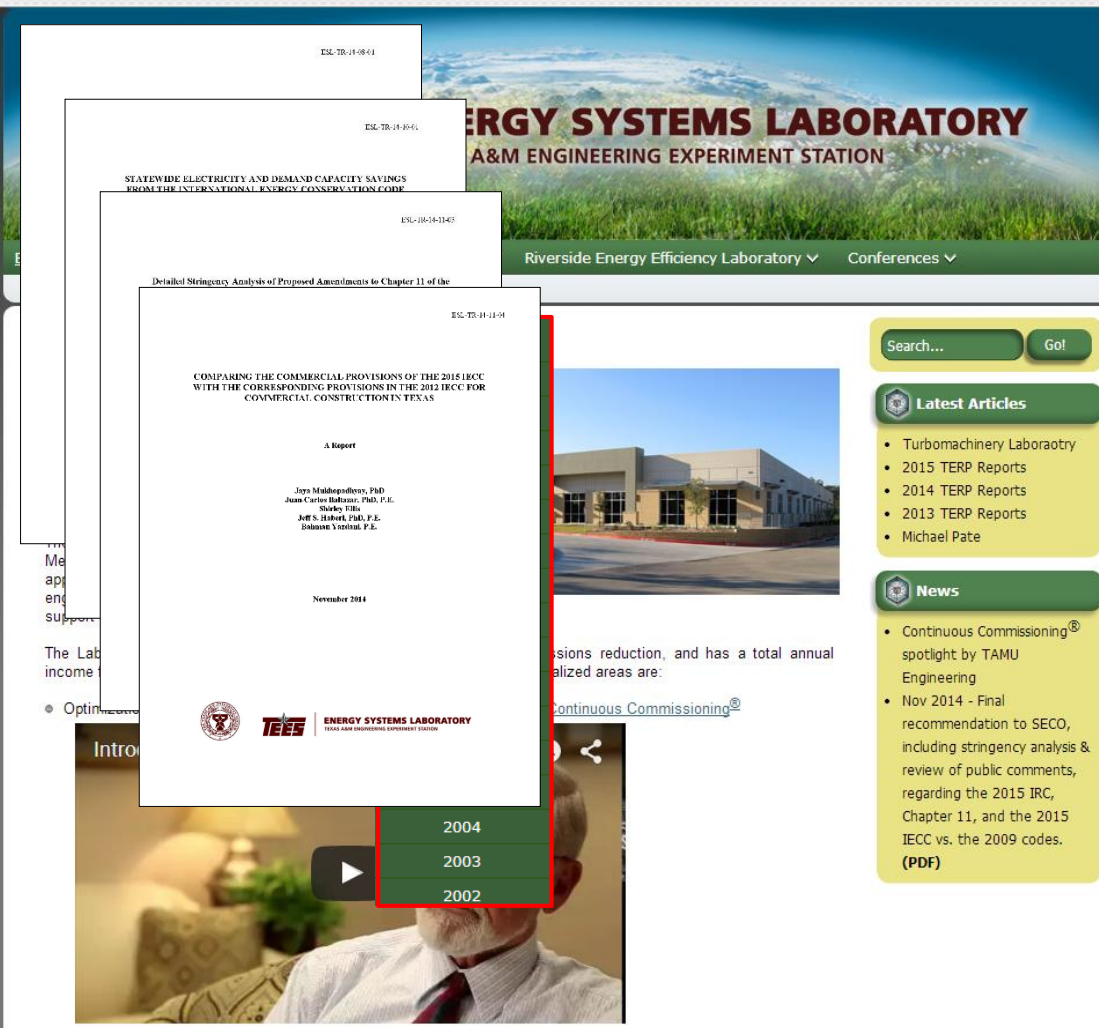
- Comparing the **residential** provisions of the 2015 IECC with the 2012 IECC
- Statewide electricity and demand capacity savings from the IECC
- Analysis of Proposed Amendments to 2015 IRC and the 2015 IECC



The screenshot displays the Energy Systems Laboratory website. A report titled "Detailed Stringency Analysis of Proposed Amendments to Chapter 11 of the 2015 IRC and the Residential Provisions in the 2015 IECC" is highlighted. The report is dated November 2014 and was prepared for the Texas State Energy Conservation Office (SECO). The authors listed are Jaya Nishikubayashi, PhD, James Wilson, PhD, P.E., Steve Ellis, Jeffa Hubert, PhD, P.E., and Babun Vaidyanath, P.E. A sidebar on the right lists "Latest Articles" including "Turbomachinery Laboratory", "2015 TERP Reports", "2014 TERP Reports", "2013 TERP Reports", and "Michael Pate". Below this, a "News" section mentions "Continuous Commissioning® spotlight by TAMU Engineering" and "Nov 2014 - Final recommendation to SECO, including stringency analysis & review of public comments, regarding the 2015 IRC, Chapter 11, and the 2015 IECC vs. the 2009 codes. (PDF)". At the bottom, a video player shows a man speaking, with a dropdown menu listing years from 2002 to 2007.

REPORTS AND PAPERS: TERP

Reports: 2002 through 2013



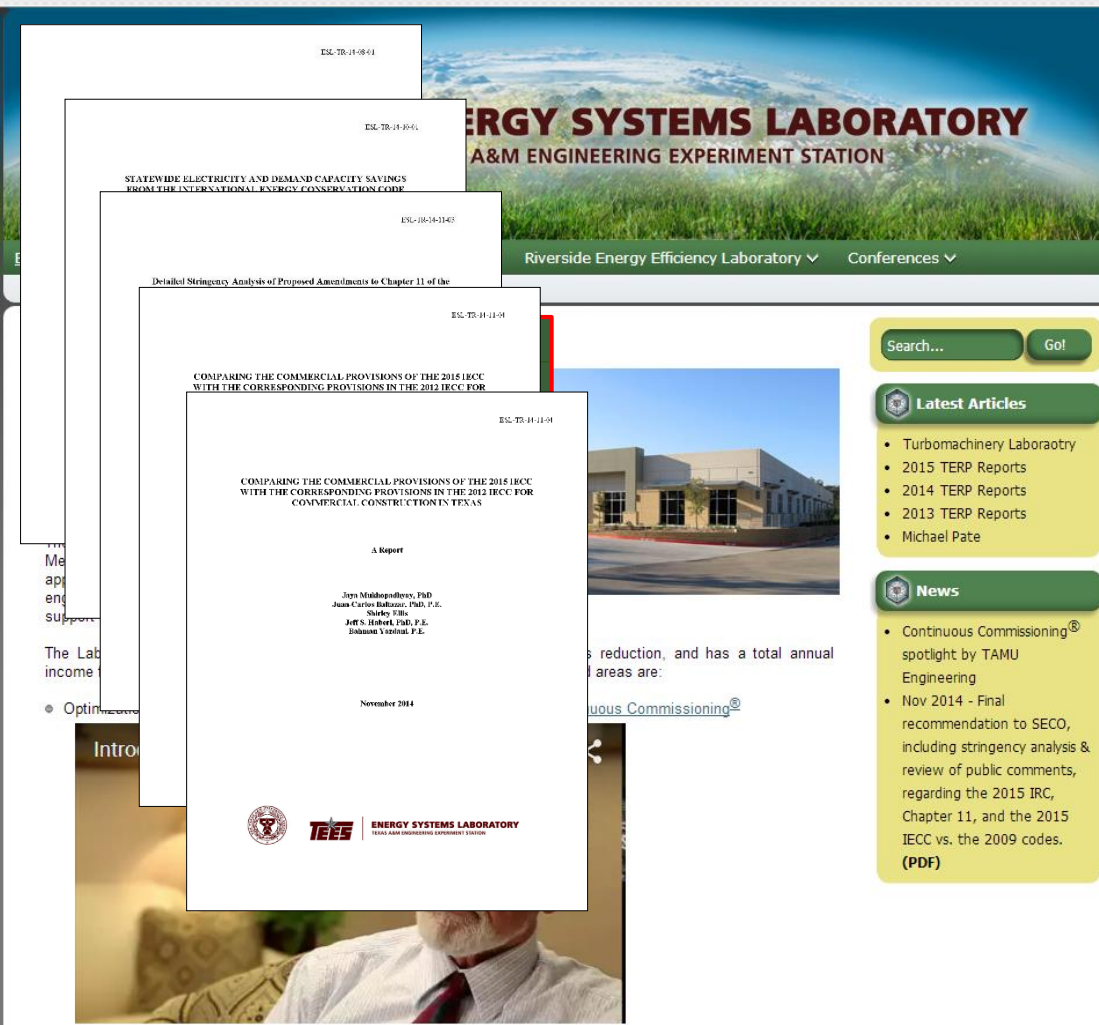
The screenshot shows the Energy Systems Laboratory website. A report titled "COMPARING THE COMMERCIAL PROVISIONS OF THE 2015 IECC WITH THE CORRESPONDING PROVISIONS IN THE 2012 IECC FOR COMMERCIAL CONSTRUCTION IN TEXAS" is highlighted. The report is dated November 2014 and is authored by Jory Madigan, PhD, Juan Carlos Balazs, PhD, P.E., Sharkey Ellis, Jeff S. Hubert, PhD, P.E., and Bolanese Yonatan, P.E. The website also features a search bar, a "Latest Articles" section, and a "News" section. A video player is visible at the bottom left, showing a man in a suit.

2014 Reports:

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REPORTS AND PAPERS: TERP

Reports: 2002 through 2013



2014 Reports:

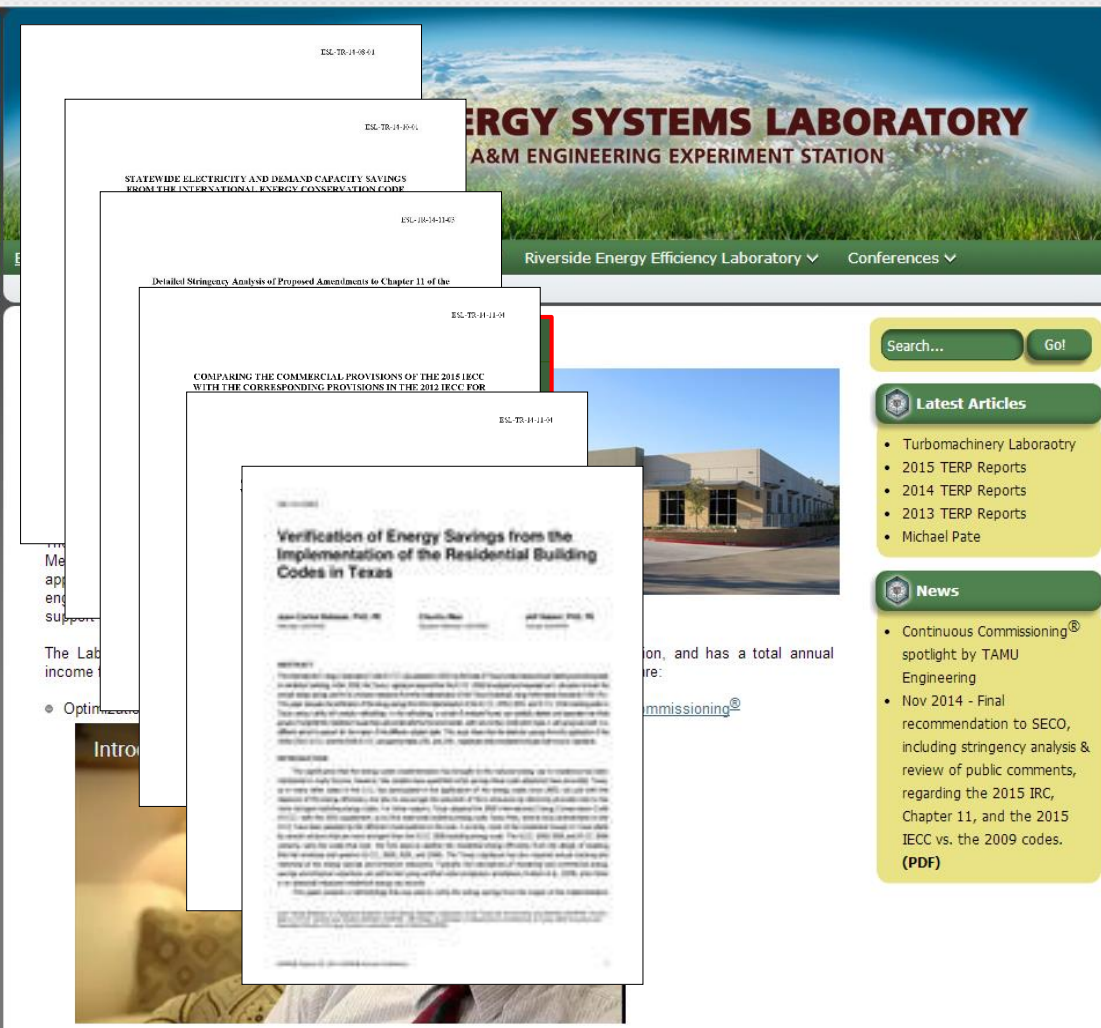
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2014 Papers:

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REPORTS AND PAPERS: TERP

Reports: 2002 through 2013



2014 Reports:

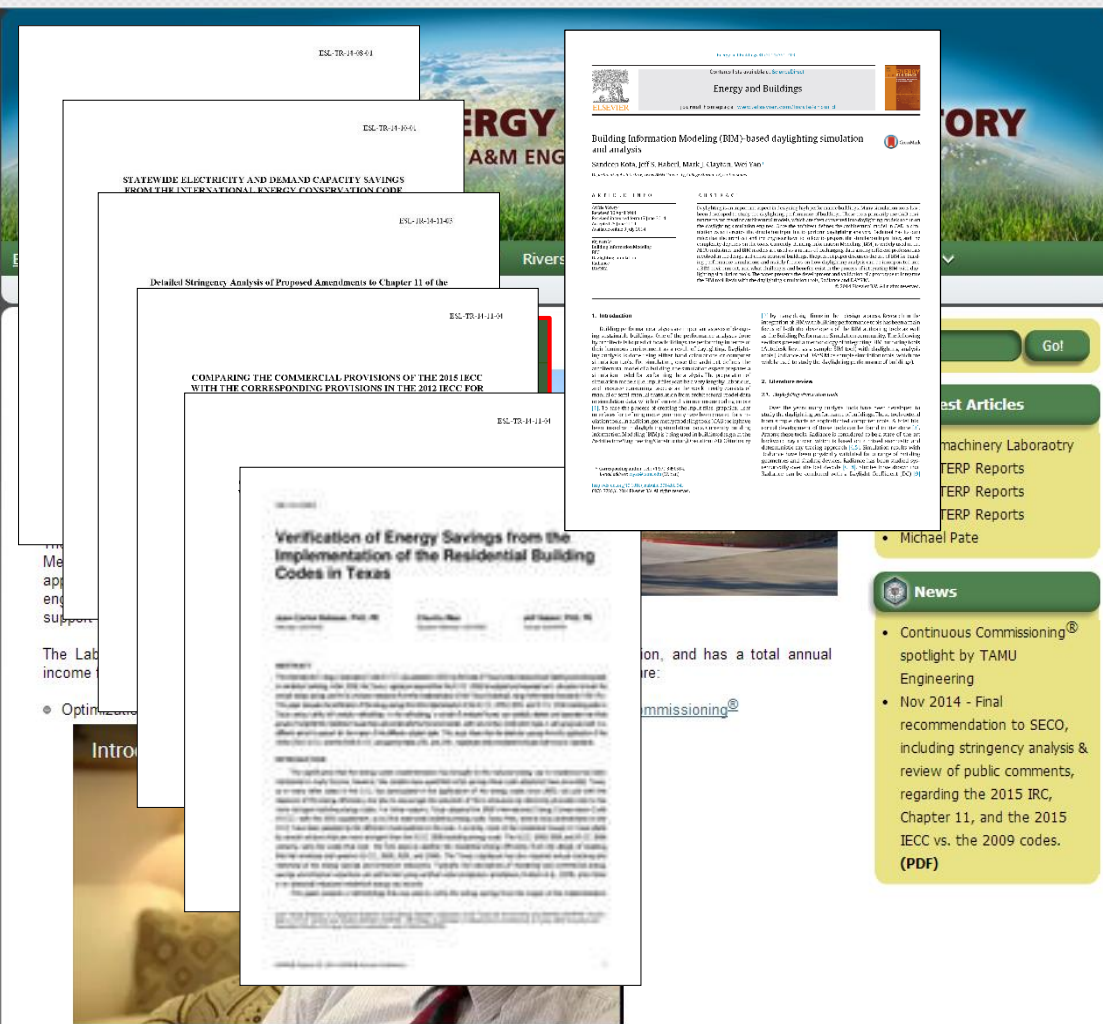
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REPORTS AND PAPERS: TERP

Reports: 2002 through 2013



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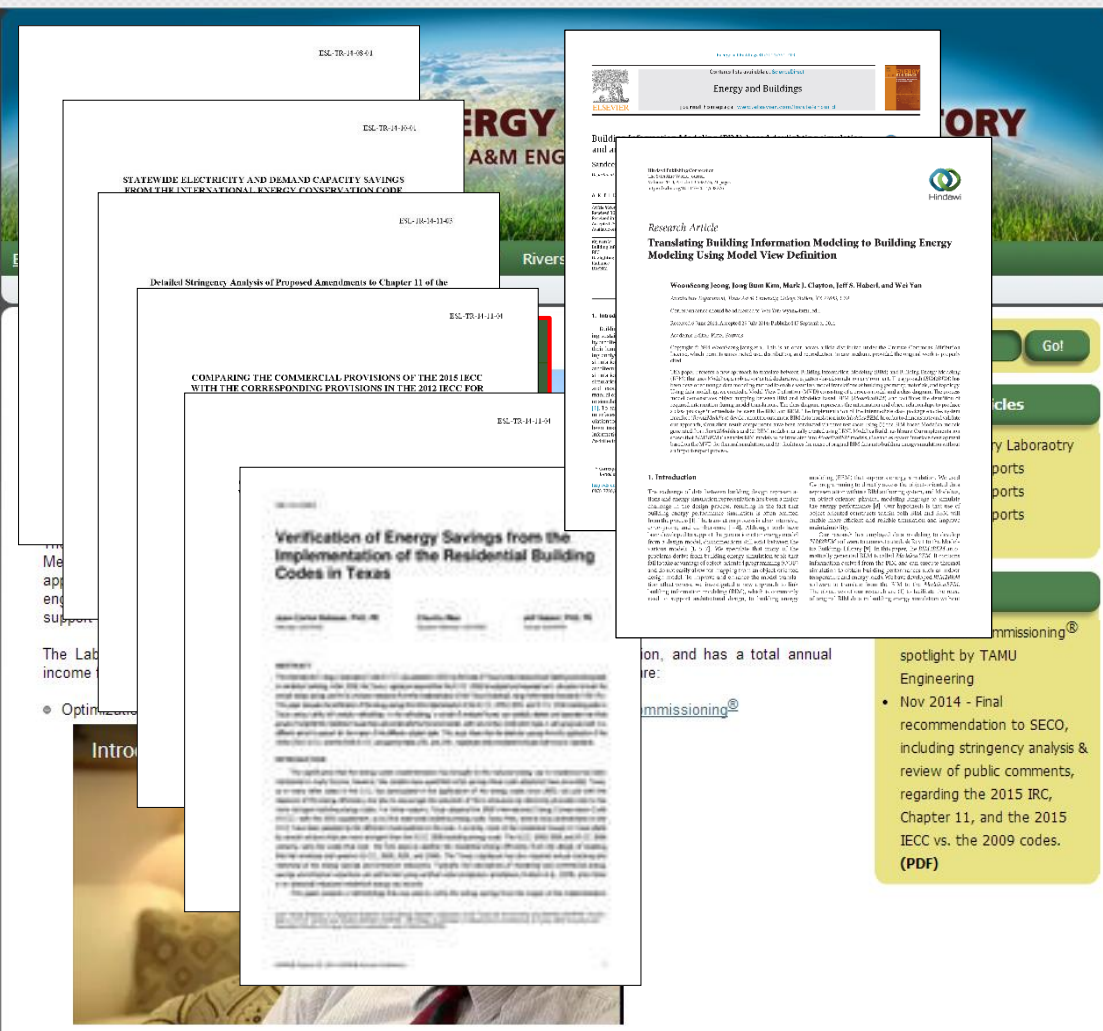
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REPORTS AND PAPERS: TERP

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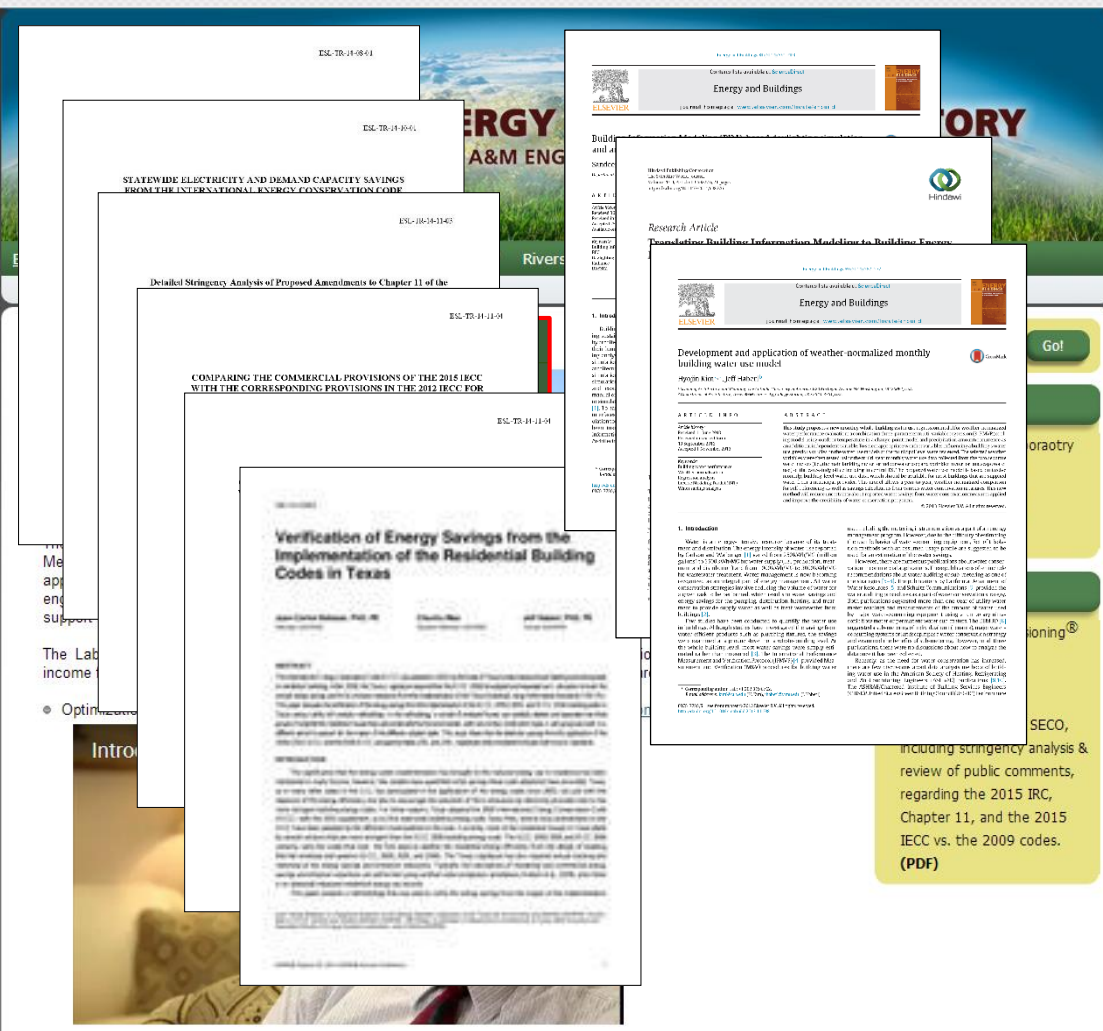
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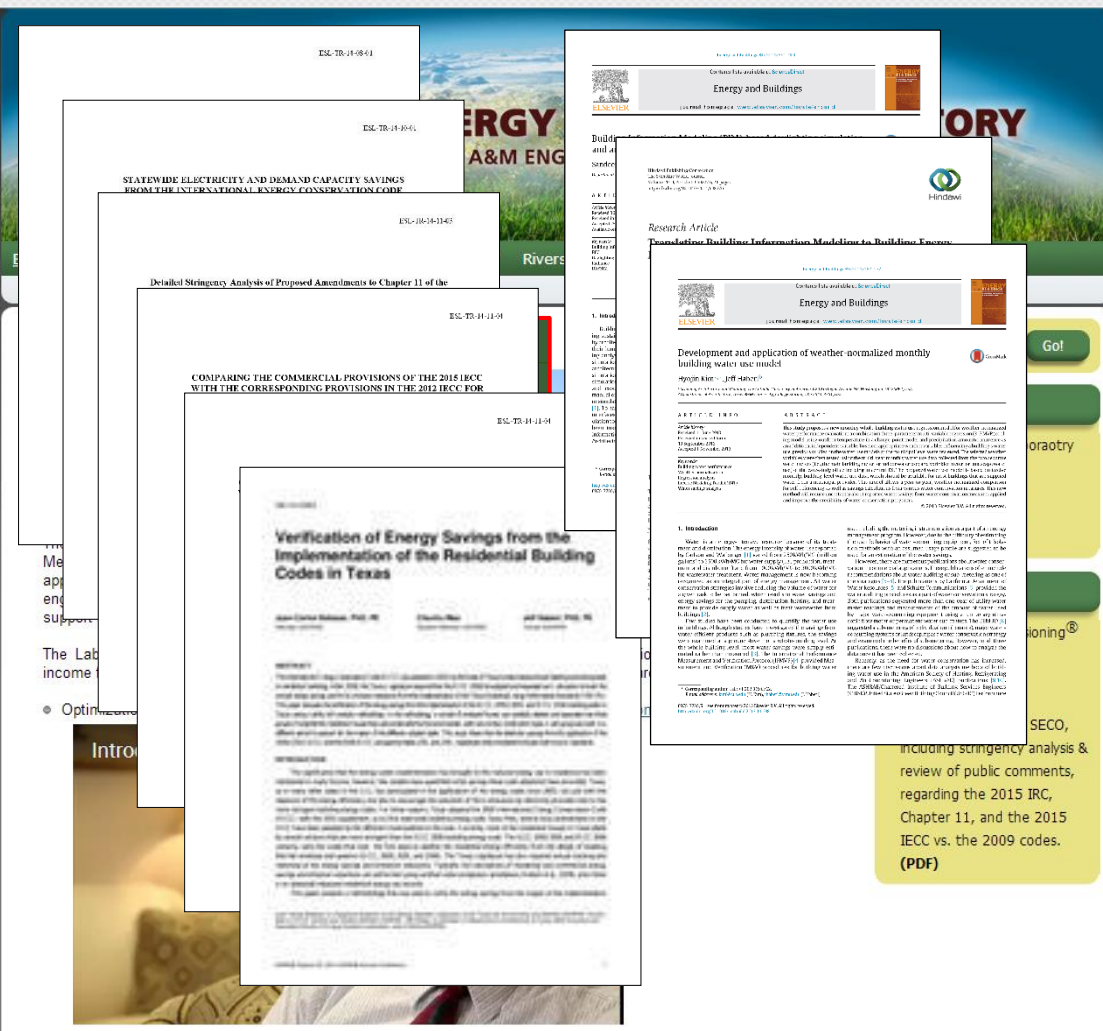
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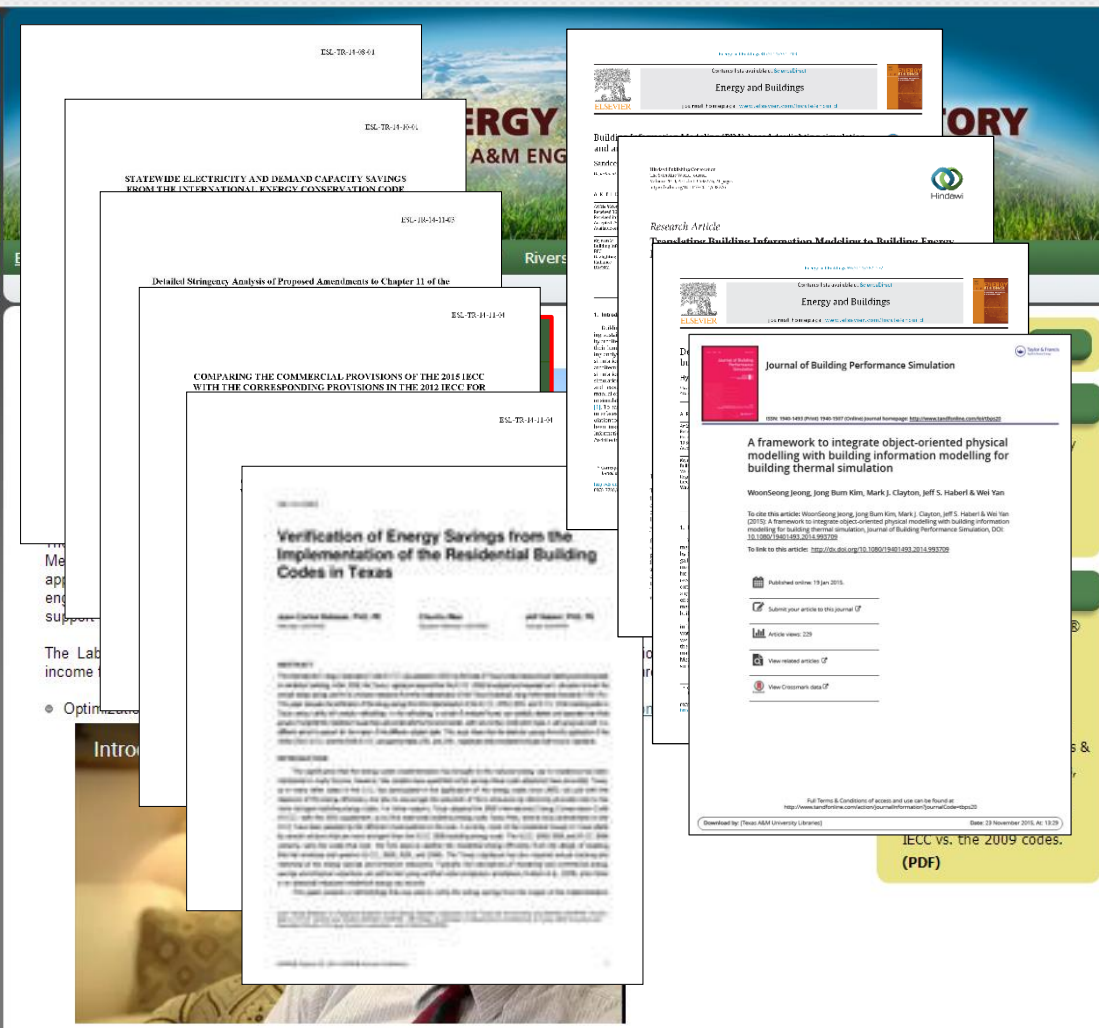
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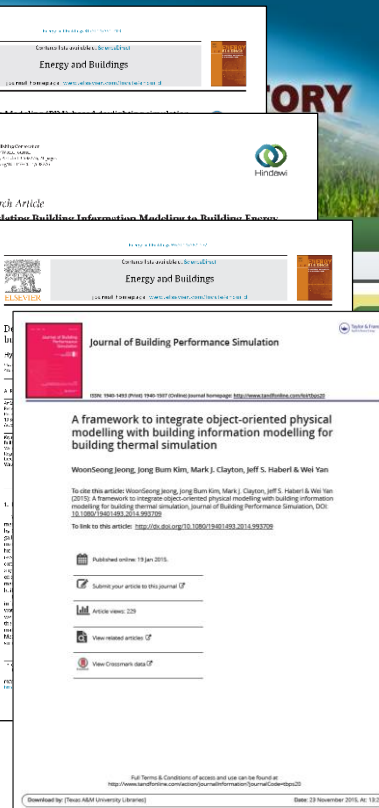
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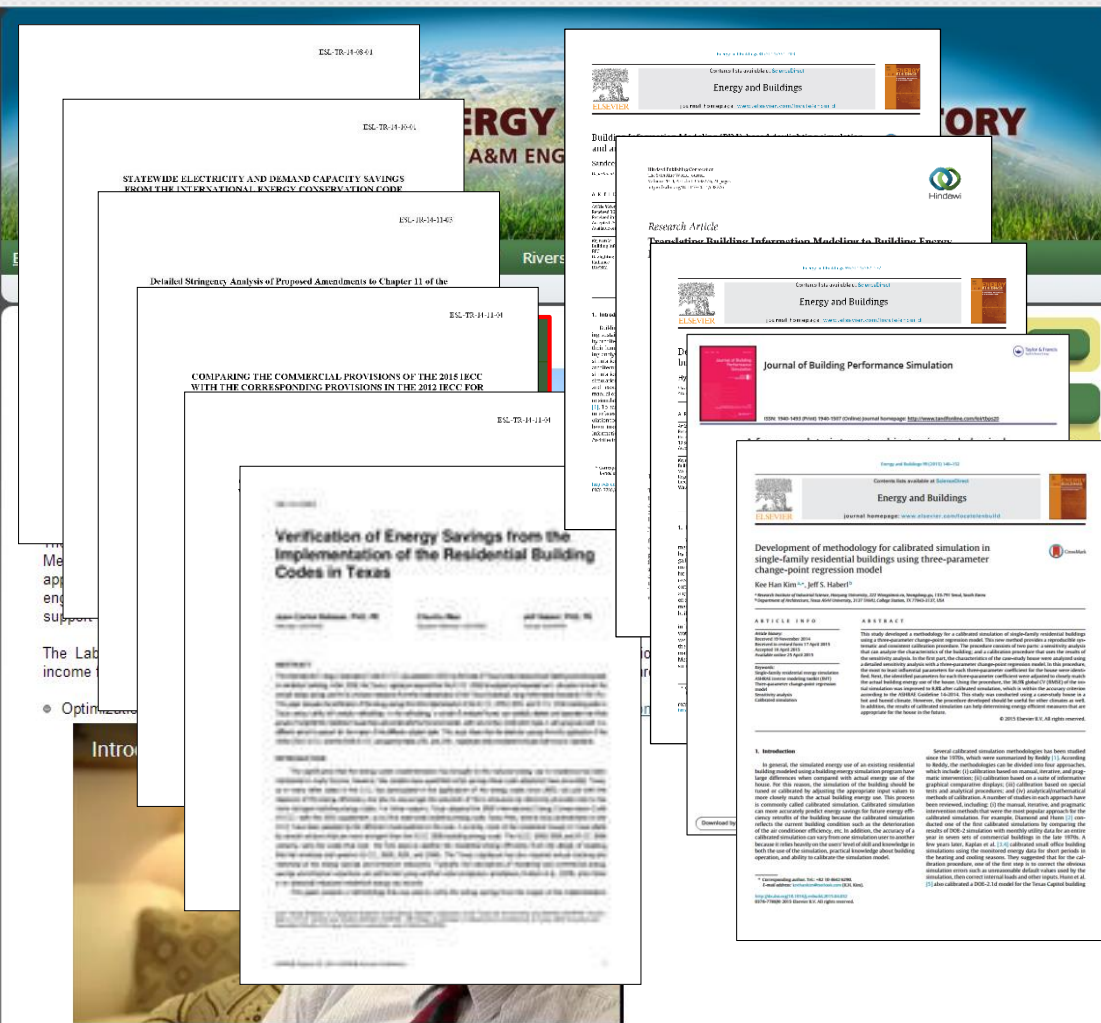
- A Framework to Integrate Object-Oriented Physical Modelling with BIM for Building Thermal Simulation



IECC vs. the 2009 codes.
(PDF)

REPORTS AND PAPERS: TERP

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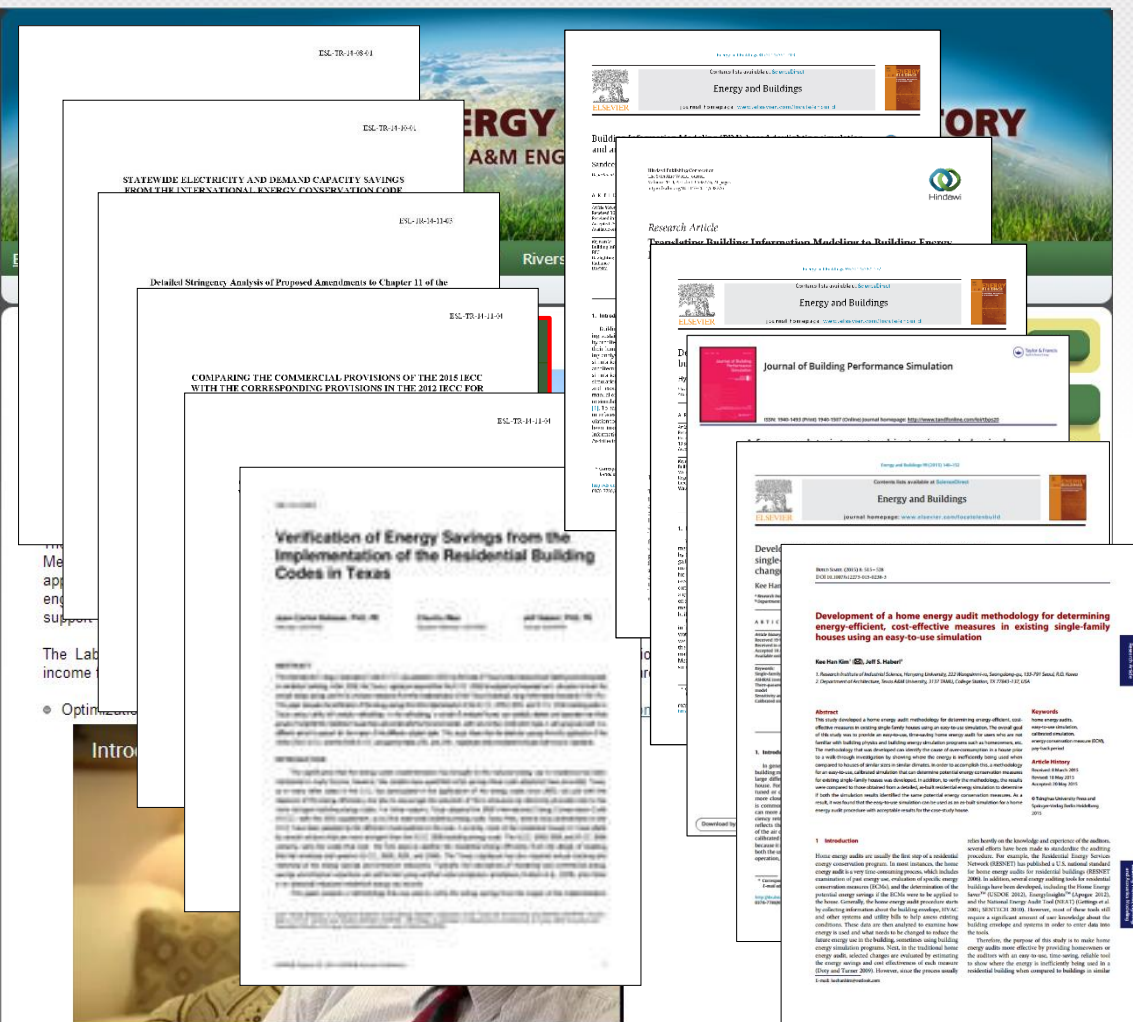
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REPORTS AND PAPERS: TERP

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- Development of Methodology for Calibrated Simulation in Single-family Residential Buildings
- Development of a Home Energy Audit Methodology for Determining Energy-Efficient

ACEEE: NATIONAL RECOGNITION FOR CODE CHANGES (2015)

A solid 20 states rose in the *State Scorecard* rankings. California, a leading state, is also one of the most improved states this year. Maryland, Illinois, the District of Columbia, and **Texas also deserve recognition for improvement over the past year.** Maryland increased its commitment to energy efficiency in 2015 by establishing new, more aggressive energy savings targets for utilities. Illinois is one of the first states to adopt the newest building energy codes, and has increased the amount of energy efficiency available to utilities through procurement agreements with the Illinois Power Agency. Like Illinois, **Texas has been aggressive in adopting the latest building energy codes, and has also taken notable actions to ensure code compliance across the state.** The District of Columbia is among the most improved for the second year in a row, due to its progress across a number of policy areas and the ramping up of DC Sustainable Energy Utility programs.



American Council for an Energy-Efficient Economy

NEWS RELEASE

For Immediate Release
 Media Contact: Patrick Kiker
pkiker@aceee.org, 202.507.4043

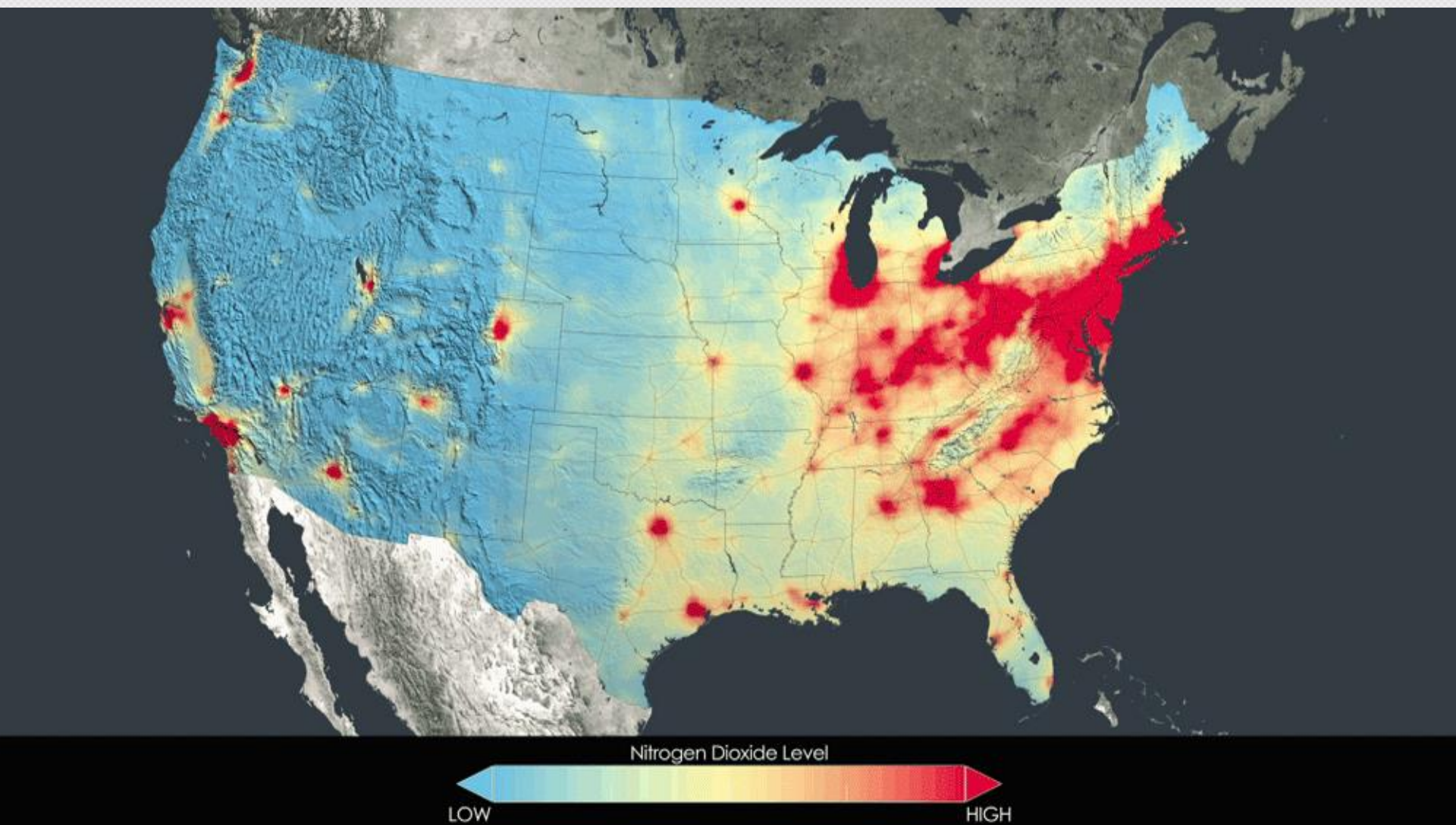
ACEEE State Scorecard: Massachusetts Edges Out California As Most Energy-Efficient State, Maryland Among Most Improved

Top 10 States Ranked in Energy Efficiency Scorecard: MA, CA, VT, RI, OR, CT, MD, WA, NY ... With MN and IL Tied for 10th; Five Most Improved States: MD, IL, DC, CA, and TX; and Five States in Most Need of Improvement: MS, LA, SD, WY, and ND.

WASHINGTON, DC (October 21, 2015): Energy efficiency measures continue to flourish in states across the country, with several states -- including California, Maryland, Illinois, Texas, and the nation's capital, Washington, DC -- taking major steps that improved their scores in the ninth annual edition of the *State Energy Efficiency Scorecard*, released today by the American Council for an Energy-Efficient Economy (ACEEE). The *State Scorecard* ranking of the states is issued annually with the support of the US Department of Energy. This year, DOE Deputy Assistant Secretary for Energy Efficiency Kathleen Hogan participated in the release of the ACEEE report.

Available online at <http://aceee.org/state-policy/scorecard>, the following are key findings of the 2015 *State Scorecard*:

U.S. AIR QUALITY IMPROVEMENT FROM 2005 - 2011



Source from NASA: http://www.nasa.gov/content/goddard/new-nasa-images-highlight-us-air-quality-improvement/#.U_-CNxzKbxQ

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<http://esl.tamu.edu/terp>