Cayman Islands Residential Building Energy Efficiency Programme

Building Energy Efficiency into Residential Homes

March 2025

ECONOLER

Cayman Islands Government

Ministry of Sustainability & Climate Resiliency

Energy Efficiency in Residential Construction

Training for Developers, Builders, Architects & Suppliers

Energy Efficiency in Residential Construction: Context

- The Cayman Islands Government Ministry of Sustainability & Climate Resiliency and Wellness (Ministry) received a grant from the European Union under their Resilience, Sustainable Energy and Marine Biodiversity (RESEMBID) Programme to implement a Residential Building Energy Efficiency Programme that is intended to reduce energy consumption in the residential sector of the Cayman Islands.
- The Ministry contracted Econoler to develop guidelines to support and ensure the effective implementation of EE measures in the residential sector.
- The Guidelines have now been finalized as well as a homeowner infographic to support an awareness campaign on EE in residential sector.

Econoler team

The Econoler team includes **energy efficiency experts** with complementary expertise and knowledge, and who have worked extensively in the English Caribbean and are aware of the challenges faced by small island nations, especially in the energy sector. The team has worked closely with the Ministry of Sustainability & Climate Resiliency and Wellness and several stakeholders to develop the Energy Efficiency Guidelines for Residential Construction, as well as this training session.

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About This Training: Content

- This training is intended to introduce you to the **Energy Efficiency Guidelines for Residential Construction** document developed by Cayman Islands' Ministry of Sustainability & Climate Resiliency and Wellness.
- Examples and case studies presented reflect the local conditions or similar situations.
- We have set aside the last part of the session for discussion and Q&A. Please stop and ask if something is not clear, or you can bring it up during the Q&A.
- This training presents the key principles, standards, and technologies that contribute to energy efficient, sustainable building design, with a particular focus on the Cayman Islands' climate, regulations, and construction challenges.

About This Training: Objectives

- The first part of the training focused on.
  - How to incorporate energy-efficient materials, HVAC systems, insulation, fenestration, and renewable energy solutions into their residential sector **new construction and retrofit** projects
  - The CARICOM Regional Energy Efficiency Building Code (**CREEBC**)
- In this second part of the training, participants will:
  - Understand energy performance standards and labelling.
  - Interpret the information communicated in different labels
  - Use this information to better inform customers

About This Training:

A few things to keep in mind:

- You do not need to remember everything we covered in the training today, just the concepts.
- The Guidelines document has all the details, and it is available from the Ministry’s website:

  https://www.gov.ky/energy/programmes/-energy-efficiency-guidelines-training-

- The training materials (PowerPoint and recording) will be available in electronic form after the training on the Ministry’s website.
- At the end, please fill out the post-training evaluation form.

Training content is aligned with the Guidelines

1. Introduction to Energy Efficient Standards and Labeling

2. Sourcing and selecting energy efficient, green, and sustainable equipment and appliances.

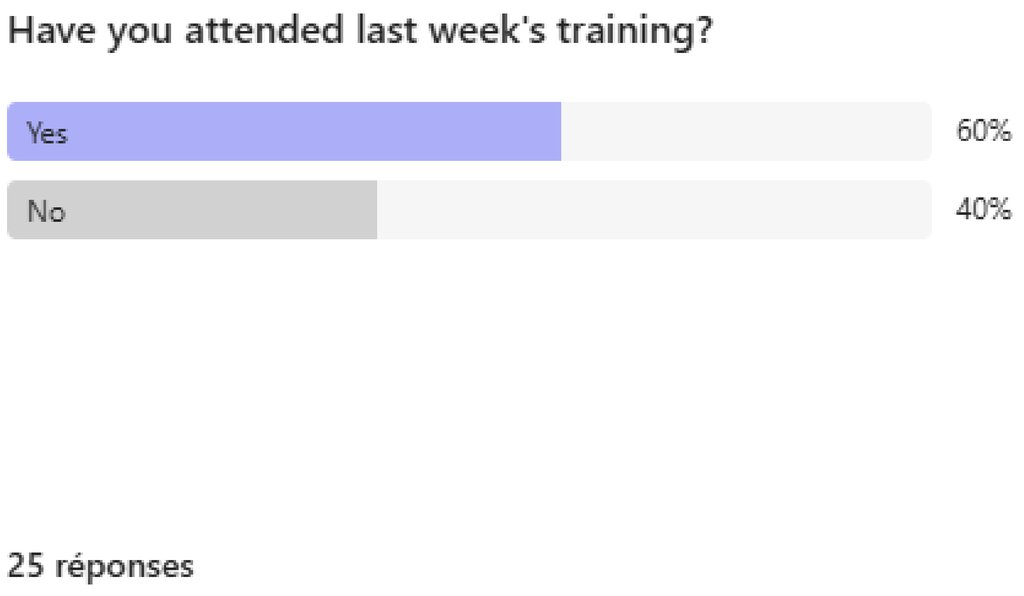
3. Customer services

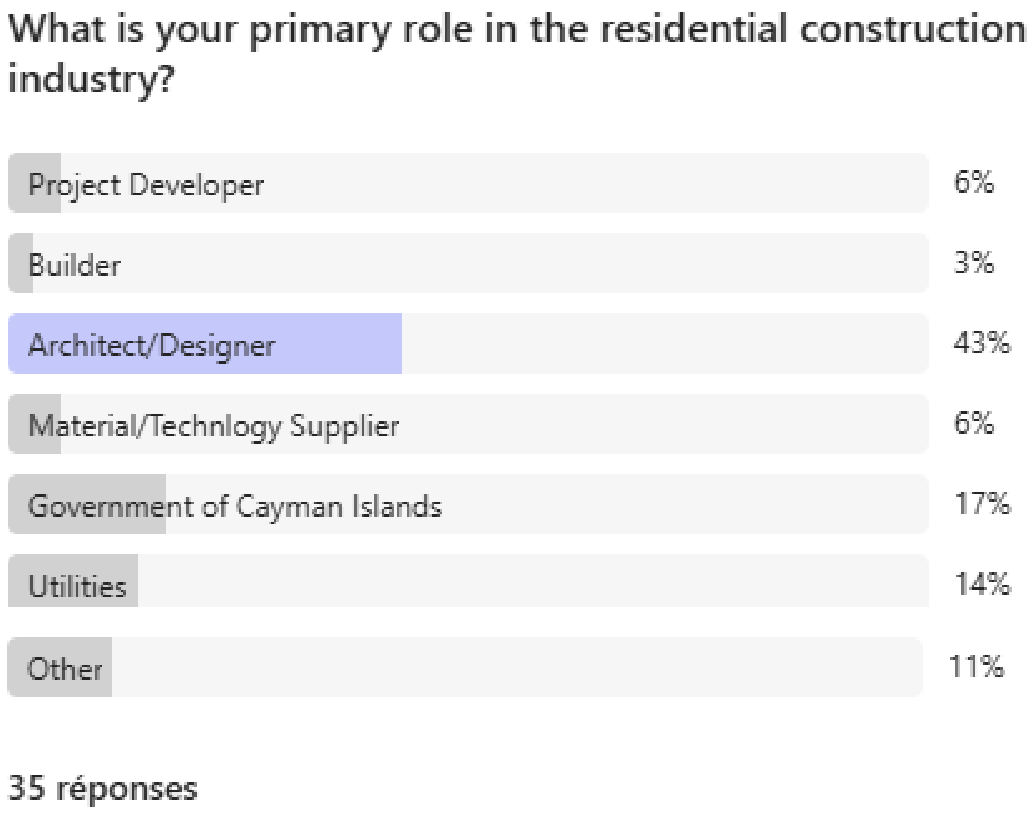
   - How to “speak energy efficiency” to your customers
   - Supporting customers in the selection and sizing of air conditioning systems (SEER, other indicators)

4. Interactive Session: Case Studies Q&A, Wrap up

   - Reviewing real-world applications of energy-efficient labels
   - Group discussion on overcoming challenges in implementation

Background of participants





Introduction to Energy Efficient Standards and Labeling

Overview of Energy Efficiency Standards and Labels

- Globally, minimum energy performance standards (MEPS) and labeling for lighting products and appliances have proven to be effective at improving equipment efficiency and increasing consumer adoption (market transformation).

  - ✓ Minimum Energy Performance Standards (MEPS): Government **regulations** establishing the **minimum level of energy efficiency** an appliance or equipment must meet before it can be sold or used commercially.
  - ✓ Energy Efficient Product Labeling: Refers to a system where a **visible label** is attached to a product, indicating its **level of energy efficiency**, allowing consumers to identify and choose products, usually signified by a recognizable symbol or a categorical label that allows consumers to compare the energy characteristics of similar products.

Overview of Energy Efficiency Standards and Labels

- MEPS, Labels – How do they work?

  ✓ MEPS and Standards focus on the "floor" of the market by eliminating the worst performing products in terms of energy performance.

  ✓ Labels focus on "pulling" the market by increasing awareness and promoting more efficient products available

  Source: EU, 2020

Figure 5. Benefits of standards and labels for product energy efficiency[7]

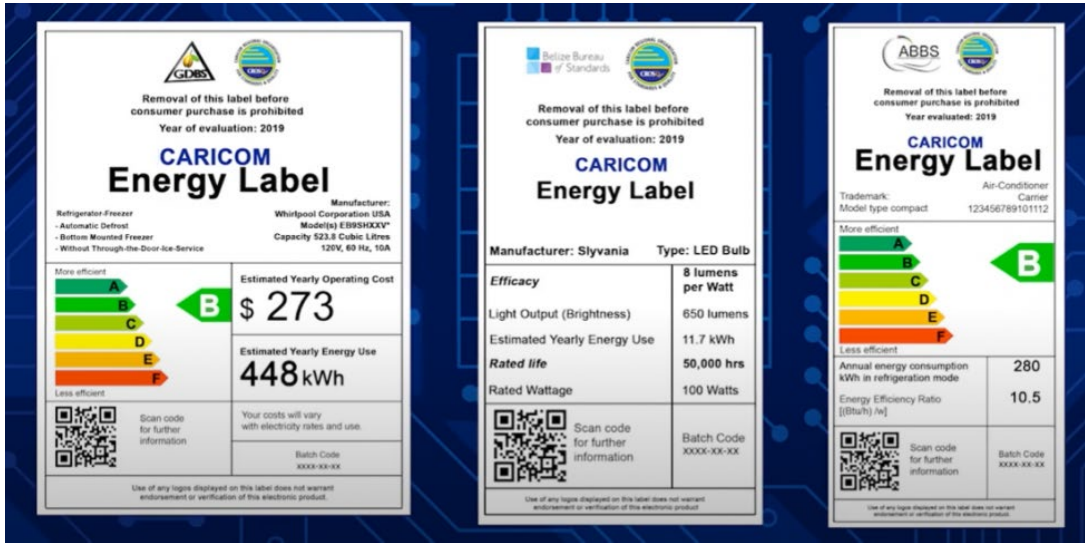
Overview of Energy Efficiency Standards and Labels

- MEPS and labeling programs are implemented to achieve several key Government and Societal objectives:

  - ✓ **Energy Efficiency Improvement**: MEPS ensures that only energy-efficient appliances and equipment are available in the market, reducing overall energy consumption.
  - ✓ **Consumer Awareness**: Product labeling programs help consumers with clear information about energy consumption, leading to informed purchasing decisions.
  - ✓ **Environmental Benefits**: These programs reduce greenhouse gas emissions and environmental impact.
  - ✓ **Economic Savings**: Households and businesses benefit from lower electricity costs by adopting energy-efficient appliances.

Energy and Sustainability Labels in Different Jurisdictions: The Caribbean

- The CARICOM Regional Energy Efficiency Labelling Scheme was developed by the CARICOM Regional Organisation for Standards and Quality (CROSQ):
  - ✓ The scheme is based on the implementation of minimum energy performance standards and labelling requirements for light bulbs, refrigerators, and air conditioners.
  - ✓ It is based on the EU label format.



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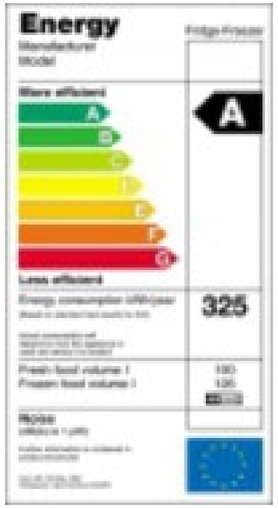
Energy and Sustainability Labels in Different Jurisdictions: The EU

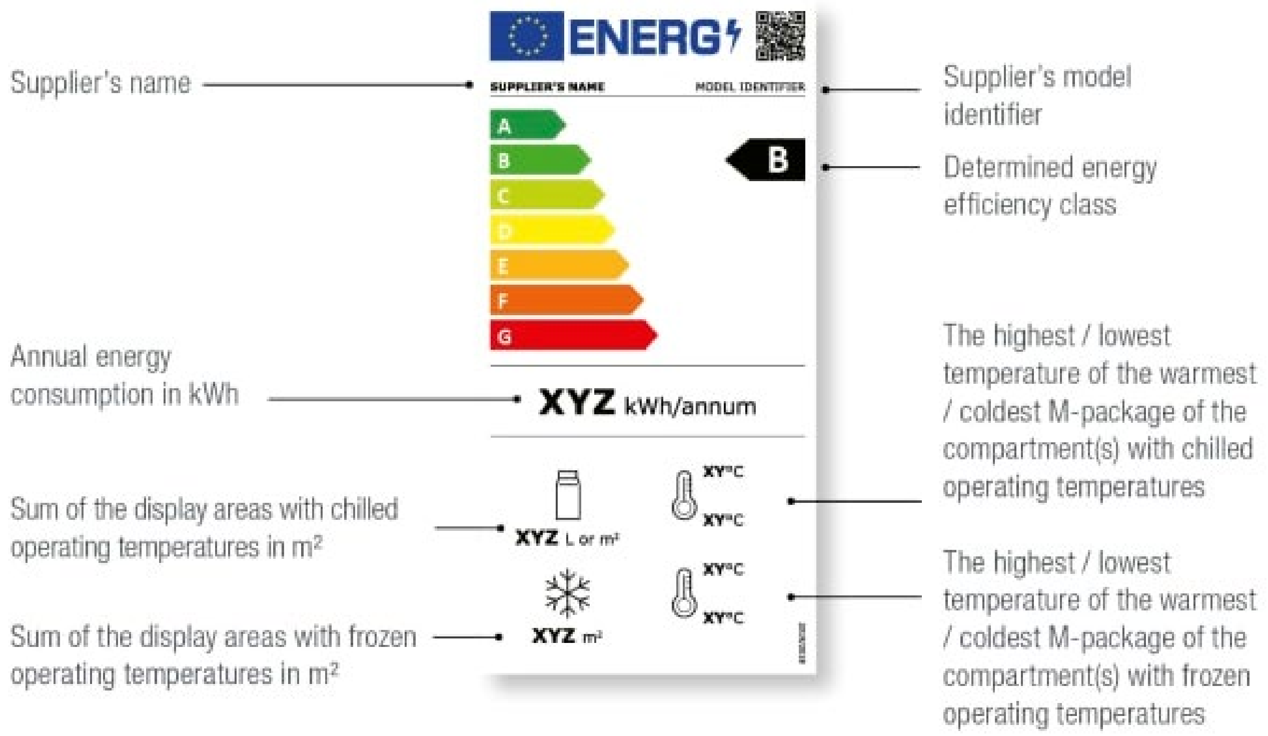
- By law, the European Community Energy Label must be displayed on all new household products displayed for sale, hire or hire-purchase



  - ✓ The label applies to the following types of household appliances: refrigerators, freezers and their combinations; washing machines, dryers and their combinations; dishwashers; ovens; water heaters and hot-water appliances; lighting; air-conditioning appliances.
  - ✓ Household appliances offered for sale, hire or hire-purchase must be accompanied by a label providing information relating to their consumption of energy or of other essential resources.
  - ✓ Products are generally rated from ‘A’ to ’G’, with ‘A’ being the most efficient

Energy and Sustainability Labels in Different Jurisdictions: The EU

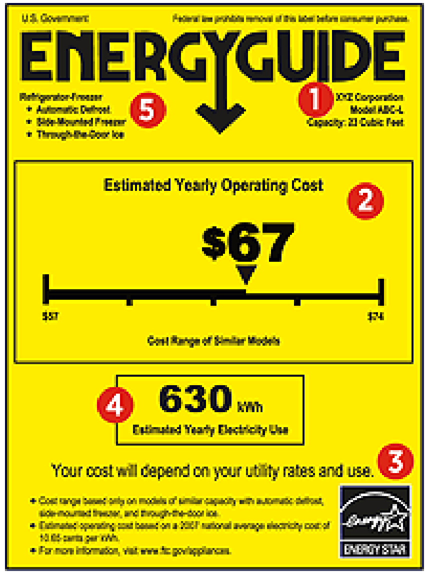
- How to read the European Community Energy Label:



Energy and Sustainability Labels in Different Jurisdictions: North America

- EnergyGuide Label: Is the most commonly used label in the US, Canada, and Mexico

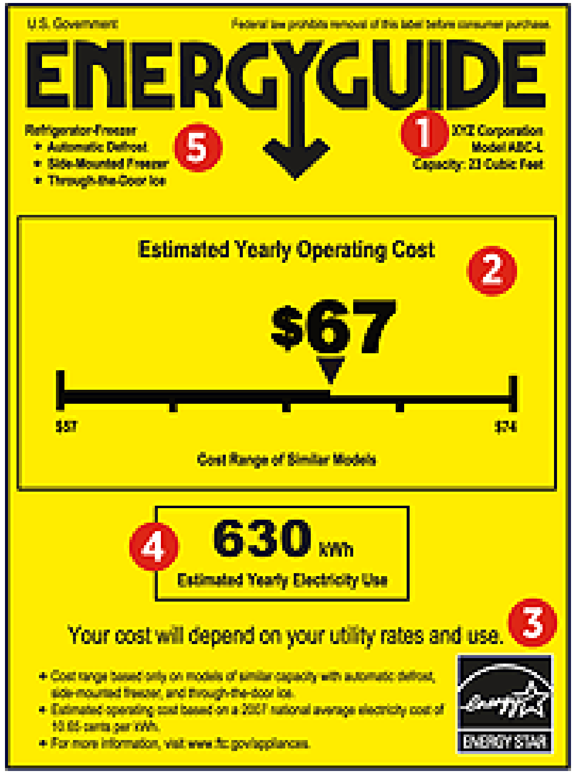
  - ✓ Required for all consumer appliances in North America
  - ✓ Do not show which appliance is the most efficient on the market.
  - ✓ They show the annual energy consumption and operating cost for each appliance.
  - ✓ Consumers can use the information to compare similar appliance choices.



Energy and Sustainability Labels in Different Jurisdictions: North America

- How to read the EnergyGuide Label:

1. Maker, model number, and size of the appliance.
2. Estimated yearly operating cost and the range of operating costs for similar models.
3. The ENERGY STAR® logo indicates that this model meets strict energy efficiency criteria.
4. Estimated yearly electricity consumption.
5. Key features of the appliance and similar models that make up the cost comparison range.



Energy and Sustainability Labels in Different Jurisdictions: North America

- The Energy Star Label: It is considered the most widely recognized ecolabel for energy-efficient products.

  ✓ Helps consumers identify products that use less energy, contributing to environmental protection.

  ✓ It is managed by the US Environmental Protection Agency (EPA)

  ✓ Signifies that a product meets specific standards for energy efficiency.

Energy and Sustainability Labels in Different Jurisdictions: North America

- How to read the EnergyStar Label:

Energy and Sustainability Labels in Different Jurisdictions: USA

- The WaterSense Label: It is currently the only ecolabel for water-efficient products.

  - ✓ The WaterSense label is a certification mark that indicates a product, home, or program is water-efficient.
  - ✓ It is managed by the US Environmental Protection Agency (EPA) in the USA
  - ✓ Categories covered: Toilets, bathroom faucets and accessories, flushing urinals, shower heads, new homes, and irrigation systems

Appliance Labeling:

- An energy-labeling program is designed to encourage consumer awareness and choice in the purchase of an energy-using product or appliance.

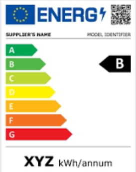
✓ It is intended to shift the market toward greater energy efficiency

✓ From a consumer's perspective, the energy label is the most important and obvious element of the program, but the label that appears on a product is only a small part of an elaborate infrastructure.

Appliance Labeling:

- A labeling program involves several key factors:

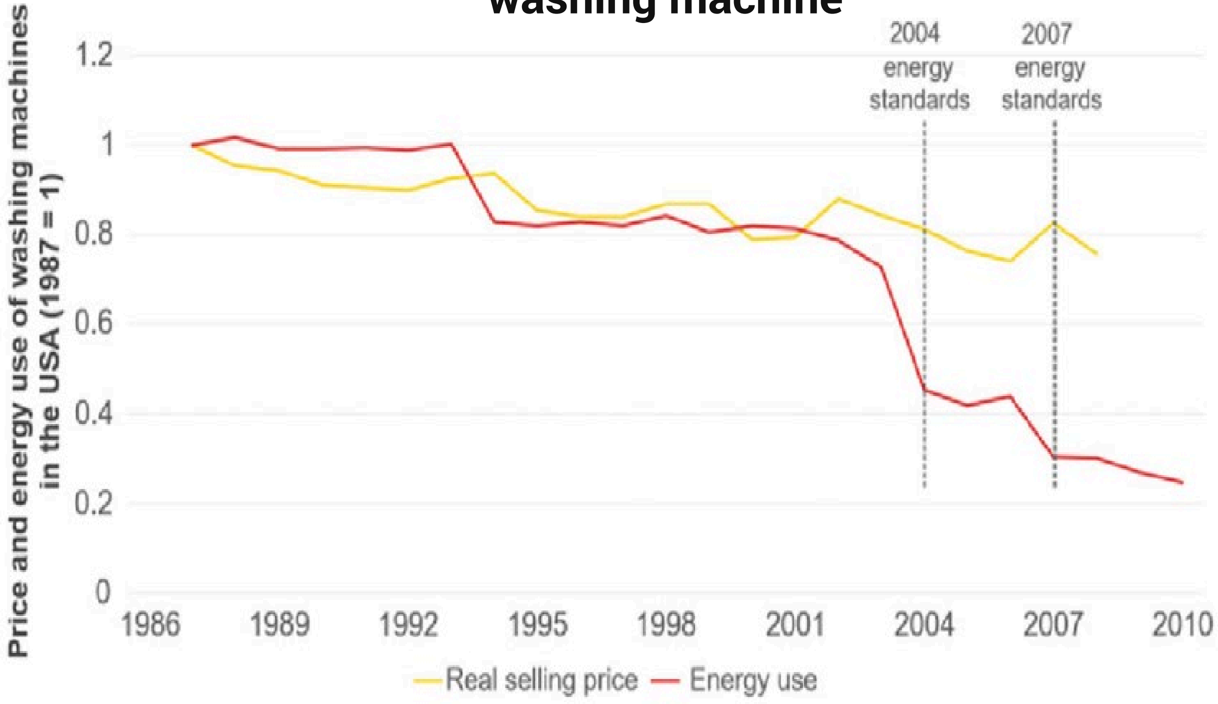
  - ✓ Products covered by the program
  - ✓ Mandatory or voluntary labeling
  - ✓ Endorsement or comparative approach

Label Type	Example	Purpose
Endorsement	Energy Star	Indicates that product is among the most energy-efficient models available on the market.
Comparative	EU 	Shows the relative energy use of a product compared to other models available on the market.

The concept of setting performance standards for appliances was introduced in the US as one of the responses to unprecedented fluctuations and uncertainty in energy supplies and energy prices as well as to better deal with growth in demand.

The development of many of the frameworks in use to plan and implement S&L also happened in the years immediately following the introduction of this concept.

Energy efficiency standards in the USA – washing machine



Source :https://www.researchgate.net/figure/Energy-efficiency-standards-in-the-USA-have-reduced-energy-use-at-a-low-cost-Source_fig19_341750735

MEPS/Labeling: Energy Performance of Key Appliances

Polls

How much do you use energy labels in your work? To what extent are they useful information for you?

Not very useful, I almost never rely on them	14%
Somewhat useful, I sometimes rely on them	52%
They are useful, I often rely on them	24%
They are critical information for my work	10%

29 réponses

As part of your work, how often do you try and educate the public/homeowners on the benefits energy-efficient AC or appliances?

Never	7%
Rarely	21%
Often	25%
Every chance I get	46%

28 réponses

Current Energy Performance of Key Appliances: Air Conditioners

- Recent advances in energy efficiency for air conditioners and heat pumps, (split and central systems) include:

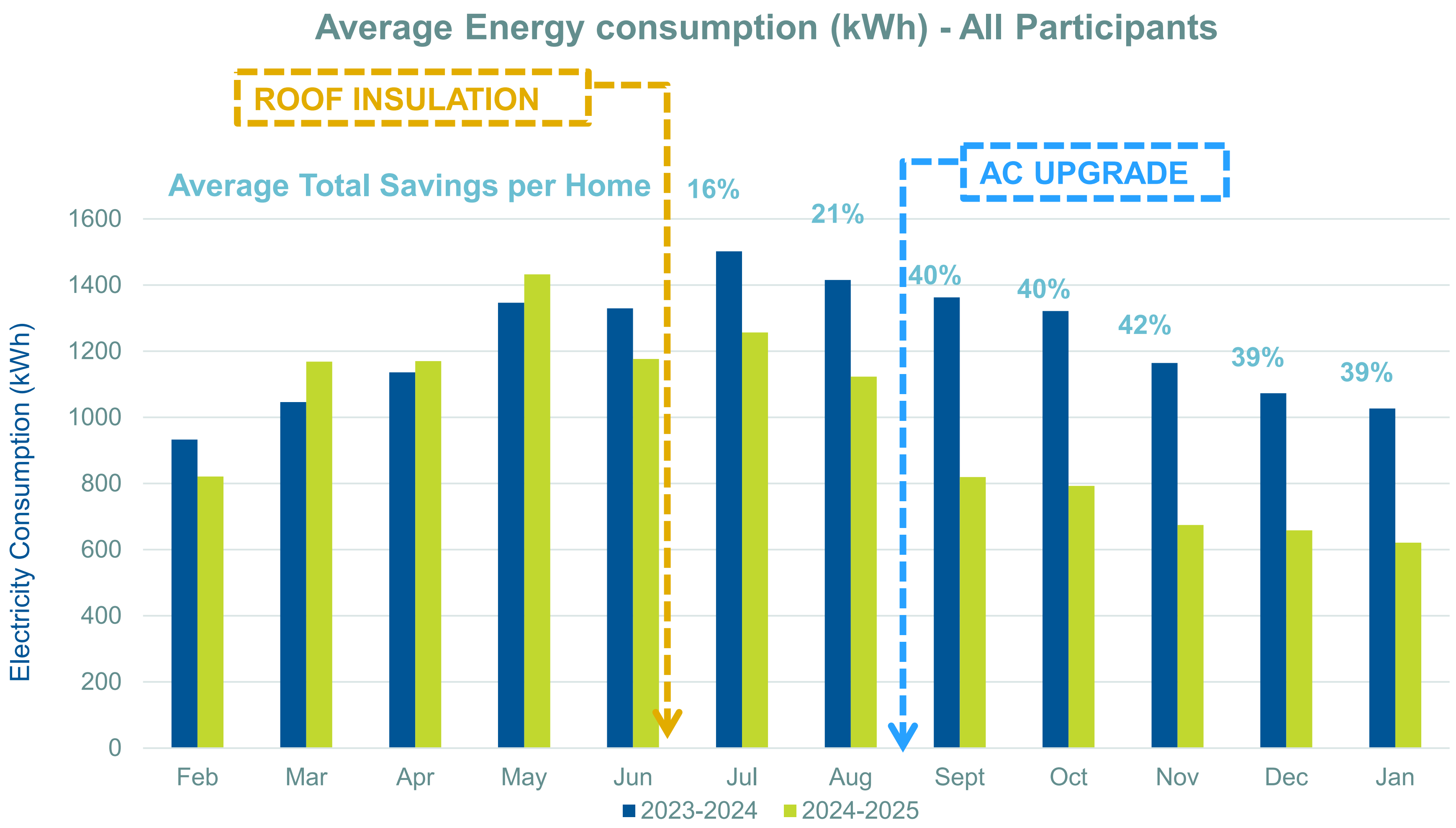
  - ✓ Variable-speed compressors: These compressors adjust their speed based on cooling needs, allowing for more efficient operation by not running at full power.
  - ✓ Advanced airflow design: Newer fan technologies ensure more even distribution of cool air throughout a space, leading to better comfort and reduced consumption.
  - ✓ Eco-friendly refrigerants: Newer refrigerants with lower environmental impact are being used in modern air conditioners.
  - ✓ Smart integration: The use of programmable thermostats, sensors, and other functions help to optimise cooling and reduce energy consumption.

Current Energy Performance of Key Appliances: Air Conditioners:

- Energy Efficiency Ratios (EER) and Seasonal Energy Efficiency Ratios (SEER) are key indicators of AC performance.

  - ✓ The latest models can reach SEER values above 20, compared to older models with SEER ratings of 10-12.
  - ✓ The SEER2 is a newer rating system that was introduced by the US Department of Energy in 2023. This rating system is relatively new and may not yet be utilised by all manufacturers.
  - ✓ It is recommended that building professionals and AC installers only compare AC units with similar ratings (i.e. SEER with SEER, and SEER2 with SEER2).

Example of Energy Savings from Adding R-30 in the Attic for 10 NHTD Homes



Example of Incremental Costs for Higher-Efficiency AC

An example of estimated incremental costs and savings for AC upgrades*

	SEER 13 → SEER 20	SEER 16 → SEER 20
Total Average Incremental Cost for Various Unit Sizes (2-5 ton)	CI$ 4,000	CI$ 2,500
Estimated Annual Savings per Home for AC Upgrade*	CI$ 600-900	CI$ 400-600
Estimated Simple Payback Period*	4-7 years	

***Estimated based on data from 10 NHDT homes that received AC upgrades (from SEER 13 to SEER 20). Results can vary based on occupant behaviour (AC usage), weather, building envelope performance, etc.**

Current Energy Performance of Key Appliances: Refrigerators

- The energy use of new refrigerators has decreased by nearly 50% since 1980.

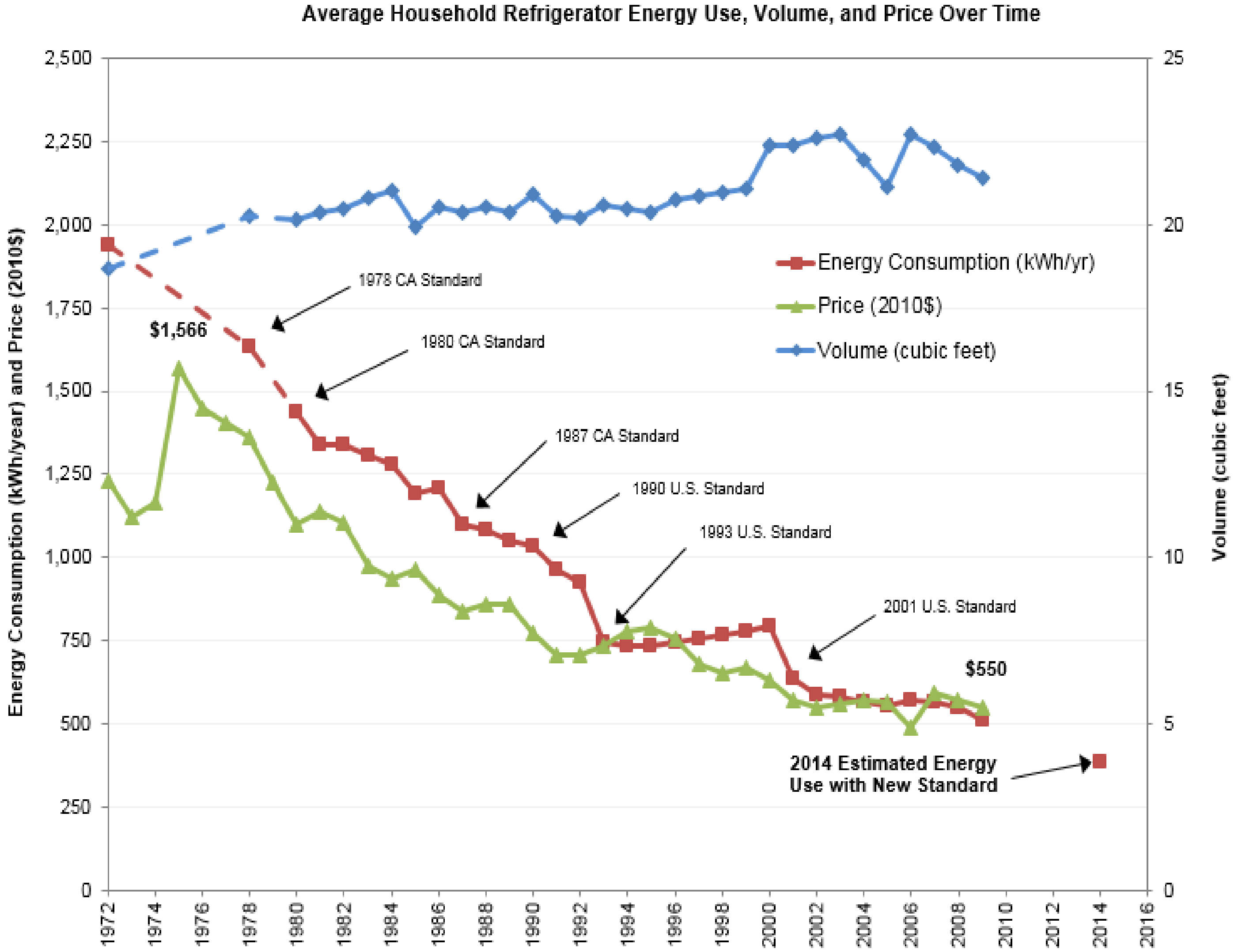
  - ✓ Energy efficient new refrigerator (EnergyStar) models exceed average units by at least 10%.
  - ✓ The efficiency of a refrigerator is based on the energy consumed per year for a given size, expressed in volume cooled per unit electric energy per day.
  - ✓ Refrigerator volume is measured in cubic feet (US) and liter (rest of word); electrical energy is measured in kilowatt-hours.
  - ✓ In the US, the Department of Energy (DOE) set maximum allowable annual energy consumption for different sizes and classes of refrigerators.

Impact of S&L on Refrigerators in the US

The first energy efficiency standards that dramatically affected manufacturers and significantly reduced energy consumption were mandated in the US by the state of California in 1976.

The California standards became effective in 1977 and were followed by US national standards that became effective starting in 1988.

Source :https://appliance-standards.org/blog/how-your-refrigerator-has-kept-its-cool-over-40-years-efficiency-improvements



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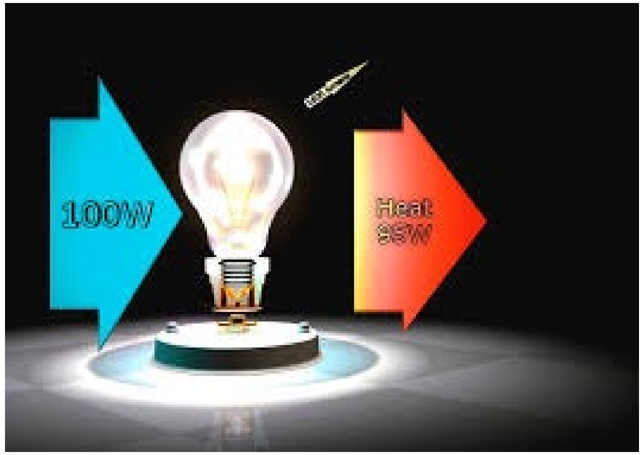
Current Energy Performance of Key Appliances: Lighting

- Improving the efficiency of lighting can save energy, reduce operating costs, and improve comfort

  - ✓ Lighting accounts for between 11% and 15% all electrical energy consumed in homes (in the United States and EU it's about 12%).
  - ✓ The lifetime energy cost of running an incandescent lamp (or even a CFL) can be many times greater than its initial purchase price.



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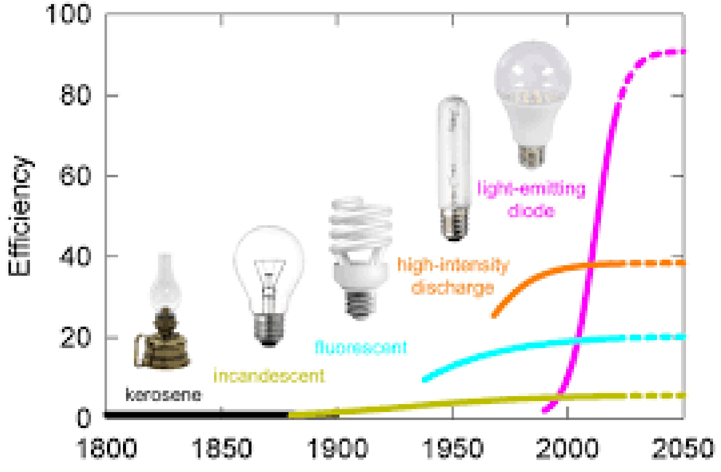
Current Energy Performance of Key Appliances: Lighting

- ✓ Lighting efficiency is the ratio of light output (lumens) to the electrical power input (W).
- ✓ Three key technologies dominate residential lighting:
  - Light-emitting diode (LED)
  - Compact fluorescent (Fluorescent)
  - Incandescent (Resistance or filament)
  - Halogen (Filament)



- ✓ LED lighting has become the gold standard for energy efficiency, consuming up to 90% less energy than incandescent bulbs and lasting 25 times longer.
- ✓ LED fixtures are widely adopted in homes, commercial spaces, and street lighting for their efficiency and durability.

Current Energy Performance of Key Appliances: Lighting

- Improving the efficiency of lighting can save energy, reduce operating costs, and improve comfort

  - For example, at an energy rate of $0.40/kWh, a typical 75W incandescent lamp operating at 5 hours per day uses?

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Current Energy Performance of Key Appliances: Lighting

- Improving the efficiency of lighting can save energy, reduce operating costs, and improve comfort

  - ❖ For example, at an energy rate of $0.40/kWh, a typical 25W CFL operating at 5 hours per day uses?
  - ❖ For example, at an energy rate of $0.40/kWh, a typical 25W CFL operating at 5 hours per day uses?

Current Energy Performance of Key Appliances: Lighting

- Improving the efficiency of lighting can save energy, reduce operating costs, and improve comfort

  - Incandescent = $54.75
  - CFL = $18.75
  - LED = $8.76

Current Energy Performance of Key Appliances: Pool pumps

- A key component of many swimming pools is the electric recirculation pump.
  - ✓ All in-ground pools and the majority of above-ground pools have at least one pump, and many pools have multiple pumps.
  - ✓ Pool owners are typically not aware of how much energy their pool pumps use or that energy-efficient alternatives exist.
  - ✓ Pool pump speeds vary based on pool operation:
    - Many pool pumps are set to run at the speed required for pool cleaning
    - Pool filtration only requires half the flow rate typical of running a pool cleaner
  - ✓ Reducing pump speed by one-half allows the pump to use just one-eighth as much energy. Multi-speed pumps run quieter, last longer, and can extend the life of the filtering systems.

Current Energy Performance of Key Appliances: Pool pumps

- ✓ Energy-efficient in-ground pool pumps use 18% less energy than standard pool pumps.
- ✓ Energy-efficient above-ground pool pumps use 11% less energy than standard pool pumps.

Sourcing and Selecting Energy Efficient, Green, and Sustainable Equipment and Appliances

Sourcing equipment:

- The Cayman Islands rely heavily on imported construction materials and appliances

  - ✓ AC units and appliances are sourced from international markets
  - ✓ This reliance on imports can lead to construction delays, as nearly all materials—cement, lumber, wiring, appliances—must be shipped to the islands.

Sourcing equipment: policies to promote energy efficiency implemented by the Cayman Islands government

- ✓ **Energy efficiency is a key objective of the National Energy Policy**, which includes incentives for promoting the implementation of energy efficiency measures in new facilities and major renovations.
- ✓ Cayman Islands government has approved **duty waivers on several energy-efficient devices and building materials** to support energy efficiency and sustainability goals.
- ✓ No mandatory requirements as yet

Sourcing equipment: Established regulations

- The Customs and Border Control agency enforces the Customs Act, which outlines import procedures. **Importers should familiarize themselves with this legislation to ensure compliance**.

  ✓ Importers are required to complete specific documentation to comply with the Customs and Border Control (CBC) regulations.

  ✓ The CBC offers an online portal, Customs Online System (COLS), allowing importers to register and submit declarations electronically.

Sourcing equipment: Recommended approach

- As much as possible, **identify and work with suppliers and distributors who are familiar with energy efficient** equipment and appliances
- Partnering with manufacturers and distributors that prioritize energy efficiency is crucial:
  - ✓ Supplier Evaluation: **Identify potential suppliers** and assess them (and current suppliers) based on their:
    - o Experience in working with energy efficiency or sustainability requirements
    - o Understanding of international energy efficiency standards and labeling, or other indicators
    - o Access to suppliers with compliant products
  - ✓ Documentation: Seek products that have documentation of energy efficiency certifications or labels, ensuring they meet established performance criteria.

Sourcing equipment: Recommended approach

- **Stay up to date on trends and other development regarding energy efficient** equipment and appliances.
- Keeping up to date on local and regional developments regarding best practices:
  - ✓ **Workshops and Conferences**: Participate in events focused on energy efficiency in the construction sector to stay updated local developments
  - ✓ **Collaborate with local builders on relevant projects**: Engage in local projects aimed at strengthening quality infrastructure in energy efficiency, benefiting from shared knowledge and resources.

Sourcing equipment: Challenges and Barriers

- Local suppliers and retailers and may be challenged to:
  - ✓ **Source the right products** – those that can meet the performance and documentation requirements at reasonable price points – from one or multiple suppliers
  - ✓ **Educating the customers about energy efficiency,** and eventually on the MEPS requirements and explaining the value the higher price of qualified products.

- Because the Cayman Islands represent a relatively small market, retailers and importers may not receive the same services as retailers in larger markets, such as:
  - ✓ Availability of manufacturers' representatives to train their staff on how to educate consumers

Communicating to Customers about Energy Efficient, Green, and Sustainable Equipment and Appliances

Consumer Education: Informed users are more likely to seek out energy efficient equipment.

- The Government has a leading role, but **all stakeholders can also play their part**
- For a deeper transition of the residential sector towards energy efficiency, it will be necessary to:
  - ✓ **Maintain or increase awareness** of the importance of energy efficiency
  - ✓ Introduce consumers and homeowners to energy efficient alternatives
  - ✓ **Introduce the concepts of product quality**, MEPS, and/or endorsement labelling approach

Consumer Education

- Retailers and suppliers can effectively promote energy-efficient appliances, benefiting consumers through reduced energy costs and contributing to broader national sustainability goals:

  - ✓ It is likely that the general population has developed a good **awareness** of energy efficiency and of climate change impacts.
  - ✓ Yet, **awareness of energy efficient options can be quite low**
  - ✓ Consumer **confidence** must be maintained as new products are introduced at to the market.

Consumer Education: from Franklin Energy and Efficiency Works

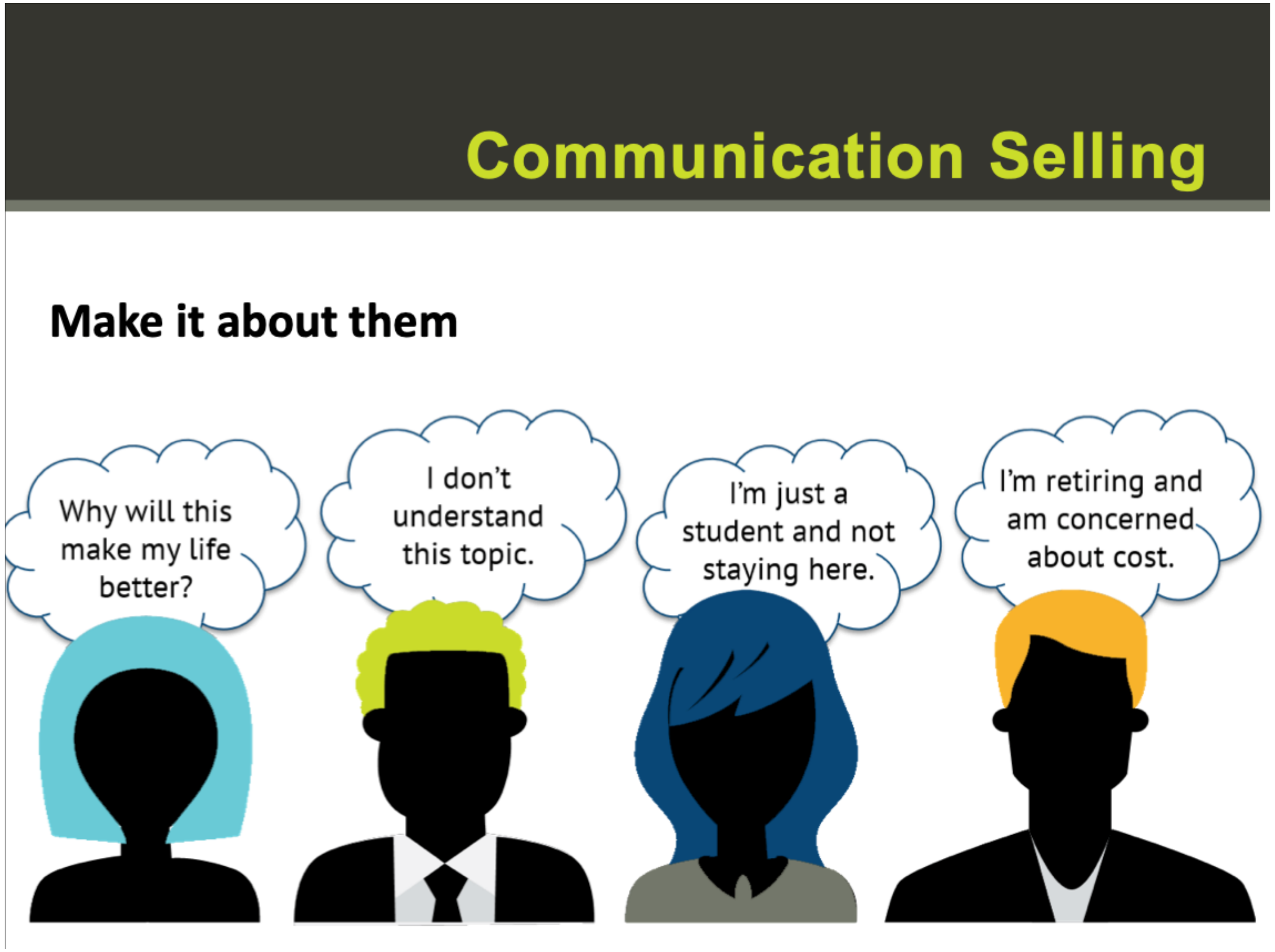
Find the Meaning Behind the Meaning

"Nobody who bought a drill, wanted a drill."

They wanted a hole.

How do we know what the customer really needs?

Consumer Education: from Franklin Energy and Efficiency Works



Consumer Education: from Franklin Energy and Efficiency Works

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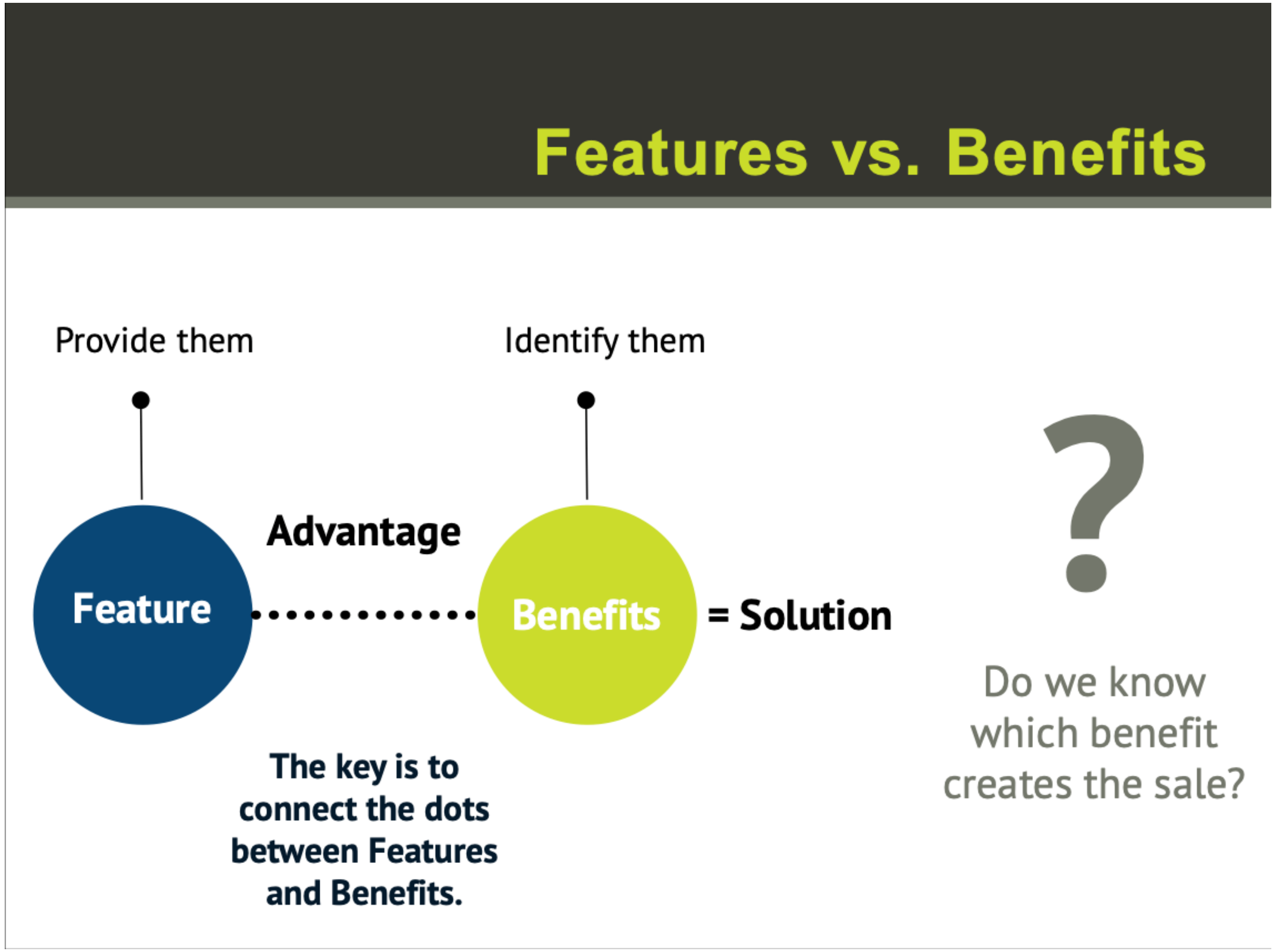


Consumer Education: from Franklin Energy and Efficiency Works

The Cost of Doing Nothing

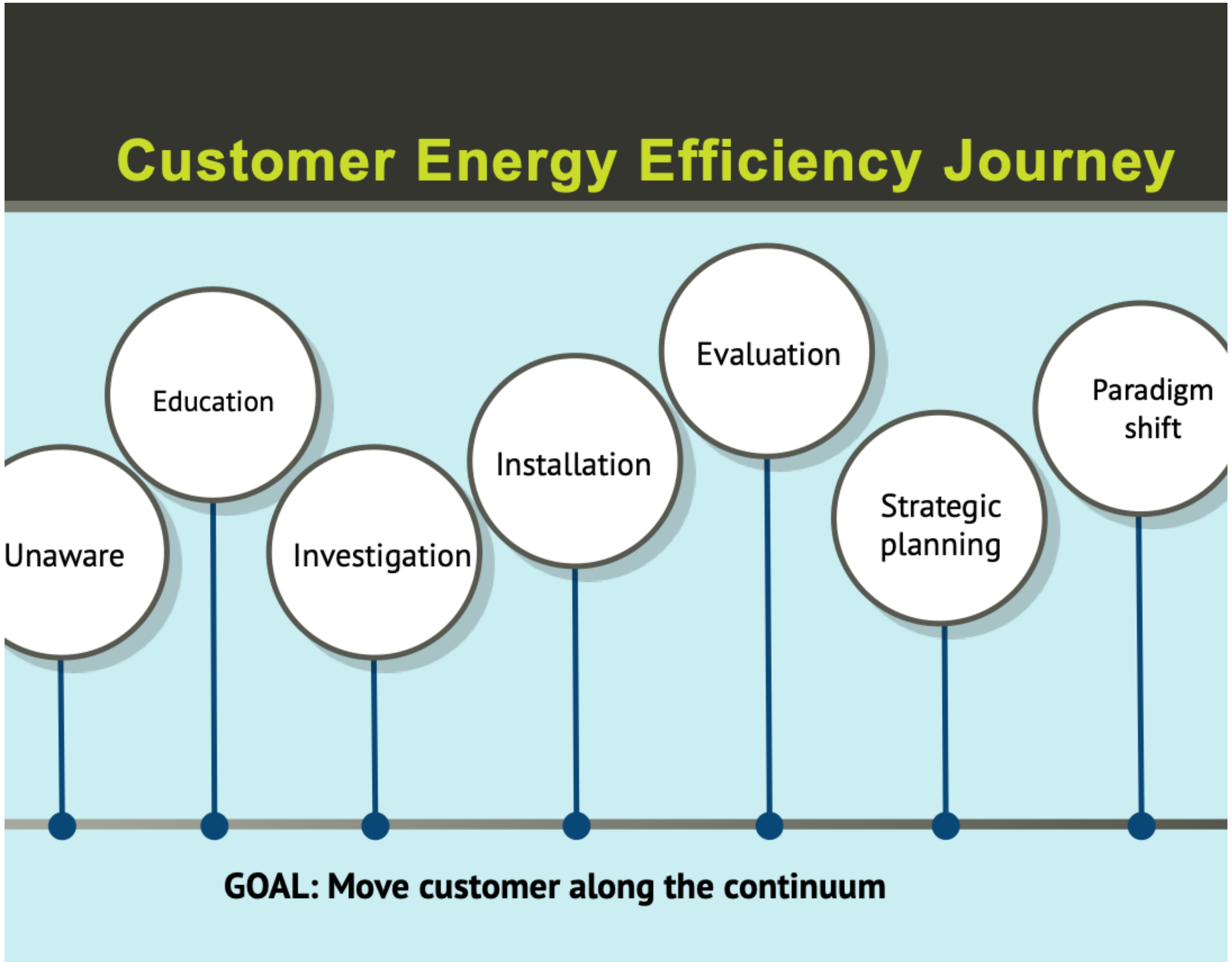
An EE project will save 50%

It costs $1500 every month to do **nothing**!

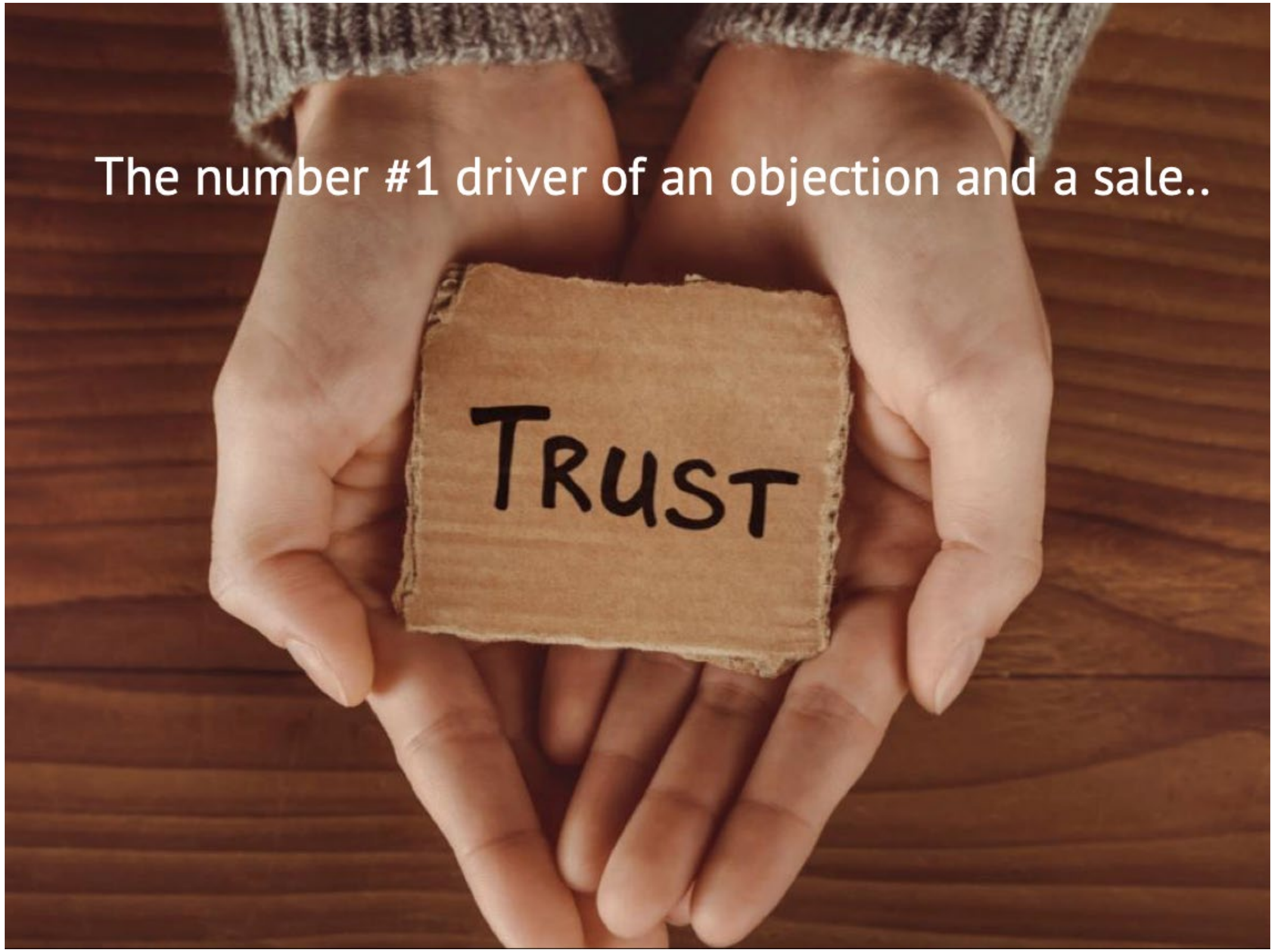
Wait **3** months

Lose **$4500**

Consumer Education: from Franklin Energy and Efficiency Works



Consumer Education: from Franklin Energy and Efficiency Works



Consumer Education: from Franklin Energy and Efficiency Works

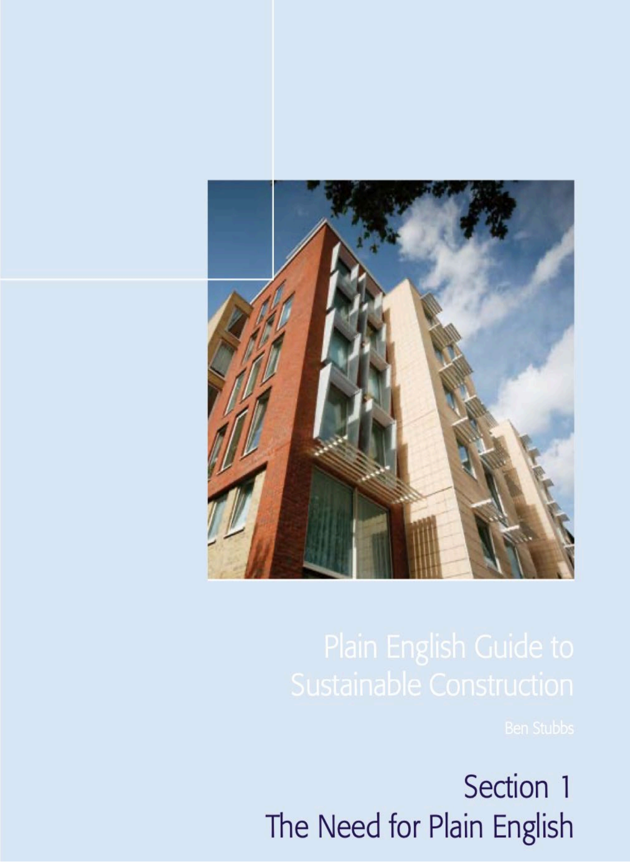
Communication and Messaging: Programs such as the Energy Star and Australia's Equipment Energy Efficiency (E3) provide resources to assist retailers and suppliers in effectively communicating and selling energy-efficient appliances to consumers.

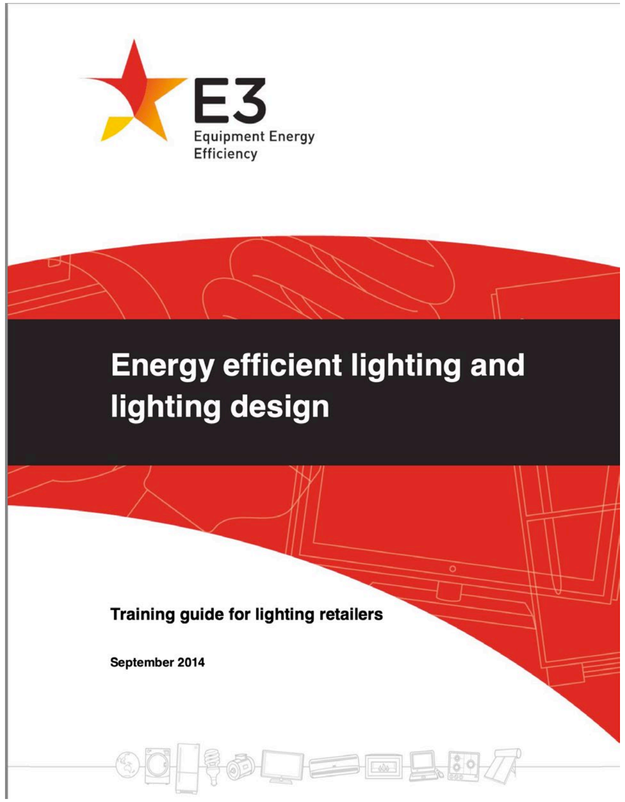
- Training and Educational Materials:
  - ✓ The Energy Star program provides resources to educate retailers on the benefits of energy-efficient products, including training modules and marketing materials to facilitate informed discussions with customers.
  - ✓ The E3 program offers guidelines and tools to help retailers understand and promote energy-efficient appliances, ensuring they can effectively communicate the advantages to consumers.
  - ✓ Both programs emphasize the importance of clear communication regarding the long-term cost savings and environmental benefits of energy-efficient appliances.

Consumer Engagement Strategies:

- Both programs emphasize the importance of clear communication regarding the long-term cost savings and environmental benefits of energy-efficient appliances. They encourage retailers to highlight these aspects during the sales process to assist consumers in making informed decisions.
- Examples of Materials from Australia's E3 Program:
  - Energy rating labels that provide consumers with information on an appliance's energy consumption and efficiency.
  - Guidelines for retailers on how to display and explain energy rating labels to customers.
  - Case studies showcasing successful retailer strategies in promoting energy-efficient appliances.

Energy Efficiency in Residential Construction: Sourcing Equipment and Communications



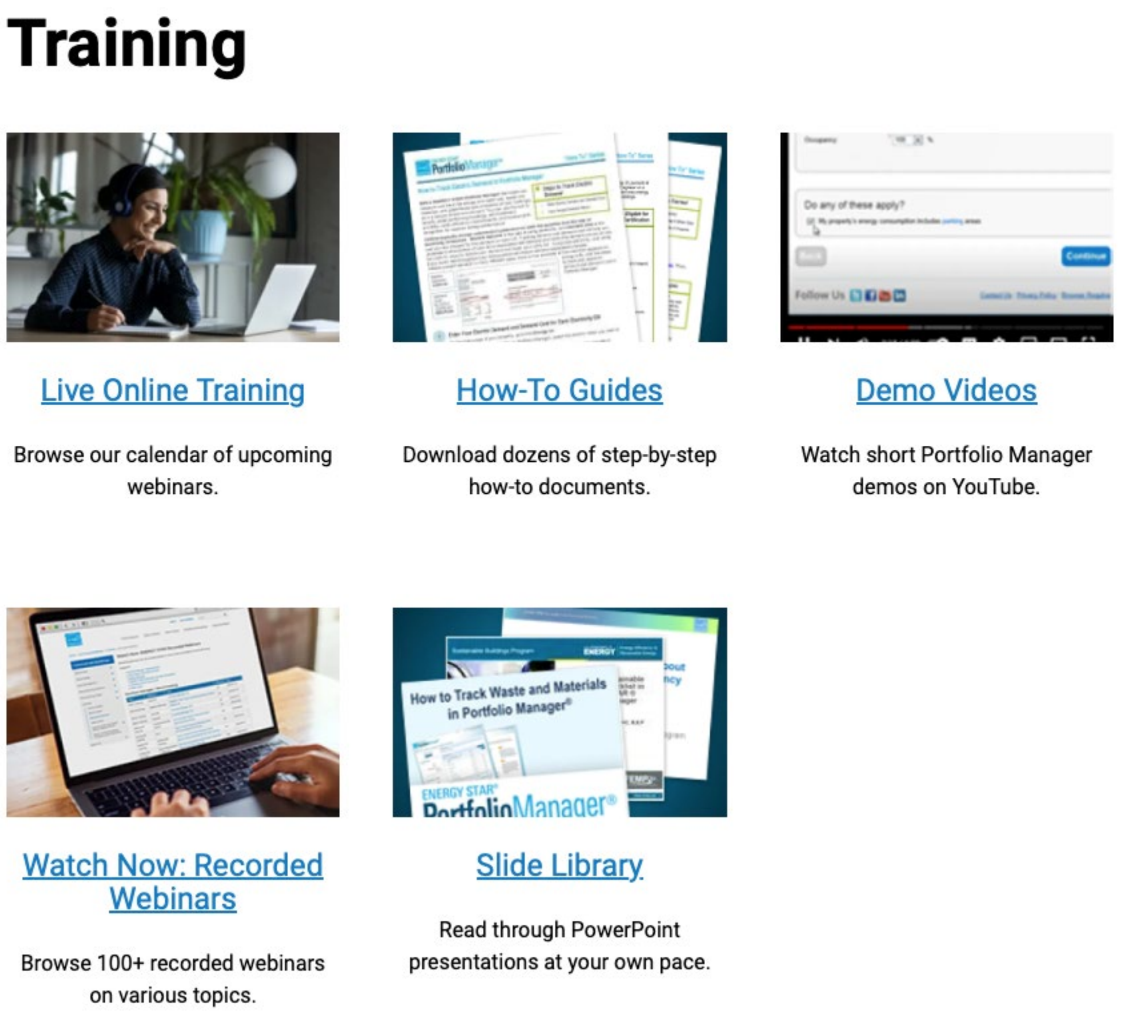


Consumer Engagement Strategies:

- Examples of Materials from Australia's E3 Program:
  - Guide for the Construction Sector.
  - Guide for Retailers

Consumer Engagement Strategies:

- Examples of Materials from EnergyStar Program:
  - ✓ Marketing materials, such as brochures and fact sheets, detailing the benefits of energy-efficient products.
  - ✓ Training modules and webinars designed for retailers to enhance their understanding of energy efficiency.
  - ✓ Case studies.



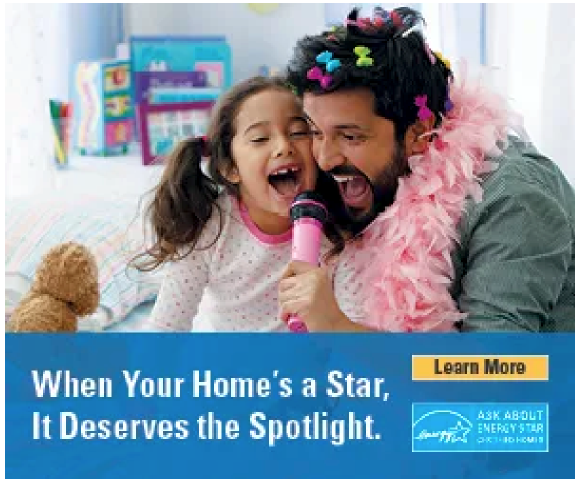
Consumer Engagement Strategies:

- Examples of Materials from EnergyStar Program:

Marketing Materials for New Homes & Apartments

Educate Homebuyers and Set Your Company Apart

As an ENERGY STAR partner, you have access to free, informative, and eye-catching marketing materials to display in model homes and sales centers, and on digital platforms such as websites and social media. These marketing materials include:



Please fill the post-training survey: https://forms.office.com/r/rjcKBWjvHc

Thank You !

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Additional Materials on the CREECB: Insulation and AC Selection

CARICOM Regional Energy Efficiency Building Code (CREEBC) Overview

- Developed by the Caribbean Community (CARICOM) to promote uniform energy efficiency standards across Caribbean nations.
- The CREEBC is tailored for tropical climates.
- Key differences from the IBC:
  - ✓ **Climate Adaptation**: The CREEBC emphasizes measures suited for warm and humid tropical conditions, such as improved cooling efficiency.
  - ✓ **Regional Focus**: The CREEBC aligns with regional energy goals set by CARICOM, encouraging renewable energy integration and reducing reliance on imported fuels.
  - ✓ **Material and Design Adaptation**: The CREEBC recommends locally sourced materials and designs that reduce heat gain in buildings, where appropriate.
- Currently not adopted in the Cayman Islands, but the Energy Efficiency Guidelines are aligned with key CREEBC requirements

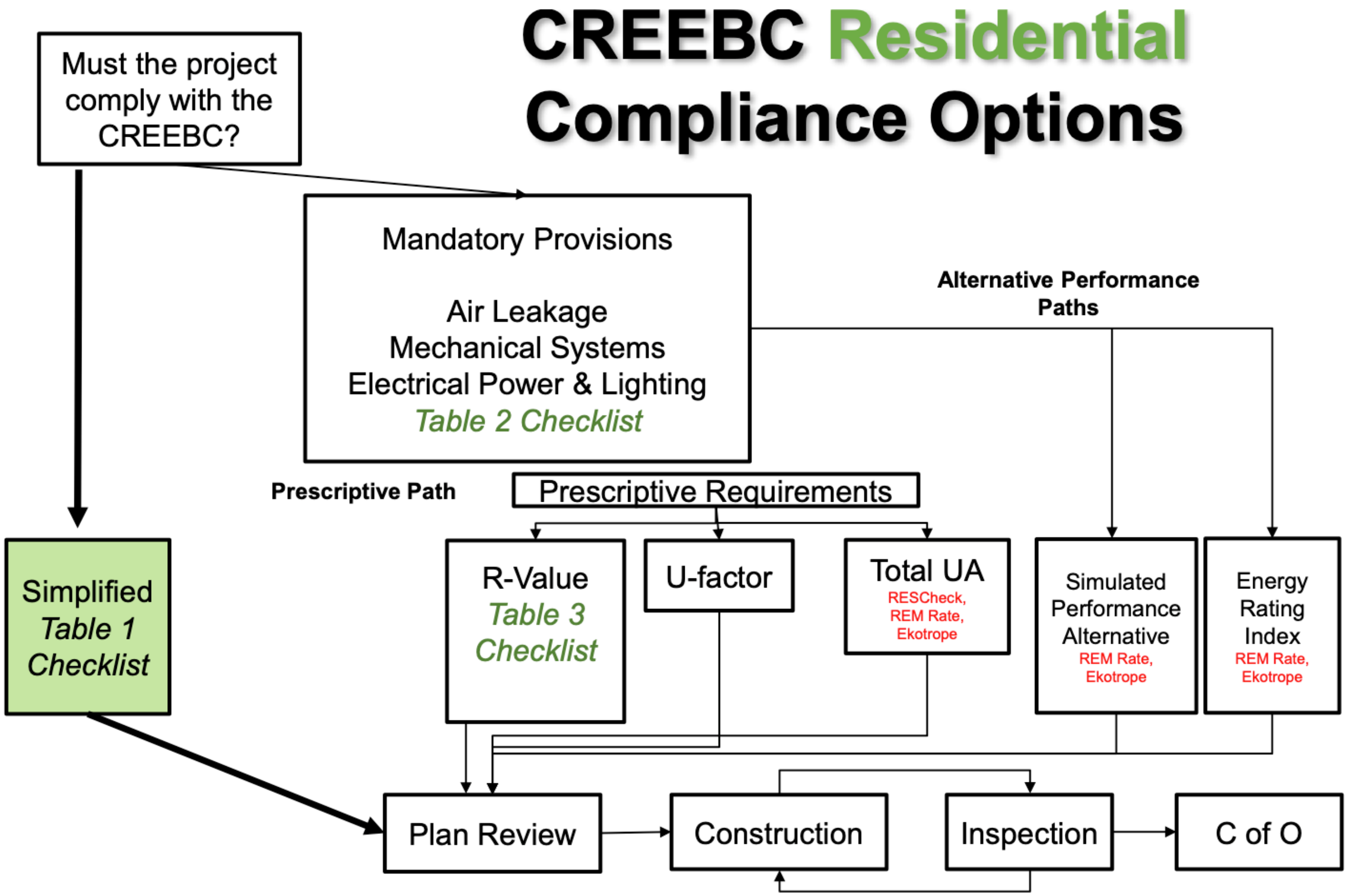
CARICOM Regional Energy Efficiency Building Code (CREEBC) Overview

- CREEBC Objectives include:
  - Conserve energy over useful life of each building
  - Provide flexibility for innovation
  - Not to abridge safety or health requirements from other laws and regulations

- The CREEBC also has an “Above Code” provision, which allows for alternative national or local energy efficiency building programs, as long as they are:
  - Approved by the code official or the authority having jurisdiction
  - Still meet the mandatory requirements of the CREEBC

CARICOM Regional Energy Efficiency Building Code (CREEBC) Overview:

- Builders have multiple pathways to demonstrate compliance with the CREEBC



CARICOM Regional Energy Efficiency Building Code (CREEBC) Overview

- Builders have multiple pathways to demonstrate compliance with the CREEBC:
  - ✓ **Simplified Prescriptive Path**: This path requires adherence to specific requirements, such as minimum insulation levels and window performance standards.
  - ✓ **Prescriptive Path**: This path is similar to simplified path but allows for some trade-offs between building components, provided overall energy efficiency is maintained.
  - ✓ **Simulated Performance Path**: This path utilizes energy modeling software to demonstrate that the proposed design performs at least as efficiently as a baseline code-compliant building.
  - ✓ **Energy Rating Index (ERI) Path**: This path involves achieving a specified ERI score reflecting the building's energy performance relative to a reference design.
- Each compliance path has specific requirements and documentation procedures.
- Builders should select the path that aligns best with their project goals and resources.

Roof Insulation:

- CREEBC contains requirements for roof (attic) insulation

Thicknesses Required to Achieve R-30 for Different Insulation Materials

Insulation Material Type	R-30 Insulation Thickness
Open-Cell Spray Foam	9 in.
Closed-Cell Spray Foam	4.25 to 6 in.
Fibreglass batt	8.25 in.
Foam Board Insulation (Rigid Foam)	7.5 to 8.33 in.
Blown-in Cellulose	9.3 in.
Stone Mineral Wool – Blown-in	10.9 in.
Stone Mineral Wool Batt	8.87 in.

Exterior wall insulation

- CREEBC contains requirements for exterior wall insulation

Examples of Combinations of Wall Structure Types and Insulation Materials

Wall/Material Type	Description	R-Value
Insulated Concrete Form (ICF)	ICF walls comprise two layers of rigid foam insulation with a concrete core.	R-22 to R-30
Wood Framing with Insulation	Wood framing requires additional insulation (e.g. spray foam or mineral wool) for thermal resistance.	R-13 to R-21
Concrete Block	Concrete blocks are not great insulators, but they offer mass that can help with thermal mass effect.	R-1.5 to R-2
Brick	Solid brick walls offer very little insulation but are highly durable and can provide thermal mass.	R-0.2 to R-0.5 per inch

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Overview: AC Efficiency

- The **SEER** is typically the more commonly **energy efficiency rating** in many jurisdictions including the Cayman Islands, but the **EER** (energy efficiency rating) is better suited for hot and humid climates.

- Here are the key differences between both ratings:
  - ✓ **The SEER measures cooling efficiency over a range of outdoor temperatures**, typically from 65° F to 95° F (with an average of 77° F), and therefore provides a broader measure of efficiency across an average cooling season.
  - ✓ **The EER measures cooling efficiency at a constant outdoor temperature** (typically 95° F) and is ideal for evaluating efficiency under peak heat load conditions. The **EER provides a more accurate estimate of real-world performance for regions where air conditioners operate almost continuously due to consistently high temperatures**, such as in the Cayman Islands.

Energy Efficient HVAC: Equipment Efficiency

- Selecting high-efficiency air conditioning units is critical for reducing energy consumption and enhancing indoor comfort.

- Key considerations include:
  - ✓ SEER and EER Ratings: Choose units with a high Seasonal Energy Efficiency Ratio (SEER) and Energy Efficiency Ratio (EER). The minimum SEER rating in many regions is 14, but selecting 20 or higher ensures significant energy savings.
  - ✓ Incorporation of advanced technologies: Inverter-driven compressors adjust cooling output dynamically, reducing energy use and maintaining stable indoor temperatures.
  - ✓ Efficiency labeling and certification: Use certified or tested equipment.
    - For example, ACs with the ENERGY STAR labels indicate that they are compliant with stringent efficiency guidelines.

SEER (SEER2)	EER
13 (12.4)	11.2
16 (15.3)	12.8
18 (17.2)	13.7
20 (19.1)	14.4
22 (21.1)	15.0

Overview: AC Efficiency

- For new residential buildings, central or mini-split air-conditioning systems should have a SEER value of 20 (approximately equivalent to 14.4 EER) to achieve significant energy savings.
  - ✓ At a minimum, a SEER of 16 should be selected (12.8 EER).

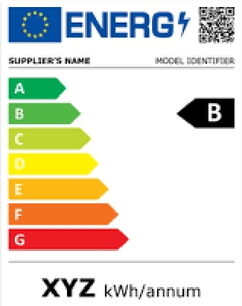
Comparative Labels

There are three subcategories of comparative labels:

› Categorical labels use a step ranking system to indicate relative energy use compared to other models on the market.

› Continuous labels use a bar graph or scale to show the range of models available on the market. Unlike categorical labels, continuous labels do not have discrete “categories” of efficiency levels.

› Information-only labels give data on a product’s technical performance but offer no simple means (e.g., a scale or categories) that allow consumers to compare energy performance among products.



EESL Programs: Labeling Process

Comparative Labels

- Category scale allows consumers to compare the energy efficiency of products
- Encourage competition among manufacturers
- May be mandatory or voluntary.

Endorsement Labels

- Simple and recognizable, allow consumers to identify the most energy efficient products
- Are voluntary since they do not seek to eliminate the least efficient products from the market.

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Introduction to S&L: Overview of Energy Use

Life Cycle Energy Use Example

VS

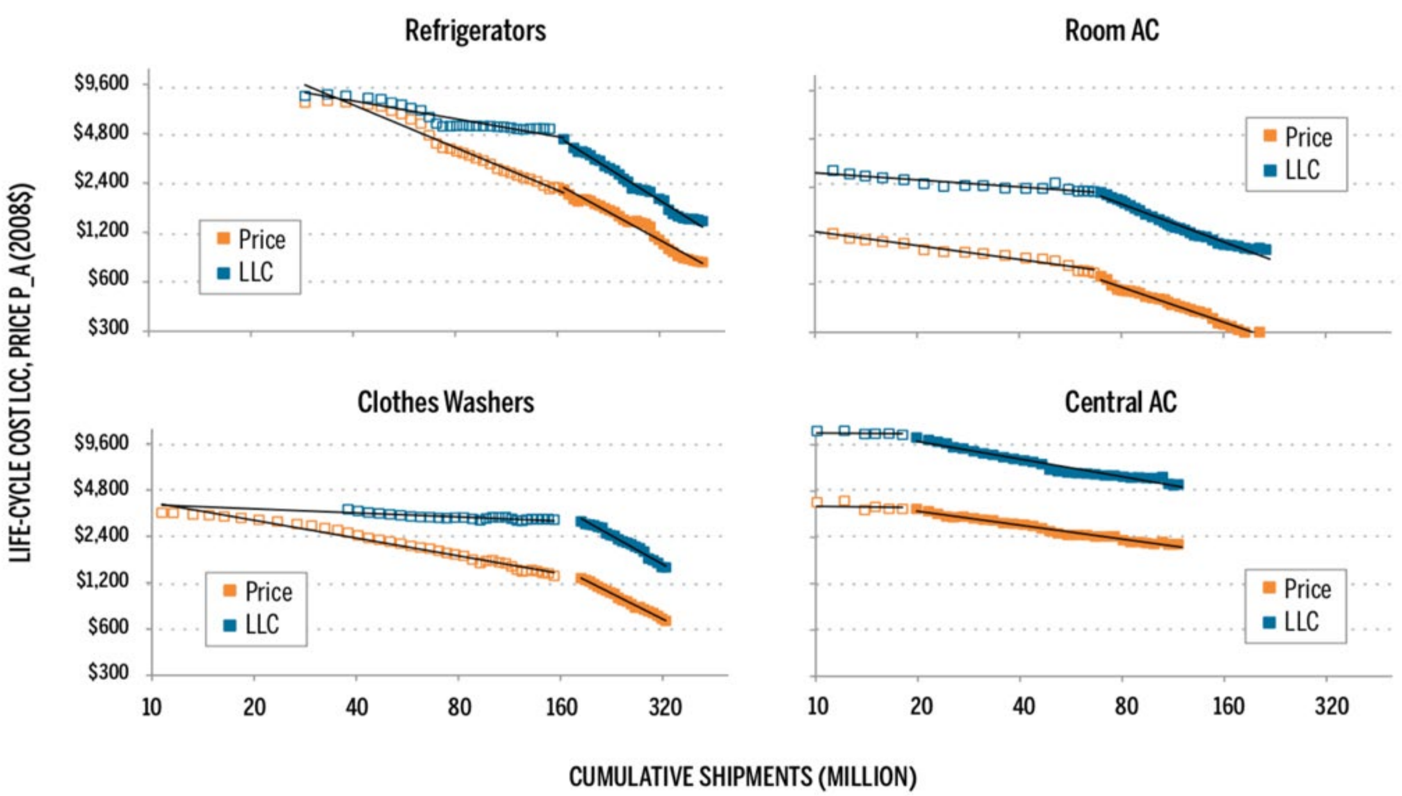
	Fluorescent Tube	LED Tube
Rated power (W)	32	12
Ballast (W)	5	0
Operating hours (h)	10	10
Annual consumption (kWh)	135.05	43.8
Annual cost @ USD $0.11	$47.27	$15.33
Service life (hrs)	20,000	50,000
Lifetime consumption (kWh)	740	600
Savings (kWh)	0	1,250

- *What is the cost of 1 kWh for your location?*
- *What is your primary fuel source?*

Introduction to S&L: Benefits and Costs

- Appliance prices have come down with improving energy performance

Figure 8: Purchase price (red) and LCC (blue) trends for appliances pre-standards and post-US Federal MEPS [12]



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