Building a Green Workforce:

Training for Tomorrow's Energy Code Compliance

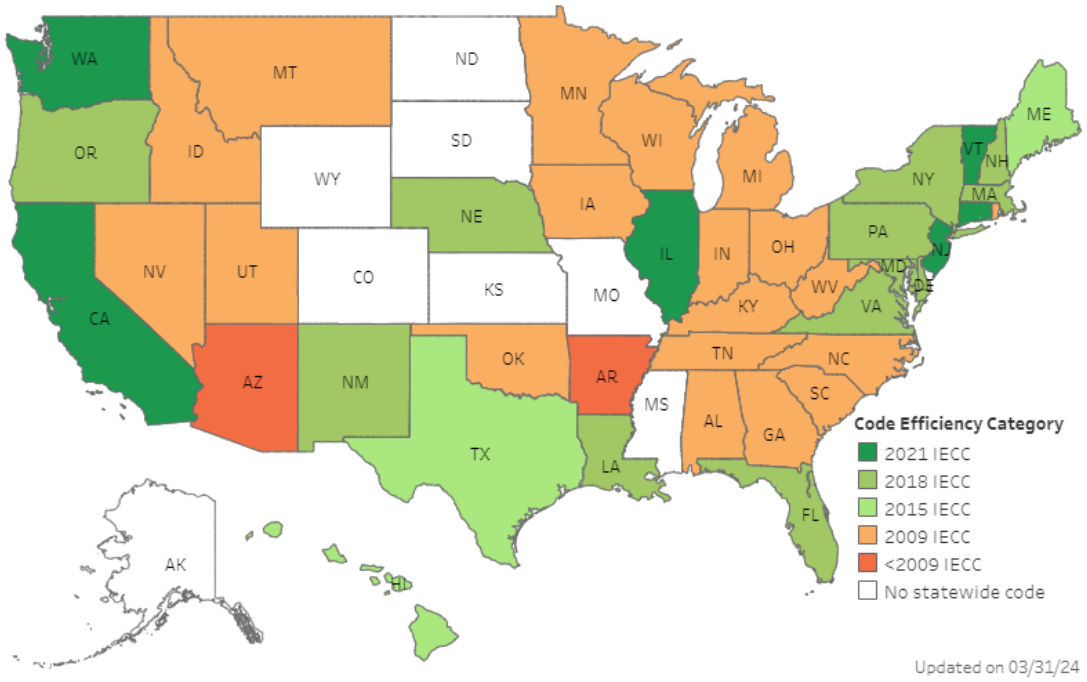
DOE National Energy Codes Conference

Sacramento | May 7

Many states and local governments are updating energy codes from outdated standards to the latest model energy code. Education & training supports successful implementation.

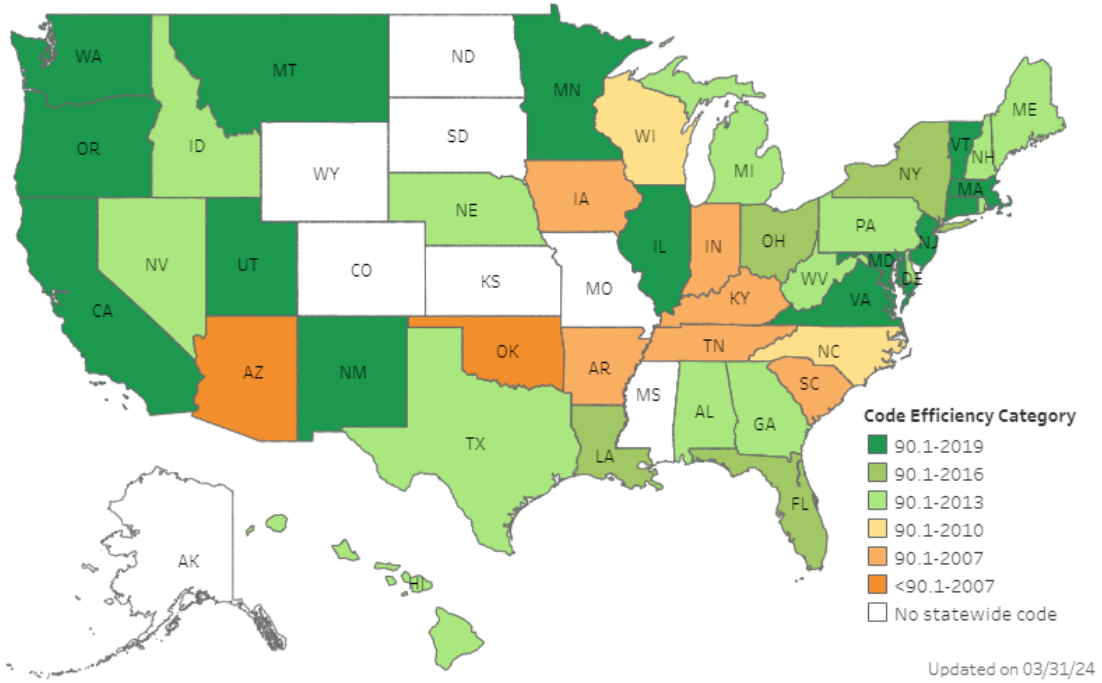
Evolution of state energy code adoption:

Residential Codes: Now



Residential Buildings (IECC)

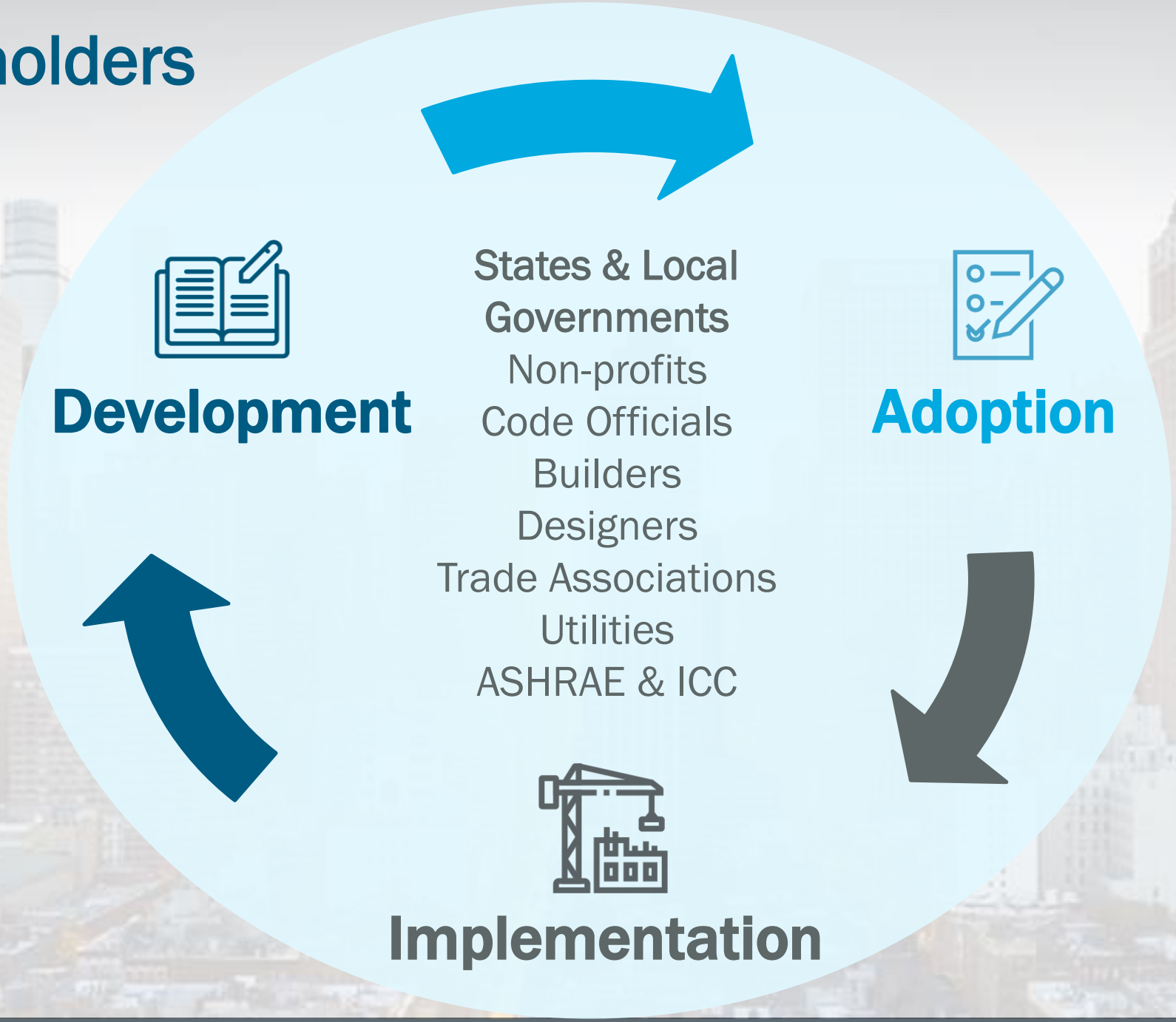
Commercial Codes: Now



Commercial Buildings (Standard 90.1)

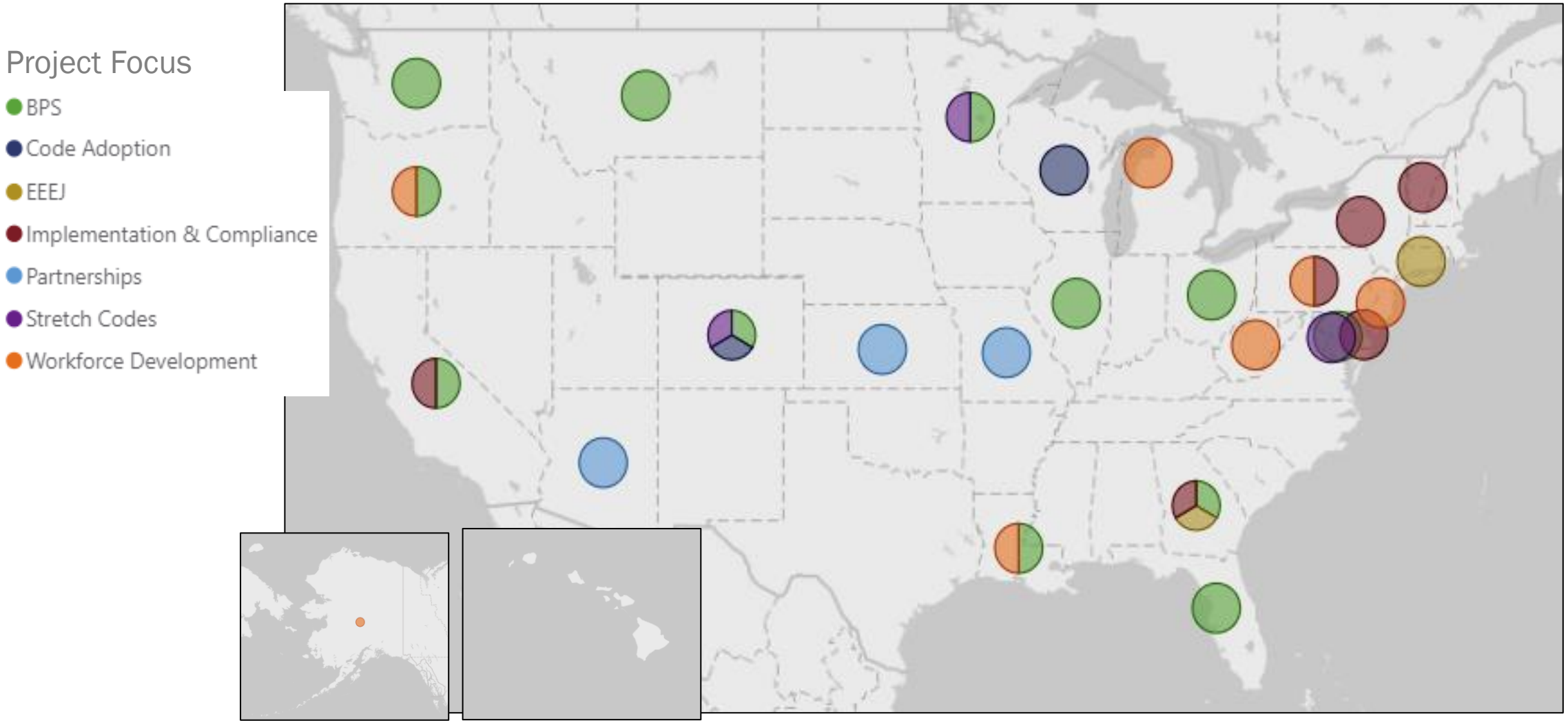
22 States in-process or anticipated to adopt a new code

Key Stakeholders



RECI Workforce Projects

> Although each project has a different focus, nearly all include a workforce component



Lessons from the Field

Erica DiLello, NORESCO

Omar Al-Hassawi, WSU

Randy Plumlee, SPEER

Wrap up and Q&A

Building a Green Workforce: Training for Tomorrow's Energy Code Compliance

Erica DiLello, LEEP AP BD+C, MBA | Project Manager

Sustainability Services

MEET THE PRESENTER

- Erica DiLello, LEED AP®, MBA
  - Codes and Standards team
  - Develop and implement building codes
  - Energy modeling and mechanical design background
  - User-centered solutions

500+
employees;
90+ on SUS Team

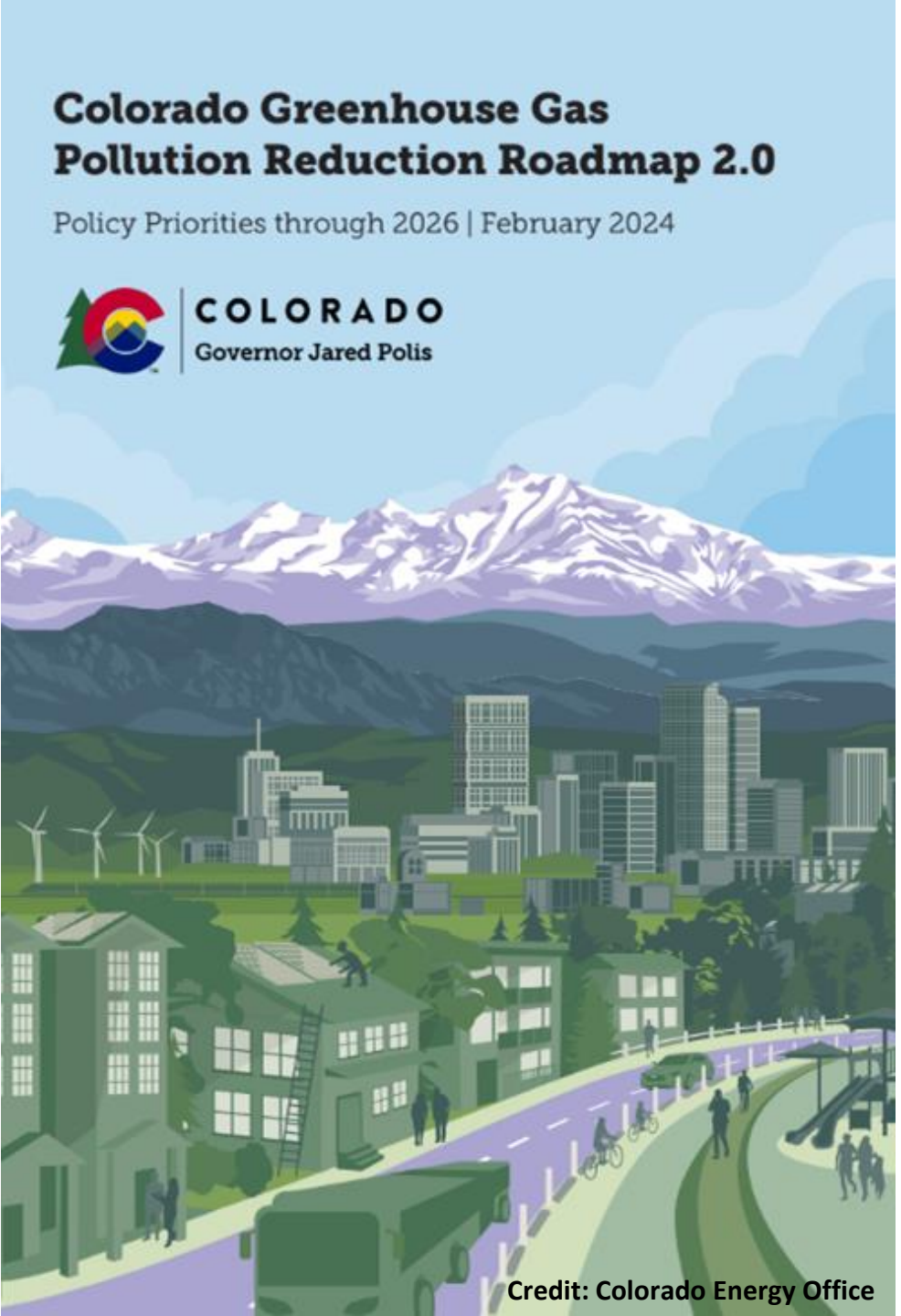
$5 billion
in guaranteed energy savings

25 million
metric tons of CO_2 emissions reduction

70+ Jurisdictions
in CO were provided code adoption technical assistance

4,800+ People
Trained on building codes

300+ Tickets
On building codes answered



COLORADO STATE GOAL

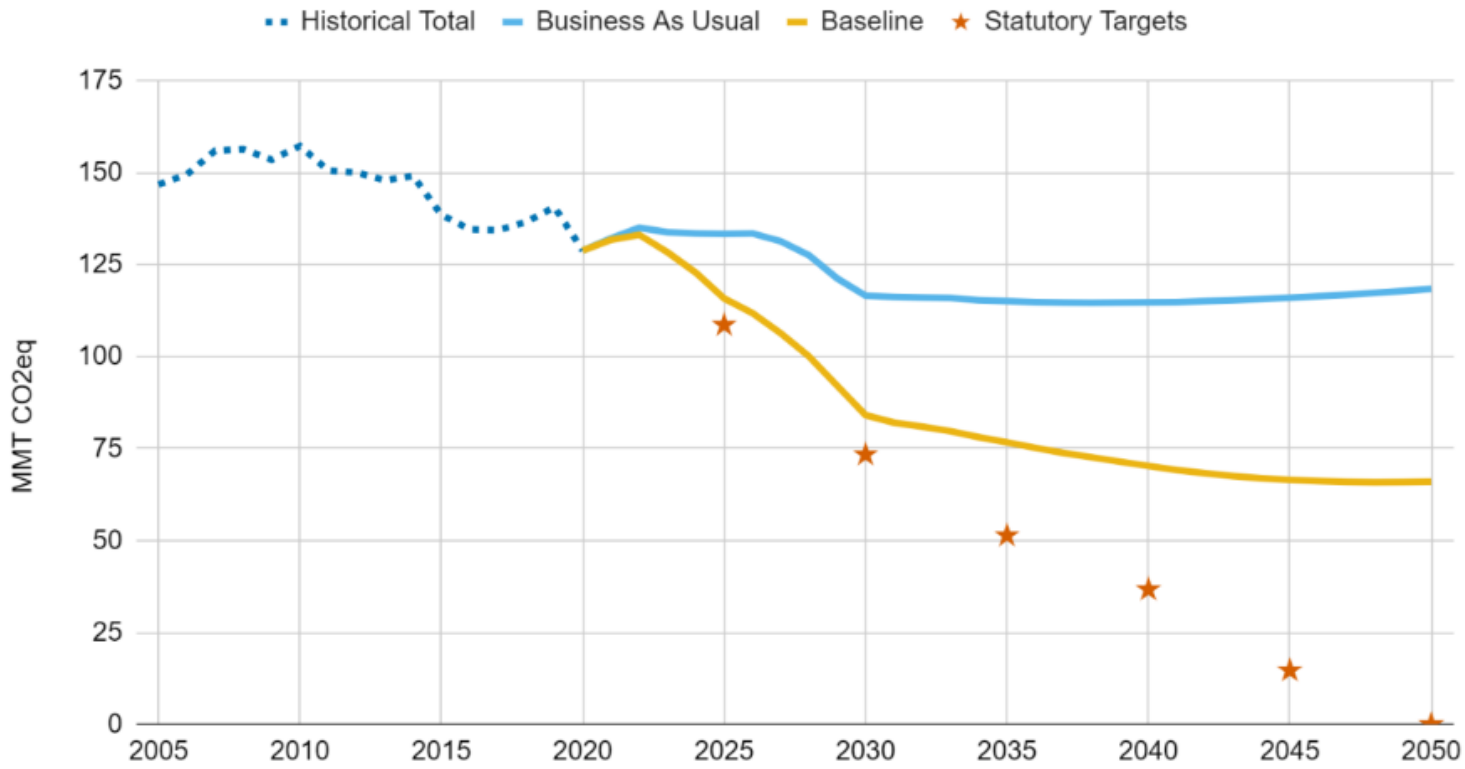
50% GHG pollution reduction in economy-wide emissions below 2005 levels by 2030 and 90% by 2050

- 80% reduction from electricity generation by 2030
- 60% from oil and gas development
- 40% from transportation
- 20% from industry and buildings

COLORADO'S PROGRESS

- Renewable energy generation in Colorado has grown from 22% in 2019 to 37% in 2023

- Colorado is projected to be more than 80% of the way to meeting its statutory goal of a 50% emissions reduction in 2030 from 2005 levels



Historic statewide emissions, updated baseline emissions projection, and statutory emissions targets

Credit: Colorado Greenhouse Gas Pollution Reduction Roadmap 2.0 by the Colorado Energy Office

NEAR TERM ACTIONS

LEAD A WORKFORCE DEVELOPMENT PLAN TO SUPPORT CLEAN ENERGY AND CLIMATE ACTION

MODERNIZE CLEAN ENERGY PERMITTING

ACCELERATE HEAT PUMP DEPLOYMENT FOR EQUITABLE ACCESS TO HEATING AND COOLING

MAXIMIZE INFRASTRUCTURE INVESTMENT AND JOBS ACT (IIJA) AND INFLATION

STREAMLINE LOCAL EV CHARGER DEPLOYMENT

INCREASE ENERGY EFFICIENCY AND ELECTRIFICATION FOR STATE'S AFFORDABLE HOUSING PROGRAMS

PURSUE STRATEGIC ELECTRIFICATION OR THERMAL ENERGY PROJECTS TO IMPROVE SAFETY AND AFFORDABILITY OF NATURAL GAS DISTRIBUTION

EXPAND RENEWABLE ENERGY DEVELOPMENT AND TRANSMISSION ON STATE LANDS

EXPAND LOW-INCOME ACCESS TO DISTRIBUTED SOLAR

ADOPT LOW-ENERGY AND LOW-CARBON BUILDING CODES

ESTABLISH STATEWIDE REGULATIONS FOR CARBON MANAGEMENT

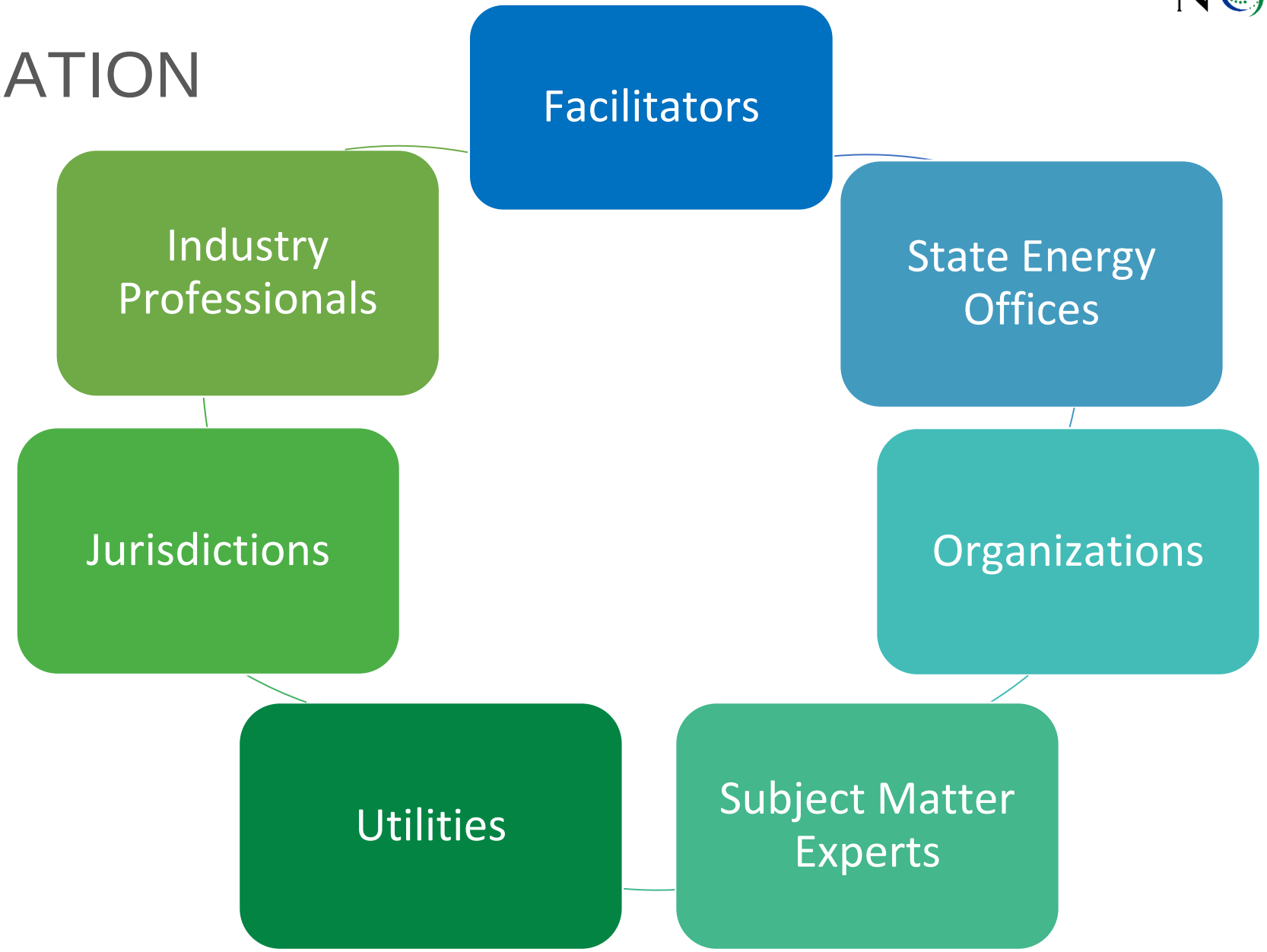
REFORM ELECTRIC DISTRIBUTION SYSTEM PLANNING FOR INVESTOR-OWNED UTILITIES TO SUPPORT STATEWIDE GOALS

Icon Credit: Noun Project

COLORADO ENERGY CODE LEGISLATION

- No statewide code
- 2019 - Jurisdictions required to adopt one of the three most recent versions of the IECC
- July 1, 2023 - Jurisdictions required to adopt the 2021 IECC and the state's model electric ready and solar ready
- July 1, 2026 - Jurisdictions must adopt the state's model low energy and carbon code (not developed yet)

COLLABORATION



BUILDING CODES IMPLEMENTATION

LACK OF KNOWLEDGE?

=

TRAINING

LACK OF AWARENESS?

=

OUTREACH

LACK OF TIME & RESOURCES?

=

TOOLS & RESOURCES

RESOURCES & TOOLS

Building Code Helpline

Submit a question on any Building Code!

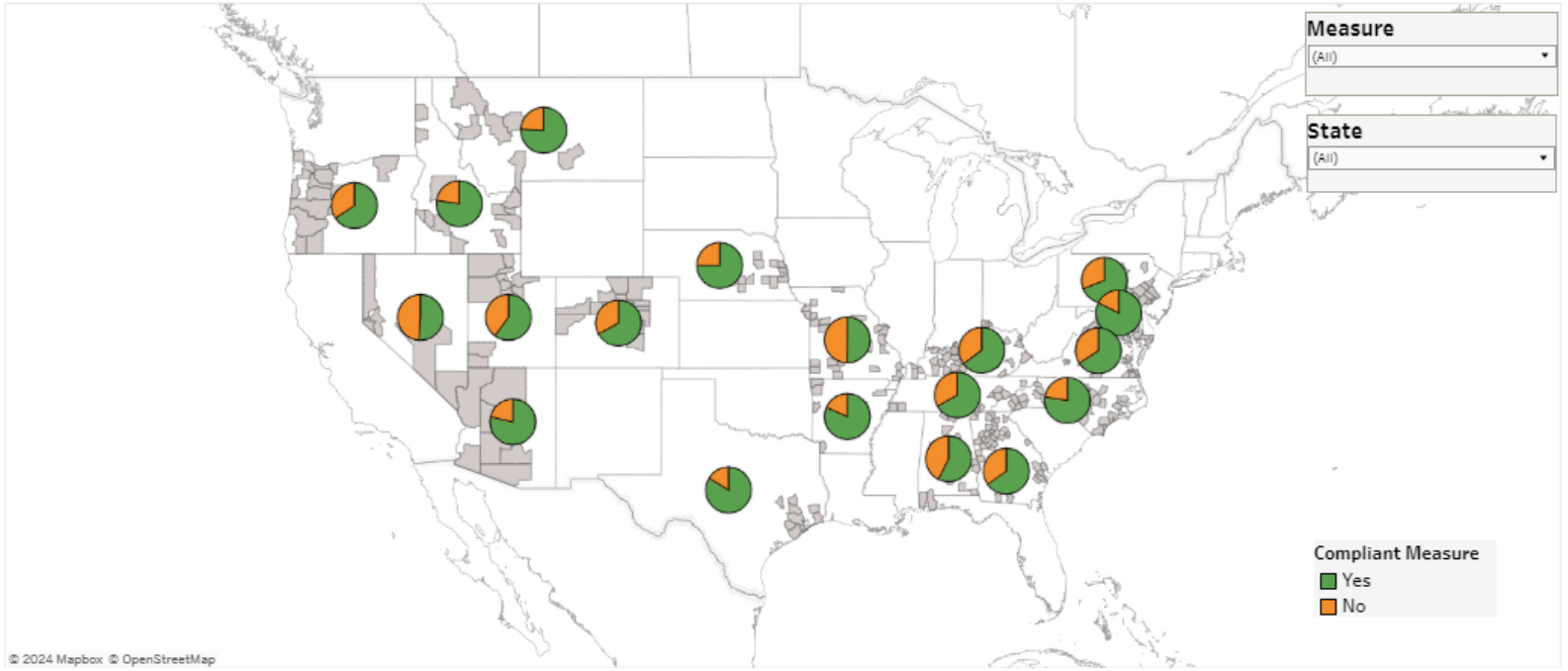
Image Credit: Colorado Energy Office

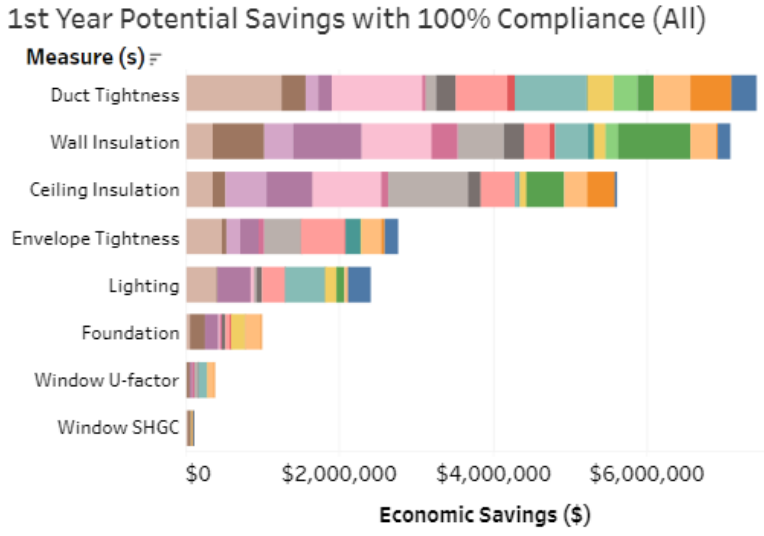
TRAINING TYPES

- Role-Based Training
  - Architects
  - Engineers
  - Contractors
  - Raters
  - Building Inspector
  - Plans Examiner
  - Permit Counter Technicians
- By Request: Virtual or In-Person
- Short Video Clips
- Previous Recordings
- Other States: Learning Management Systems, YouTube Channels, Circuit Rider, DOE Field Study

- Wednesday Webinar Series
  - 4/3/2024 All Things Residential Insulation
  - 4/24/2024 Vapor Management
  - 5/1/2024 Passive House
  - 5/29/2024 Refrigerants
  - 6/5/2024 Mechanical Ventilation for Residential Strategies and Controls
  - 6/12/2024 2021 IECC vs 2024 IECC for Residential
  - 6/26/2024 2021 IECC vs 2024 IECC for Commercial

FIELD STUDY TRAINING





State	Year..	Energy Code Baseline	# Observations
AL	2018	Amended 2015 IECC	603
	2014	Amended 2015 IECC	567
AR	2015	2009 IECC	522
AZ	2020	2018 IECC	481
CO	2020	2018 IECC	554
GA	2018	2009 IECC	571
	2015	2009 IECC	802
ID	2018	Amended 2015 IECC	567
KY	2017	2009 IECC	604
	2014	2009 IECC	630
MD	2017	2015 IECC	776
	2015	2015 IECC	783
MO	2017	2009 IECC	599
MT	2018	Amended 2012 IECC	565
NC	2017	Amended 2009 IECC	615
	2015	Amended 2009 IECC	988
NE	2017	2009 IECC	650
NV	2020	2018 IECC	587
OR	2020	2017 ORSC (based on 2015 IECC)	636
PA	2017	2009 IECC	558
	2015	2009 IECC	657
TN	2018	Amended 2009 IECC	556
TX	2018	2015 IECC	652
	2015	2015 IECC	629
UT	2020	Amended 2018 IECC	640
VA	2018	Amended 2012 IECC	557

https://public.tableau.com/app/profile/doebecp/viz/ResidentialEnergyCodeFieldStudyDashboard/IntrotoFieldStudies

SUCCESSES

- Funding available to train the industry
- Utilities contribute to their demand supply management (DSM) goals
- Ability to train anywhere in Colorado, training thousands of industry professionals
- Tracking success through knowledge swing exams
- Strides towards diversifying how we teach energy codes
- Streamline building code questions

ROADBLOCKS

- Policy limits funding allocation to specific code years
- So much funding, training market can be diluted or overwhelming
- Time & money for jurisdictions/industry
- Desire for code simplification
- Home rule state

THANK YOU!

QUESTIONS?

Erica DiLello

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Energy Conscious Construction at Washington State University

Omar Al-Hassawi, Ph.D.

Associate Professor, Washington State University

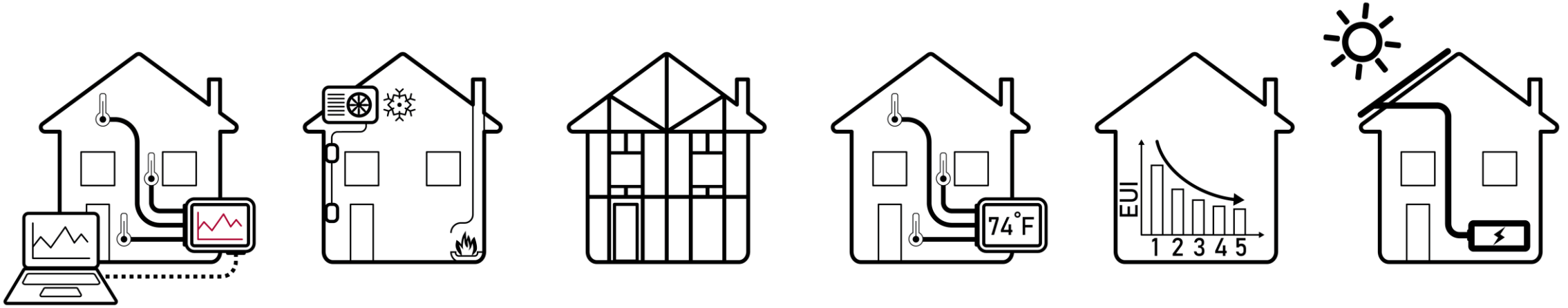
Building a Green Workforce: Training for Tomorrow's Energy Code Compliance

U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY
BUILDING TECHNOLOGIES OFFICE

WASHINGTON STATE UNIVERSITY
School of Design and Construction

Background

Competency gaps among current and future professionals at a national level which inhibit from meeting energy efficiency goals.



State and National Context

- Washington State's energy codes, one of the most rigorous nationally, especially with the recent update.
- Washington State's cap and invest program and the Climate Commitment Act to reach net zero carbon emissions by 2050.
- More than half of WA residential buildings were built before 1980.
- Nearly one in three Washington households are cost burdened, spending more than 30% of their income on housing.

University Context

- The VCEA houses:
  - The School of Design and Construction (SDC)
  - The School of Mechanical and Materials Engineering (MME)
  - The WSU Extension Energy Program
- The VCEA is one of six colleges in the nation combining engineering and architecture and the only college combining all major design disciplines for the built environment.
- Current course offerings only address a subset of the gaps and are scattered across different departments and schools.

Reviewed programs lack …

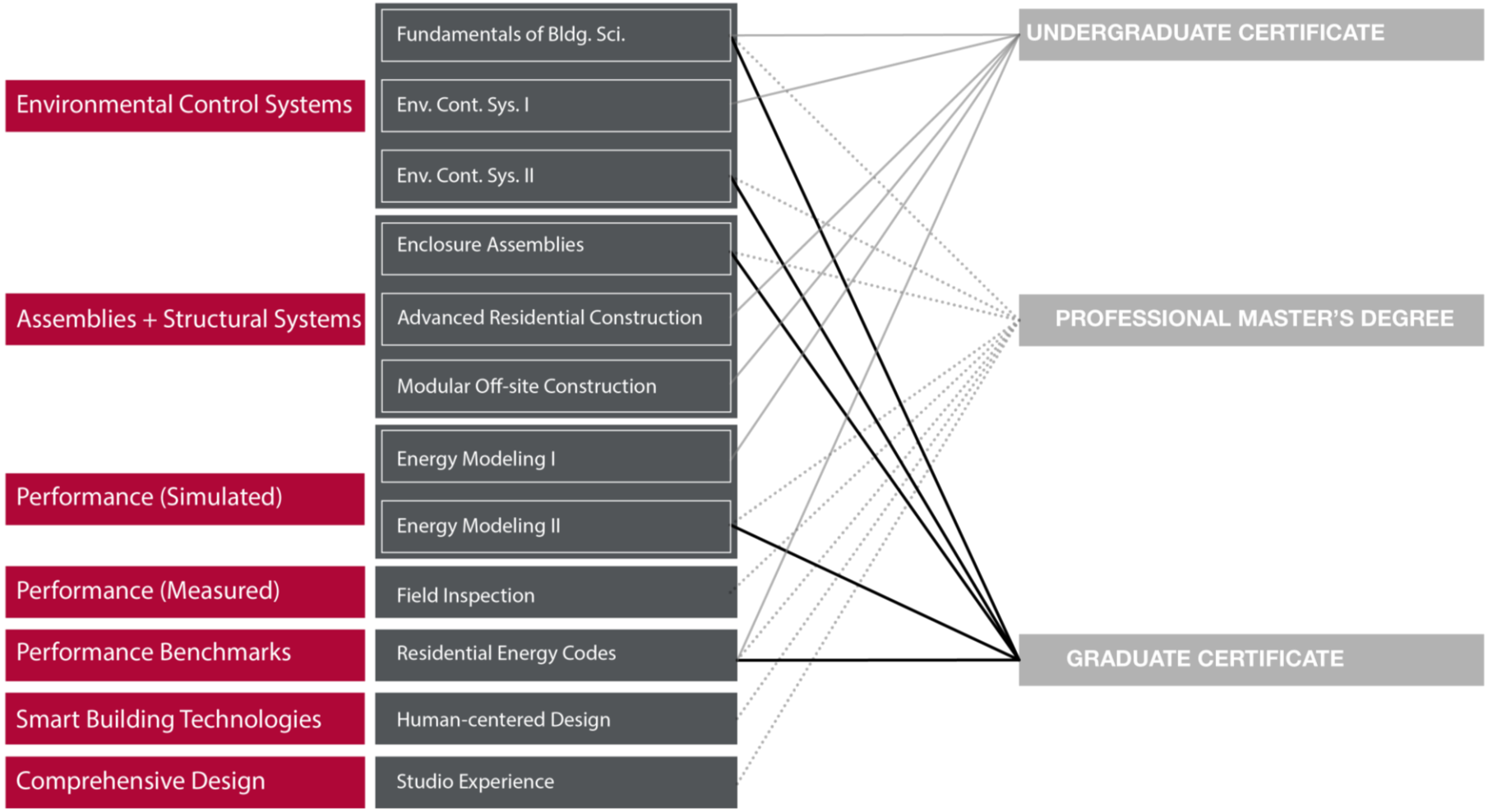
- Specialization: 95 % of reviewed programs cover a wide range of topics in energy efficient buildings.
- Asynchronous delivery: 90 % of reviewed programs were delivered in person.
- Expedited path to completion: Two thirds of the offerings were long-term degree programs and 75 % of those were MS degrees.

Our proposed programs are …

- Focused on a building occupancy (residential).
- Delivered fully online asynchronously and self-paced with predetermined deadlines.
- Structured as certificate programs at the undergraduate and graduate levels.
- Structured as an accelerated professionally oriented master's degree program.

Team of faculty, staff, students, guest speakers, and TAC

Competencies x programs x courses

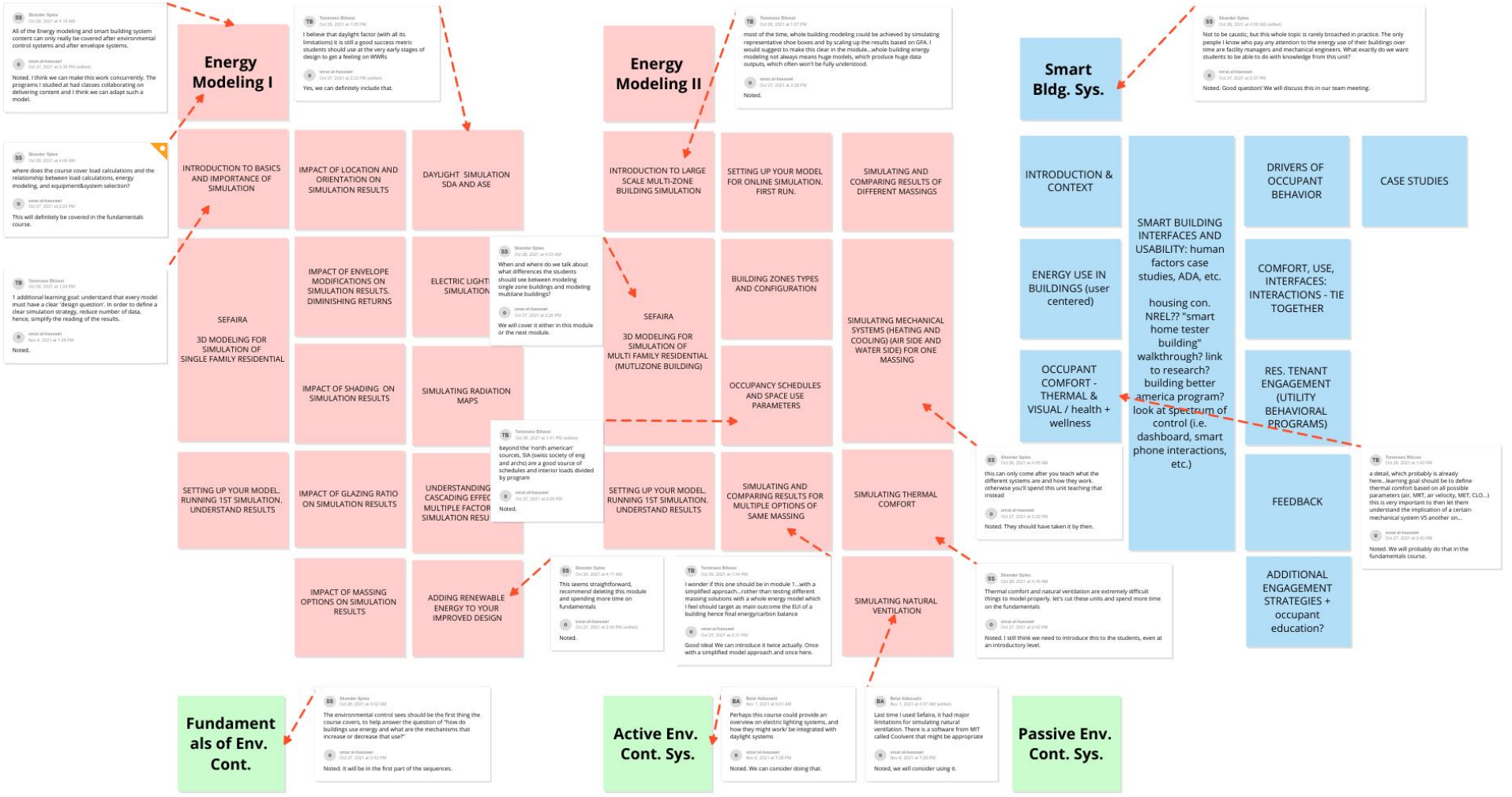


Competencies x programs x courses

Knowledge Gaps	UGC	GC	PM	Courses	UGC	GC	PM
Environmental Controls	x	x	x	Building Science Fundamentals	x	x	x
				Environmental Controls I	x		x
				Environmental Controls II		x	x
Enclosures and Structures	x	x	x	Residential Construction	x		
				Off-Site Construction	x		
				Enclosure Assemblies		x	x
Performance Data (Simulated)	x	x	x	Energy Modeling I	x		
				Energy Modeling II		x	x
Performance Benchmarks	x	x	x	Building Energy Codes	x	x	x
Performance Data (Measured)			x	Field Inspection			x
Smart Technologies			x	Human-centered Design			x
Comprehensive Design			x	Studio Experience			x
					15	**12**	**30**

WASHINGTON STATE UNIVERSITY
School of Design and Construction

Collaboration with TAC to develop course content



Promotion material

SUPPORT

"Our firm is committed to delivering carbon neutrality in all of our projects, from urban office buildings like the Bullitt Center, to overseas embassies, higher education facilities, and even in single family residential work like Loom House. We use the 2030 Challenge to set firm-wide goals. The ECC Programs provide the types of technical expertise and experience we need in our firm to achieve these goals."

The Miller Hull Partnership

ECC ARE ...

ONLINE CERTIFICATES: Which are offered through WSU's Global Campus making it more accessible for students and practitioners.

THAT ARE SHORT TERM: Giving you the opportunity to obtain in-demand learning outcomes and enter the market sooner with advanced training.

AND INTERDISCIPLINARY: Offering an in-depth specialized curriculum and opening up a diverse range of career opportunities.

ECC
ENERGY CONSCIOUS CONSTRUCTION

CAREERS

DESIGN & CONSTRUCTION:
Architects, Envelope Specialists, Interior Designers, Landscape Architects, Construction Managers

ENGINEERING:
Mechanical Engineers, Civil Engineers, Structural Engineers, Environmental Engineers

INSPECTION & MAINTENANCE:
Energy Auditors, Building Inspectors, Building Officials, Energy Raters

ECC RECOGNITION:
The Certificates have earned the U.S. Department of Energy's Zero Energy Design Designation for ensuring students have a solid foundation in building science and an opportunity to apply that knowledge in a zero energy design project.

ZERO ENERGY DESIGN DESIGNATION
U.S. DEPARTMENT OF ENERGY

OUR MISSION:
To create a workforce that is experienced in high-performing energy-efficient residential building design and construction, capable of meeting Washington State's progressive climate initiatives while advancing Washington State University's land-grant commitment.

SDC.INFO@WSU.EDU
(509) 335-5539
HTTPS://SDC.WSU.EDU/

WASHINGTON STATE UNIVERSITY
School of Design and Construction

WHAT?

The School of Design and Construction's Energy Conscious Construction (ECC) Certificates are a set of interdisciplinary educational programs with emphasis in high-performing energy-efficient residential buildings and covering all phases of the design process from pre-design to construction observation.

WHY?

WA residential buildings consume 23% of all energy. Our state has one of the most progressive energy codes and is committed to reducing greenhouse gas emissions from buildings through the Climate Commitment Act. The ECC programs prepare you for a career in building energy efficiency and address the rise in competency gaps associated with Washington's initiatives and goals for a sustainable future.

WHO?

DEGREE SEEKING: Open to current students in the Voiland College of Engineering and Architecture, specifically **undergraduate** students at the junior level as well as **graduate** students.

NON-DEGREE SEEKING: Open to non-degree seeking students from outside WSU with backgrounds in design, construction, and engineering disciplines.

UNDERGRADUATE

ONLINE CERTIFICATE | 15 CREDITS

COURSES	CREDITS
ME 483 Fundamentals Of Bldg. Sci.	3
SDC 451 Energy Modeling I	3
SDC 441 Bldg. Energy Codes	3
ARCH 464 Advanced Res. Const. **OR** ARCH 495 Modular Off-Site Const.	3
ARCH 493 Environmental Cont. Sys. I	3

GRADUATE

ONLINE CERTIFICATE | 12 CREDITS

COURSES	CREDITS
ME 579 Environmental Cont. Sys. II	3
SDC 552 Energy Modeling II	3
SDC 541 Bldg. Energy Codes	3
ARCH 531 Advanced Tectonics	3

COMPETENCY

GAPS COVERED IN THE CURRICULUM


Energy Modeling


Assemblies & Structures

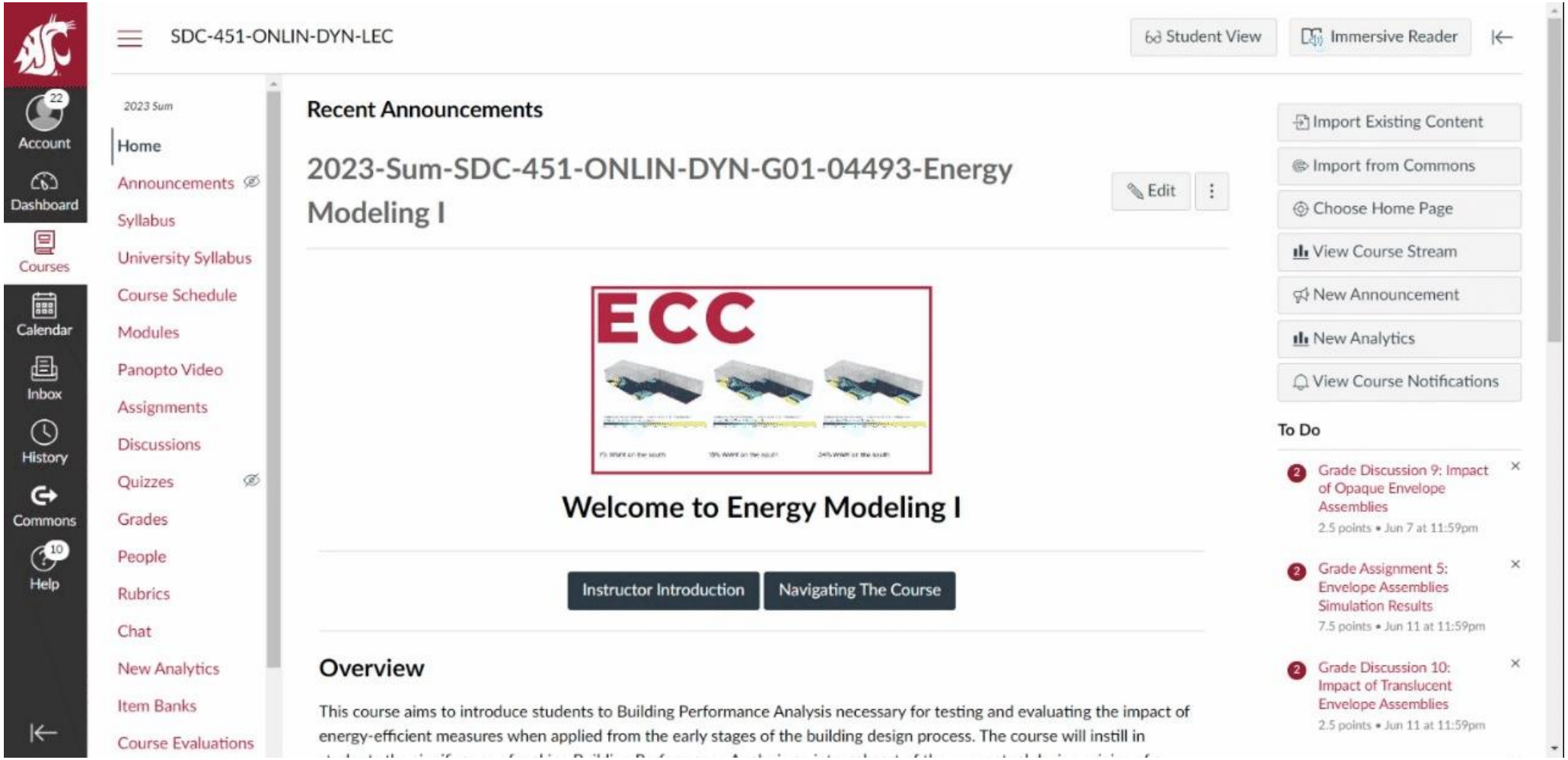

Environmental Cont. Sys.

Performance Benchmarks

YOU can design and create an energy-efficient built environment using the knowledge and skills the ECC provides.

Promotion material

Promotion material



Energy Conscious Construction (ECC) Certificate Programs

- The undergraduate + graduate certificates were awarded the Zero Energy Design Designation from the U.S. Department of Energy in Summer of 2023.
- Nationally, the ECC certificates are only one of two certificate programs with this designation and potentially the only certificate program that is fully online, and asynchronous.

ECC courses delivered to date

Course no.	Course name	Faculty	Semester	In-person	Online	
ARCH493	Environmental Control Systems I	Al-Hassawi	Sp 23	0	7	
ARCH531	Envelope Assemblies	Drake	Sp 23	30	0	
SDC441/541	Energy Codes, Standards, Rating Systems	Jones (Extension)	Su 23	0	4	
SDC451/551	Energy Modeling I	Al-Hassawi	Su 23	0	3	
SDC452/552	Energy Modeling II	Al-Hassawi	Su 23	0	4	
ME483	Fundamentals of Building Science	McLarty (Mechanical Engineering)	Su 23	0	5	
ARCH464	Advanced Residential Construction	Smith (University of Arizona)	Fa 23	0	8	
ARCH493	Environmental Control Systems I	Al-Hassawi	Sp 24	0	17	
ARCH 495	Modular Off-Site Construction	Smith (University of Arizona)	Sp 24	0	6	
ARCH531	Envelope Assemblies	Drake	Sp 24	26	0	
				56	**54**	
					110	

Successes and Challenges

Successes:

- One student earned the undergraduate certificate.
- Two students are earning the graduate certificate this summer.
- Five courses are offered this summer (four returning and one new).

Challenges:

- Breaking even and supporting teaching faculty.
- Increasing enrollment numbers per course.
- Hands-on experiences in fully-online courses.
- Completing course content for courses as well as for professionals.

Thank you! Questions?

For further details, please refer to this website

Effective Energy Code Training in Texas and OK

Randy Plumlee

Energy Code Program Manager for SPEER

Covering Texas and Oklahoma

2024 National Energy Codes Conference

SPEER

The South-central Partnership for Energy Efficiency as a Resource

Brief Background and Experience

- Obtained an A.A.S. in Residential Building Performance
- Certified as IECC-R, HERS, BPI, LEED-GR, NGBS
- 10 years with one of the largest 3rd party verifiers in Texas
- Managed a Team of energy inspectors that covered DFW, Houston, and Austin
- Trainings included IECC-R, RESNET HERS and RFI, Energy Star, NGBS, and LEED-Homes
- Focus trainings around building science principles and consistency
- **Fun Fact:** Was part of the Field Inspection Team on the first residential LEED-Homes project outside of the United States – the Msheireb Downtown Doha project in Qatar

SPEER

The South-central Partnership for Energy Efficiency as a Resource

Covering Texas and Oklahoma

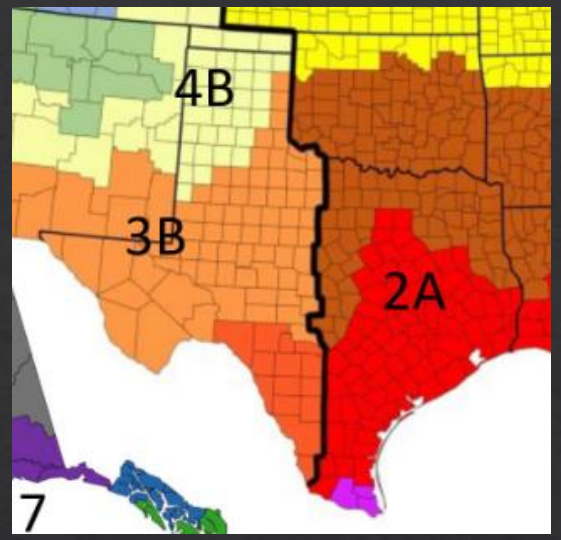
- Both Texas and Oklahoma are home-rule states
- Texas is very much the wild west with very little consistency between cities with adoption and amendments
- Oklahoma has the Oklahoma Uniform Building Code Commission (OUBCC)
  - Reviews, amends and adopts building codes for Oklahoma
  - Cities have the authority to adopt newer codes, but currently all are equal to OUBCC adopted code of an amended 2018 – weakening to 2009 levels

SPEER

The South-central Partnership for Energy Efficiency as a Resource

Energy Code for 10 Largest Texas Cities

- Houston – 2021 w/ 2024 electrification and EV amendments
- San Antonio – 2021 w/ amendments
- Dallas – 2021 w/ amendments
- Austin – 2021 w/ amendments
- Ft. Worth – 2015
- El Paso – 2021 w/ weakening amendments
- Arlington – 2021
- Corpus Christi – 2015
- Plano – 2021 w/ amendments
- Laredo – 2018 IRC w/ deleted Chapter 11



SPEER

The South-central Partnership for Energy Efficiency as a Resource

Focus of our Trainings

- **Webinars** – 51 – over 2100 attendees
- **In-Person** – 53 – over 5200 attendees
  - Over last 2 years

- **Who's our Audience**
  - 42% City Building Officials or Staff
  - 48% 3rd Party Verifiers and Energy Inspectors
  - 10% Contractors including Insulation, Air sealing, and HVAC Techs
  - Additional trainings for developers, architectural firms, real estate inspectors

SPEER

The South-central Partnership for Energy Efficiency as a Resource

Focus of our Trainings

- **Topics Include:**
  - Building Science principles
  - 2021 IECC Significant Changes
  - Understanding the different pathways thru code
  - HVAC Energy Code requirements including Manual J and S
  - Proper ductwork design and installation practices
  - Mechanical Ventilation requirements and Testing requirements
  - Indoor Air Quality (IAQ)
  - Difference between code and above code inspections and the scope of work for each
  - Energy Star checklists and field verification
  - Air Sealing techniques and field verification
  - Heat pump Technologies
- **Choice of Topic depends on the Audience**

Challenges with our Trainings

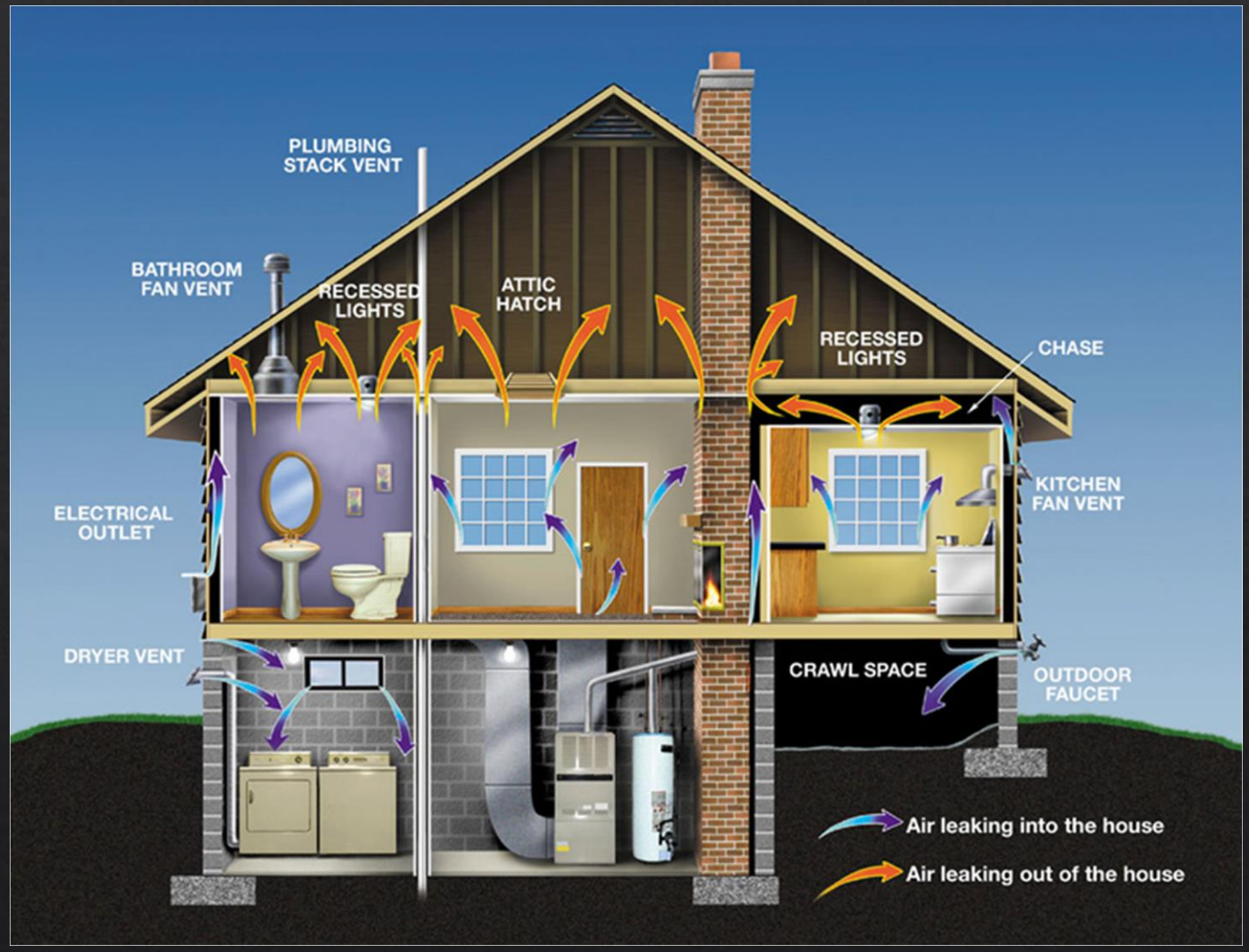
- Questions of Why and How does any of this make sense –
  - "Houses need to breath!"
  - "This is getting too complicated"
- Push back from city councils, builders, contractors, and trade associations
- Lack of enforcement due to it not being a health and safety concern – view changes after trainings
- Lack of understanding in the scope of work between city and 3rd party verifiers
- Not viewing the 3rd party verifiers as contractors – requiring registration, verification of active certifications, holding correct amounts of liability insurance
- Collecting half of the equation for HVAC – Manual J but not S – **Explain the importance of both**
- "We just do whatever X does" – X being the closest major city or OUBCC
- How to overcome objections – **Case studies, show how it can be a health and safety issue, go down the rabbit holes**

SPEER

The South-central Partnership for Energy Efficiency as a Resource

Weatherization Training

- Train existing weatherization crews on the principles of building science
- Energy code basics
- HVAC installation best practices
- Mechanical ventilation
- Combustible appliance zone training
- Understand the why not just the how
- Help them better understand the importance of what they do
- Ensure they are aware “improvements” can create a health and safety issue



Assemble the Team

- Reaching out to 3rd party verifiers for coverage
  - Getting them involved with cities and builders
- Work with HVAC contractors to understand energy code requirements and what's being tested
- Include plan reviewers on energy code training and compliance software reports
- Assist community colleges with course curriculum based on building science

SPEER
The South-central Partnership for Energy Efficiency as a Resource

Building a Green Workforce: Training for Tomorrow's Energy Code Compliance

Randy Plumlee

rplumlee@eepartnership.org

www.eepartnership.org

Energy Efficiency as a Resource – YouTube

SPEER

The South-central Partnership for Energy Efficiency as a Resource

Questions

Thank you

Contact

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Ian.blanding@ee.doe.gov

Building Energy Codes Program

https://www.energycodes.gov/