Energy & Store Development Conference

E+SD 2013

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THE VOICE OF FOOD RETAIL

Energy & Store Development Conference

E+SD 2013

ENERGY TRENDS

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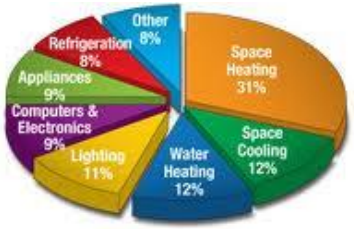
AGENDA

- Building Codes
- Energy Consumption
- Potential Code Changes
- Efficiency and System Trends
- Trends in Europe
- Europe Transition Plan & Why?
- Business Case
- How to get involved
- Q&A



BUILDING CODES

- Rules that specify the minimum standard intended to protect the public health and safety
  - Standards for structure, Fire code, requirements for earthquake, hurricane, flood, and tsunami resistance, minimum and maximum room and exit sizes and location
  - Energy provisions and consumption
  - Specifications on components

BUILDING CODES (cont.)

•The regulation of building construction and systems used have become increasingly important because of the environmental (*greenhouse effect*) , economical (*health/productivity*), social (*corporate responsibility*) and financial (*millennials*) ramifications.

•Codes do not have to be government standards. Proactive approach and optimizing use of technology is much more powerful and enforceable than any government codes.

Typical Adoption Process, State and Local

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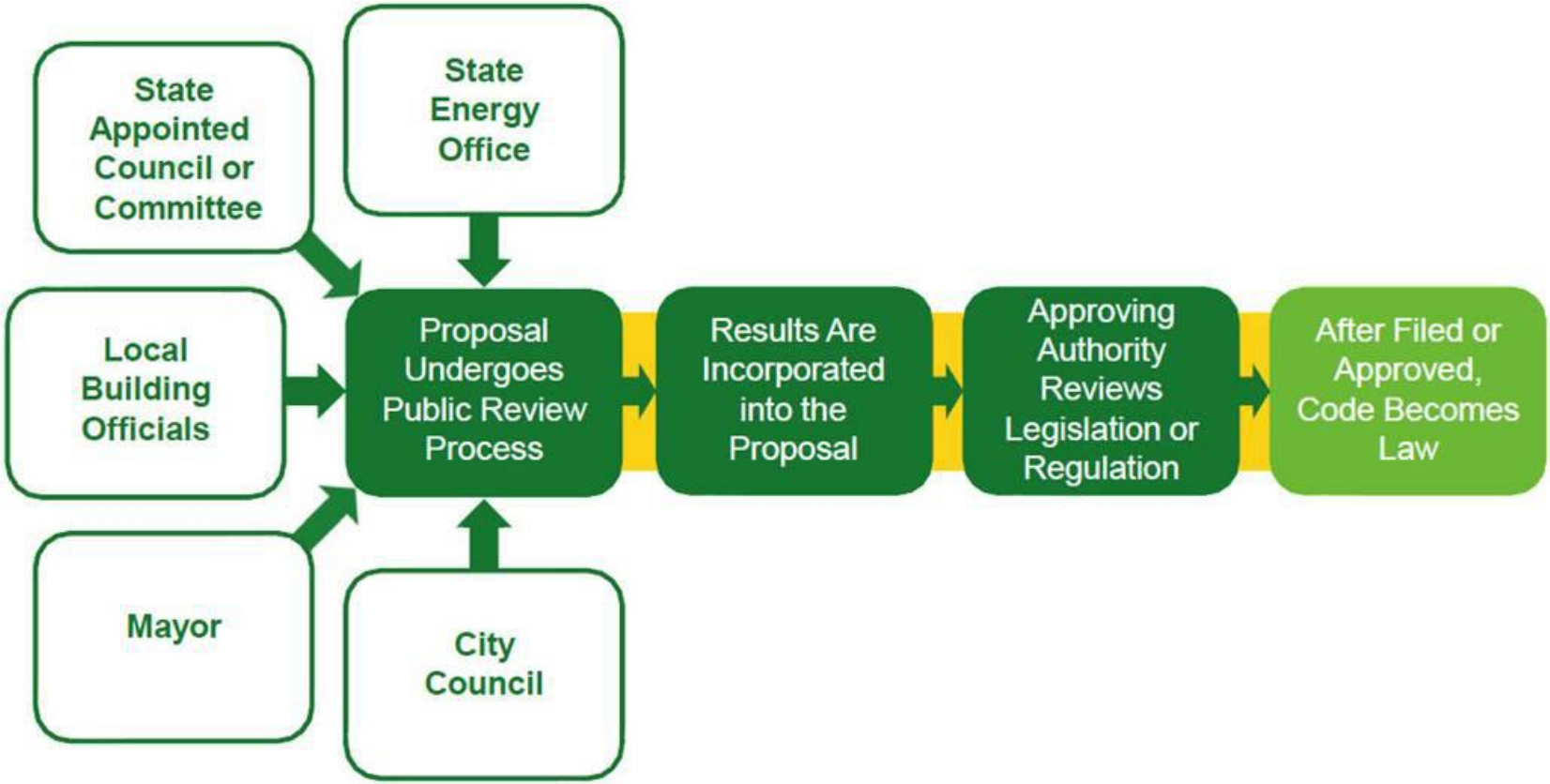


EXAMPLE OF RECENT CODE REVISIONS

Life Safety

•The width factor reduction for stairs and other egress components includes requirements for both fully sprinklered and *emergency voice/alarm systems* in the building.

•Hazardous Exhaust: Fire and smoke dampers prohibited in hazardous exhaust.

- Ducts (e.g. Laboratory exhaust).

EXAMPLE OF RECENT CODE REVISIONS (cont.)

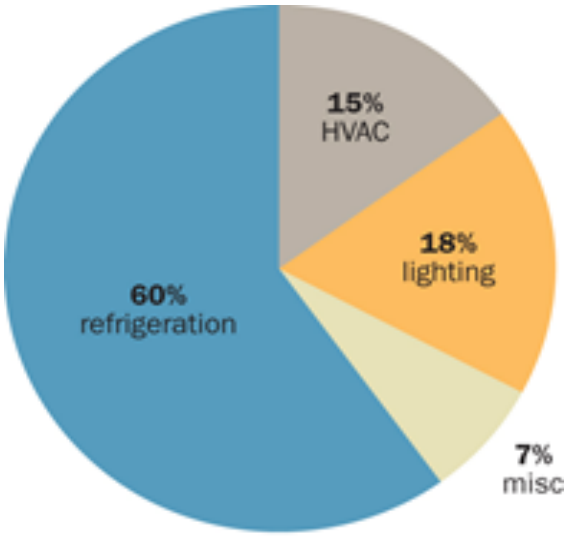
Environmental

- Radioactive waste
- Fossil fuel emissions

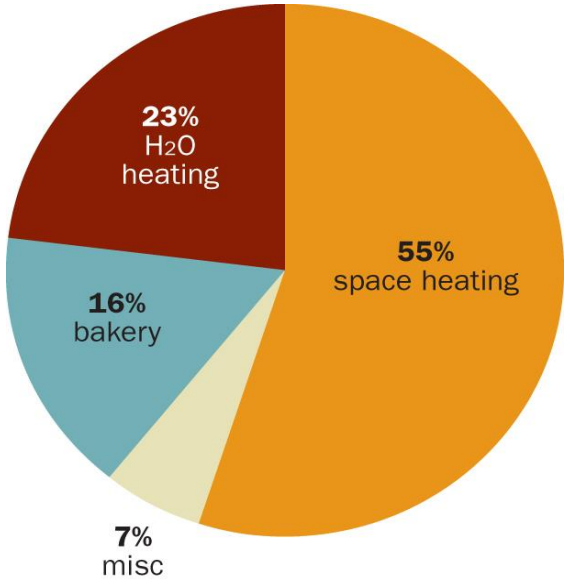
Energy

- New T24 will take effect in January 1, 2014.
- Skylights : U-factor and SHGC more stringent
- Use of photocells in tandem with time clocks

TYPICAL ENERGY CONSUMPTION



Grocery - Electric



Grocery - Natural Gas

- Compressors and condensers account for 60-70% of refrigeration energy consumption.
- 25 percent of which is wasted through controllable inefficiencies!

EXAMPLE OF POTENTIAL CODE CHANGES

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- **ASHRAE Standard 90.1** in various editions is the standard.(current energy code reference in IBC and IECC) The most current is ASHRAE Standard 90.1-2010 with the 2012 addendums.

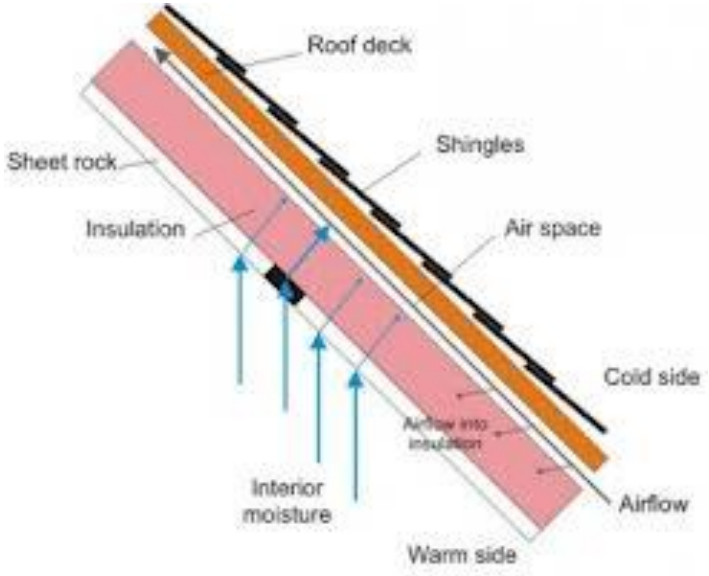
- **Air side energy recovery** is required based upon climate zones and the amount of supply air from the air handling systems. This excludes outside air required for kitchen exhaust hood makeup. The minimum recovery efficiency is ***50%*** change in the difference between the outside air and the systems return air.

EXAMPLE OF POTENTIAL CODE CHANGES (cont.)

- **Building pressurization control** via differential pressure sensors (using outside as the RP) to maintain positive building pressure while maintaining the required amount of outside for proper ventilation. Pressure sensors to be a part of determining control the systems' outside air dampers sequence of operation.

GIANT EAGLE EXAMPLE OF CODE COMPLIANCE

- Recent building energy performance has made us change how we design and construct our buildings. Higher R value for the roof to maintain the aesthetic appearance of the building shell.



- **Equipment efficiencies:**
  - *Food Casework:*

- Standard 90.1-2010 with Addendum g (2012) now prescribes minimum energy efficiencies for commercial refrigeration include open and closed casework. It limits the energy usage in kWh per day for various casework types based upon volume or total display area of the case. Previously, this standard did not include refrigeration casework and related equipment.

- *HVAC equipment:*

- The 90.1-2010 and the 2012 amendments include increased efficiencies based upon the type of equipment and the capacities. These efficiencies are too numerous to list here. (See hand-out).

EFFICIENCY & SYSTEMS TRENDS (cont.)

Reduction of energy usage (not energy cost) by 30% over ASHRAE 90.1-2010 baseline buildings. The Federal Government has been mandating between 30% and 40% by executive order for Federal buildings.

•**Energy recovery** in almost all building designs by using the following:

- *Water side heat recovery – using refrigeration system heat rejection to heat the spaces, generate heating water.*
- *Air side using total energy recovery systems.*

EFFICIENCY & SYSTEMS TRENDS (cont.)

- **Energy usage reduction** employing various forms of the following:
  - *Reduction of HVAC equipment sizes by 50%.*
- **Air side energy recovery** as mentioned above.
- **Control of space ventilation** to meet exhaust requirements and actual occupancy ventilation requirements based upon CO2 monitoring.

EFFICIENCY & SYSTEMS TRENDS (cont.)

- **Use of fully conditioned make-up** for kitchen hood exhaust systems by taking advantage of the Hood manufacturer's UL listing and right sizing for the actual equipment beneath the hood.

- **"Sharing or moving"** of heat via water based system from the food refrigeration system to the HVAC refrigeration systems. Employing water to air heat-pump systems.

- **Consider water-based heat rejection** systems versus air-cooled for higher operational efficiencies in both HVAC and refrigeration systems.

EFFICIENCY & SYSTEMS TRENDS (cont.)

- Min. efficiency for condensers (Scroll Technology/Variable Speed)

- More Focus on compressor standards for seasonal efficiency and continuous capacity modulation

(condensing temp of 25° C has been used to represent average operating conditions in Northern Europe, and 30° C for Southern Europe)

Cycle time: 20 sec Valve active/open: 12 sec Valve inactive/ closed: 8 sec Resulting capacity: 40%

EMERSON Climate Technologies

CAPACITY MODULATION

- Easy modulation for precise temperature control
- Lower energy consumption
- Load matching and modulation from 10–100%
- Economical and reliable alternative to VFDs

North America

Europe

Net Zero 2030

Asia Pacific

Elsewhere (More Time!)

ALL Roads Lead To Rome

TRENDS IN EUROPE

	European Union	North America
•Smaller Format	6,000 sq. ft.	18,000-2,000
•Superstore	50,000 sq. ft.	75,000

•Focus on:

- Higher Efficiency
- Lower Environmental Impact
- Lower Operational Cost = Higher Profits
- Increase Use of Technology
- High Greenhouse Tax (especially on R404A)
- Reduced Refrigerant Charge
- More Urban Stores, Short-Term
- Small Urban Stores, Long-Term (OL)

Next 5 Years

- Fluorinated Gas regulations continues. Goal to reduce F-gas emissions by 65% by 2030.
- Ban on HFCs in hermetically sealed commercial refrigeration.
- R404A no longer considered for new system designs.

2018-2020 & Beyond

- Move toward Refrigerants with very low GWP.
- New Store and remodeled to be HFC free.
- Ban on use of HFC in all commercial refrigeration equipment.
- Implement energy / refrigeration saving measures on all open case coolers/ freezers (doors).

EUROPEAN REFRIGERANT TRANSITION PLAN

R404A **Most common, non-toxic, zero ODP, HGWP**

R407A **Now (in transition), Low GWP**

R134a

CO2 **Now (in transition), Naturals**

R290 **And Future**

HFO Blend **Future (2020+), Naturals**

(Zero ozone depletion potential and meet EU regulatory requirements requiring gases with GWPs lower than 150.)

EUROPEAN REFRIGERANT TRANSITION PLAN (cont.)

Past → **Present** → **Future**

Std HFC → **LGWP HFC/Natural** → **HFO Blend**

Central & Dist/DX Systems

+ →

Self-Contained
Cascade Booster →

+ Secondary
Integral Heat/Cold Store

EUROPEAN REFRIGERANT TRANSITION PLAN (cont.)

R290 is the common name for 98% pure propane

Pros of R290

- Zero ODP
- Very low GWP
- Excellent thermodynamic properties leading to high energy efficiency
- Good compatibility with system components
- Low charges allowing smaller heat exchangers and piping dimensions

Cons of R290

- Extremely flammable

Drivers for Refrigeration Trends

- Future government pressure and legislation
- Higher tax and penalties (e.g. Denmark & Norway impose a high greenhouse gas tax on all refrigerants)
- F-gas regulations continue to tighten, hence the need to act
- Regional incentives, and climate leading to regional conclusions
- Energy efficiency & cost
- Food waste and temperature integrity

•Natural refrigerant-based technologies is continuously increasing in most of Europe's refrigeration, heating and cooling sectors

•More manufacturers and commercial end-users are turning to HFC-free systems using ammonia, carbon dioxide, hydrocarbons, water or even air.

A deliberate policy signals in form of phase-out schedules, tax and credit systems, or financial support schemes would significantly accelerate the uptake of such systems.

ATMOsphere Europe 2012

BUSINESS CASE

- Higher capital cost
- More time to adopt
- Better & more comfortable work environment
- Better shopping experience
- Lower operating cost
- Lower foot-carbon

Ultimately change will happen and better be prepared!

GETTING INVOLVED

Model Codes & Standards

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Title	Type	Applicability	Common Versions
International Energy Conservation Code (IECC)	Model Energy Code	Residential & commercial buildings; mandatory, enforceable language	2003 IECC 2006 IECC 2009 IECC
ASHRAE Standard 90.1 Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings	Energy Standard	All buildings except residential 3 stories or less	90.1-2004 90.1-2007

IECC Code Process

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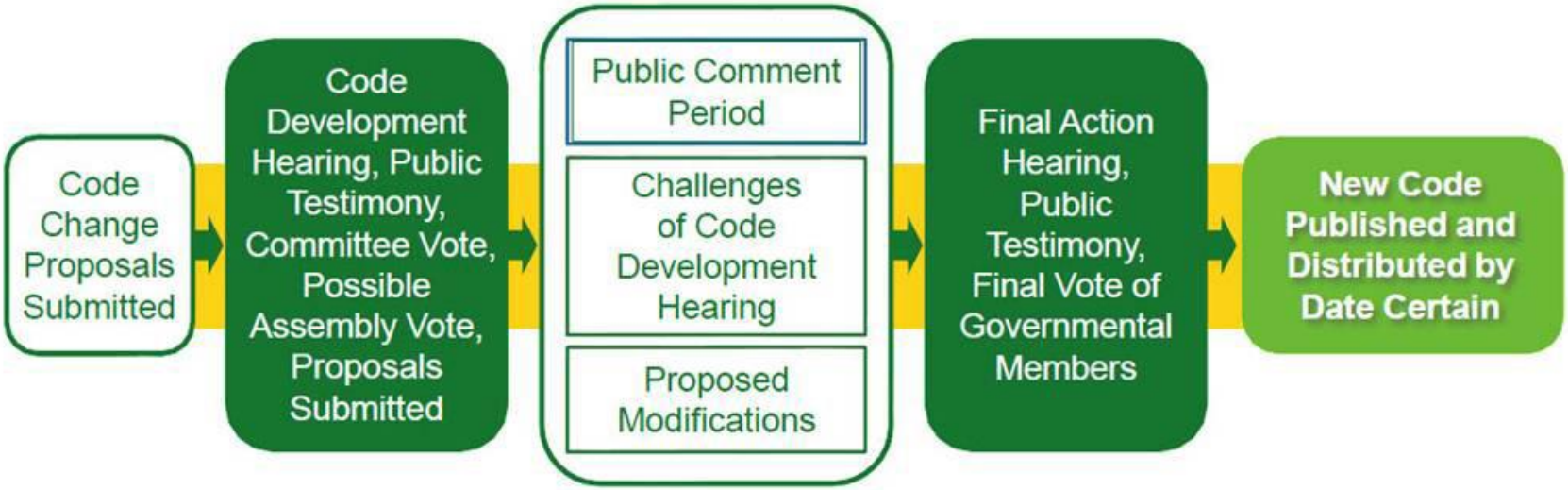

ASHRAE 90.1 Process

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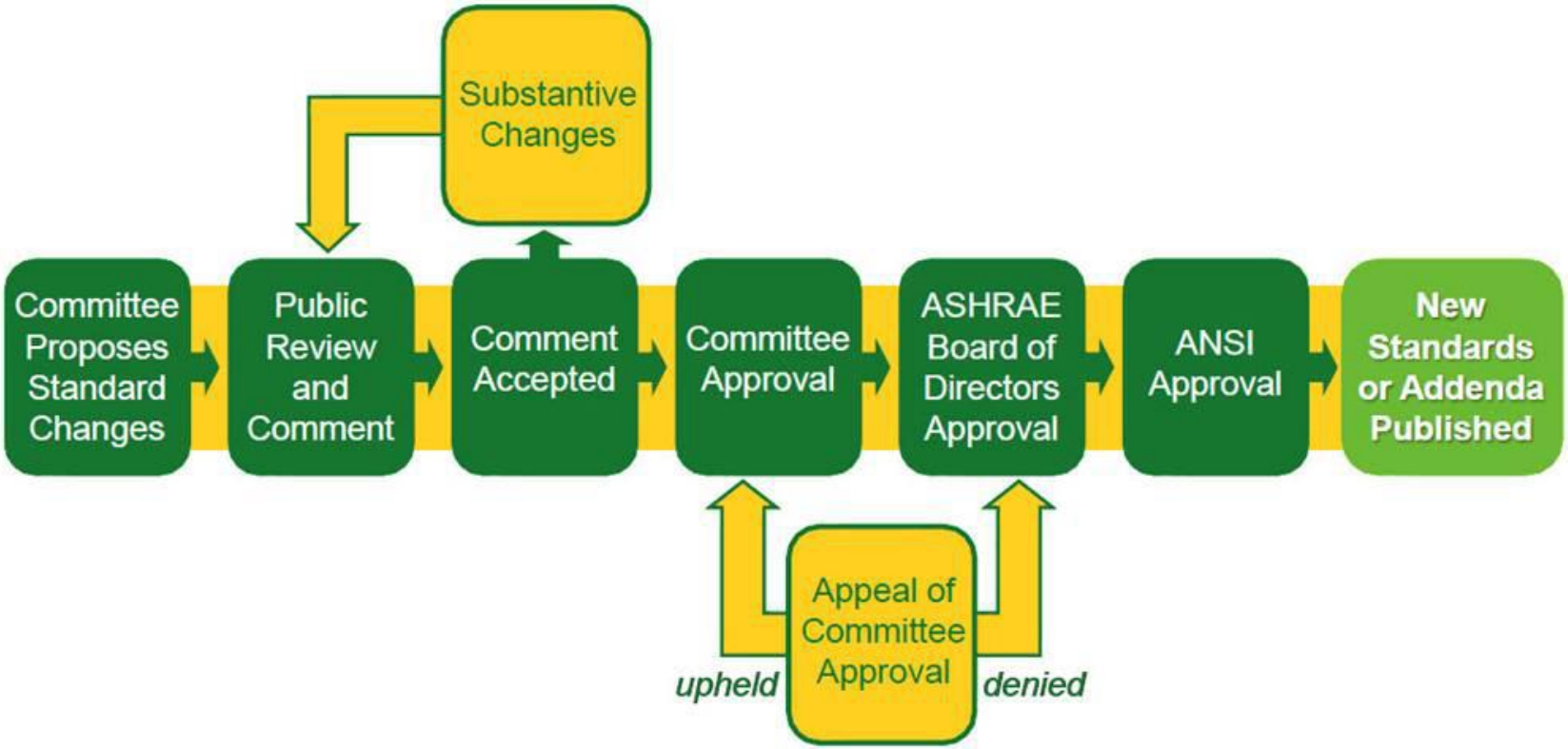

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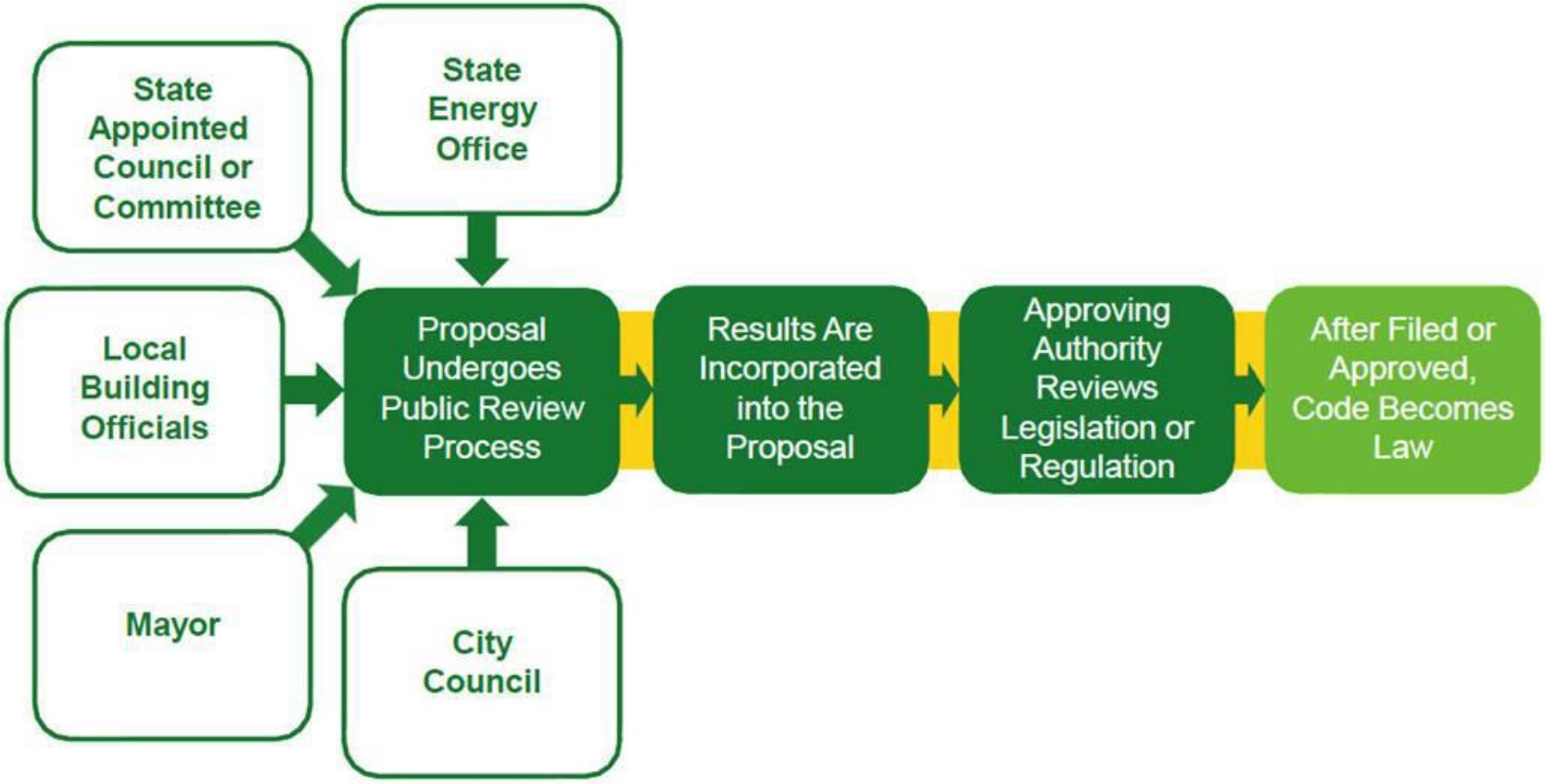

QUESTIONS?

THANK YOU!