



GUAM BUILDING CODE COUNCIL

2014  
Guam  
Tropical  
Energy  
Code

GTEC Conference  
Brent Wiese  
March 3 & 4, 2015

---



GUAM BUILDING CODE COUNCIL

## Topics of Discussion

- Introduction
  - Guam Building Code Council
- Value of an Energy Code
- Energy Codes Implemented Nationwide
- 2012 Guam Tropical Energy Code
  - History
  - Concerns and Changes
- 2014 Guam Tropical Energy Code
  - Implementation, Enforcement, and Education
  - Types of Projects Impacted
  - Differences from the 2009 International Energy Conservation Code (IECC)

## Guam Building Code Council

- P.L. 30-199; Bill 460-30 (COR), effective 12/29/10
  - Updated Guam Law to use most of the 2009 International Code Conference codes
  - Section 15 required the formation of the GBCC
  - Section 16 required that the GBCC “shall also provide recommendations for further amending or adding to the codes adopted with this legislation, including...the International Energy Code, 2009 edition, the Model Tropical Energy Code...”
- P.L. 31-17; Bill 18-31, effective 4/18/11
  - Established the Guam Building Code Council
  - Section 2(q)(1) The Council shall have the power to “review, as deemed appropriate, proposed revisions, deletions, additions, or other modifications to the Guam Building Code, and forward its recommendations for such modifications to *I Liheslaturan* for adoption”



GUAM BUILDING CODE COUNCIL

## Value of an Energy Code

- Why do we need another code?
- Why should the government make me spend more money?
- Why not let the market drive building efficiencies?
- How soon can we get this approved?
- What's for lunch?

## Value of an Energy Code – Globally

- Buildings consume over 40% of all energy, and over 70% of all electricity used in the United States.
- Buildings account for 40% of the nation's carbon dioxide emissions.
- Residential buildings created 1,200 metric tons, commercial buildings created 1,000 metric tons, of the 5-6,000 metric tons of CO<sub>2</sub> emissions created in the US in a 10 year period.
- States that adopted energy codes reduced household energy use by 10%, and greenhouse gas emissions by 16% from 1986-2008.
- Global warming will have significant impact on an island.

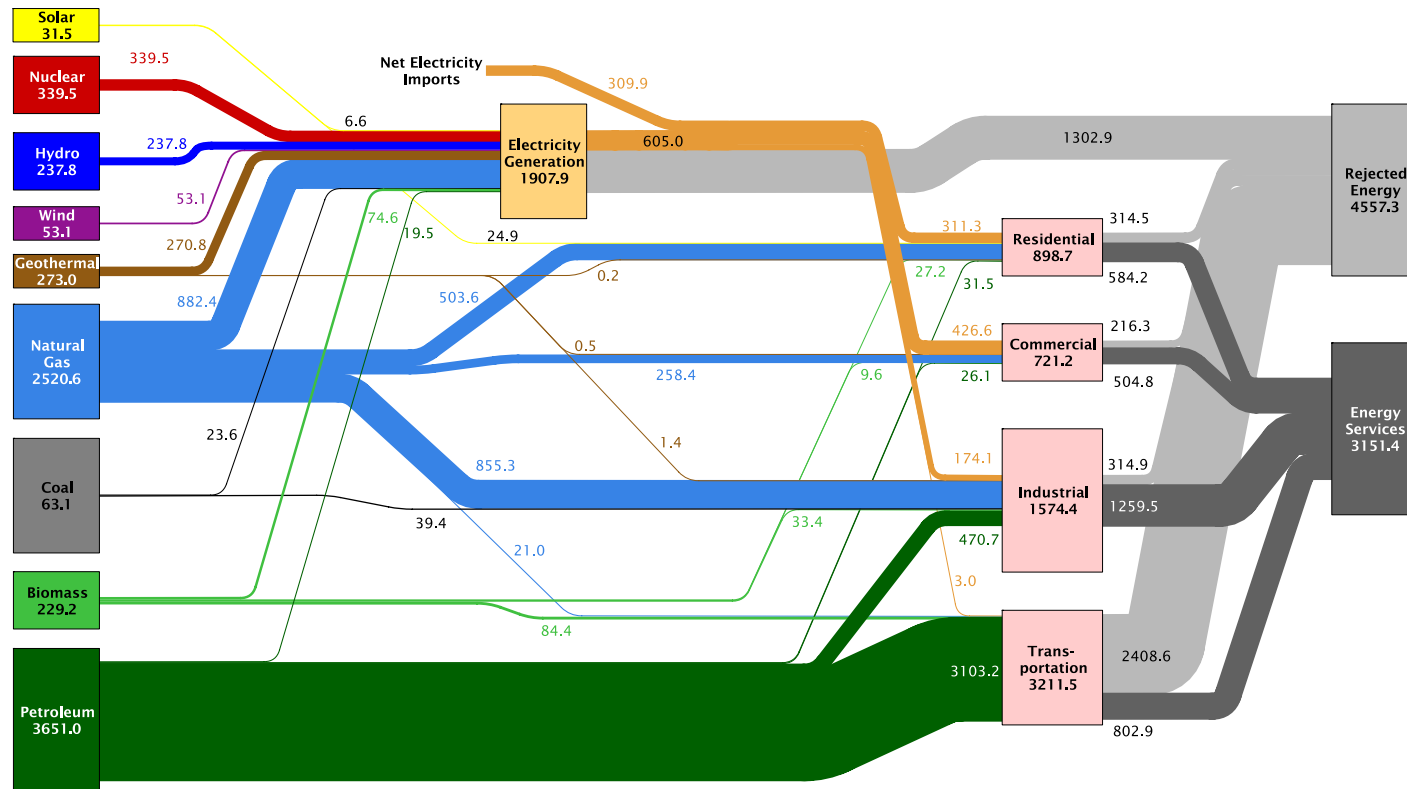
## Value of an Energy Code – Globally

- Saved energy saves even more money. For every kilowatt/hour of energy not consumed, roughly 3 kilowatt/hours of energy is not produced.
- Power generation losses, distribution losses, pump and motor losses all add up to “rejected energy” that can’t be used.
- In a 2008 Lawrence Livermore National Laboratory study, in California’s residential use, there was a 64% loss of energy generated. For every dollar saved, \$2.76 of energy is saved from being generated. This does not include raw material acquisition, refinement, and shipping fuel.

# Value of an Energy Code – Globally

Estimated California Energy Use In 2008  
~7708.6 Trillion BTU

Lawrence Livermore  
National Laboratory



Source: LLNL 2010. Data is based on DOE/EIA-0214(2008), June 2010. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports flows for non-thermal resources (i.e., hydro, wind and solar) in BTU-equivalent values by assuming a typical fossil fuel plant "heat rate." The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. Interstate and international electricity trade are lumped into net imports or exports and are calculated using a system-wide generation efficiency. End use efficiency is estimated as 65% for the residential, 70% for the commercial, 80% for the industrial sector, and as 25% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL-MI-10527

## Value of an Energy Code – Guam

- An energy code is an integral piece of the *Guam Energy Task Force 20% in 2020* plan. The most effective “alternate” energy, is energy not spent.
- Reduce the amount of dollars sent off island to buy diesel fuel. In 2012, GPA spent over \$300,000,000 in fuel to generate electricity. Money not spent on fuel and sent off island, stays here and grows the island’s GNP.
- Less power demand, means less power generation, which means less smoke emissions. Which provides cleaner air, increased visibility, and potential cost savings as EPA tightens emission standards. Could save \$5M over 5 years.
- Less power demand, means less infrastructure. Power plants cost a lot of money. Less demand can delay the need for additional power generation.



## Value of an Energy Code – Guam

- Promotes the generation of more on-island jobs from the development and deployment of new building technologies and design strategies.
- Provides more opportunities for Guam to be eligible for energy related funds and grants.
  - Dept. of Energy has been a source for energy development, conservation education, and improved energy efficiency.
  - Guam benefited tremendously from ARRA money to improve existing buildings' energy performance.
  - Several programs require that Guam has, or soon will have an energy code.
  - Failure to approve an energy code could put Guam at risk for future funding.

## Value of an Energy Code – Guam

- Overcomes market barriers that inhibit investment in energy efficient buildings.
  - Developers have little incentive as they pay initial costs, but not the power bills.
  - Levels the playing field for developers, all making the same minimum commitment.
- Safeguards owners and tenants from long-term financial burdens that can result from short-term design and construction decisions.
  - Provides a common foundation for evaluating, regulating, and incentivizing building design, construction, technologies, and performance.
  - Levels the playing field for homebuyers and renters with a recognized standard.
- Promotes increased property values and increased rent potential.
  - The local tax code has been defined to allow for a utility allowance to increase in low cost housing rent allowed. This is offset by the lower utility bills.



GUAM BUILDING CODE COUNCIL

## Value of an Energy Code – Individually

- An effective energy code allows more of your income for spending. Less you pay for power, the more you can spend on other things. The less businesses pay for power, the less they need to charge to capture those expenses.
- An effective energy code saves homeowners money and increases property value.
  - Thermal efficiency could reduce mechanical equipment sizes.
  - A modest initial increase in cost for energy efficiency, is rolled into the mortgage. Spreading that cost over 15 or 30 years has a minor effect on the monthly mortgage payment. But the energy efficiency savings on the power bills offsets that increase, leaving the owner with more cash monthly to use.

## Value of an Energy Code – Individually

- Home mortgage of \$200,000
  - With a 30 year loan, 4% rate, will have roughly \$950 monthly mortgage payment
  - GPA bill of \$200 a month
  - Total payments equal \$1,150 a month
- Take the same house, with energy efficiency improvements, say 5% of the value, now \$210,000
  - With a 30 year loan, 4% rate, will have roughly \$1,000 monthly mortgage payment
  - GPA bill of \$140 a month
  - Total payments equal \$1,140 a month
  - Monthly payments DECREASE
  - Money saved increases the value of the house



GUAM BUILDING CODE COUNCIL

## Value of an Energy Code – Individually

- An effective energy code reduces maintenance costs, improves comfort, improves health and safety.
  - Reduces maintenance costs by avoiding excessive equipment run time.
  - Better building sealing reduces insect and rodent infestation, reduces condensation which can lead to mold, and reduces outdoor noise intrusion.
- An effectively designed mechanical system provides a more comfortable living and working environment.
  - Provides better thermal control, no more blasting arctic air.
  - Provides more fresh air, which is healthier and reduces potential for “Sick Building Syndrome”.
  - Happier employees leads to higher employee retention, less turnover, less sick days, which means less spent on training and downtime.

## Who has an Energy Code?

- As of February 2015, 44 States require compliance to the International Energy Conservation Code.
  - As does the District of Columbia, Puerto Rico, and the US Virgin Islands.
  - Three states created their own energy codes. Three states allow local jurisdictions adopt energy codes.
  - Florida created their own tropical energy code, based on the ASHRAE 90.1 2007 / 2009 IECC standards.
  - Hawaii requires compliance to the ASHRAE 90.1 2004 / 2006 IECC standards, but allowing compliance to the newer version.
  - The CMNI uses the Tropical Energy Code, based on the ASHRAE 90.1 2001 / 2003 IECC standards. This was the basis of the 2014 GTEC.

## Who has an Energy Code?

- Why do all these states and territories have energy codes?
  - The Alliance Commission on National Energy Efficiency Policy has shown that by 2030 the US could:
    - Add 1.3 million jobs,
    - Cut household energy costs
    - Save businesses \$169 billion a year
    - Increase GDP by up to 2%
    - Decrease energy imports by more than \$100 billion a year
    - Reduce CO2 emissions by one-third
  - Substantial energy impact to avoid developing new energy production, allowing aging plants to retire without replacement.



GUAM BUILDING CODE COUNCIL

## Alternates to an Energy Code

- U.S. Green Building Council's *Leadership in Energy and Environmental Design* (LEED)
  - Promotes environmentally compatible buildings and a healthy work environment, for the lifetime cycle of the building.
  - For fee service, documentation requires substantial effort and additional costs.
- ICC *2012 International Green Construction Code* (IgCC)
  - Similar to LEED.
  - Builds on top of the *International Energy Conservation Code*.





GUAM BUILDING CODE COUNCIL

## 2012 Guam Tropical Energy Code



## 2012 Guam Tropical Energy Code

- History
  - The *Guam Building Energy Code* was implemented around 2000, based on the ASHRAE 90.1-1989 standard, funded by the US Dept. of Energy for Guam and America Samoa, was enforced by DPW until the 2009 ICC codes were implemented.
  - The *Model Tropical Energy Code* completed in 2009, never implemented, based on the 2006 IECC / ASHRAE 90.1-2004 standard, funded by the US Dept. of Energy for Guam, Hawaii, Puerto Rico, Virgin Islands, and the CNMI.

## 2012 Guam Tropical Energy Code

- History
  - Guam Energy Code Task Force held first meeting on 12/1/2011
  - Several Task Force members help develop the 2009 energy code
  - Task Force was comprised of over a half dozen mechanical engineers, several mechanical contractors, electrical engineers, architects, contractors, realtors, and DPW representatives
  - Modified the 2009 Model Tropical Energy Code
  - Six advertised public GBCC meetings held to review and approve the GTEC
  - Bill 61-32 transmitted to *I Liheslaturan* on 3/4/13
  - Bill 61-32 was approved by near unanimous vote by the *I Liheslaturan Guåhan*, veto signed by the Governor

## 2012 Guam Tropical Energy Code

- Concerns with the 2012 GTEC
  - Submit revisions to references to the ICC *International Energy Conservation Code* within previously approved codes
  - Research Energy Efficient Mortgage (EEM) options to increase home loan amounts
  - Need to document additional costs vs. energy savings for low income residences



GUAM BUILDING CODE COUNCIL

## 2012 Guam Tropical Energy Code

- Update References to the ICC IECC
  - Currently, the IBC, IRC, and IMC reference the IECC
  - Revise these references to the Guam Tropical Energy Code
  - Submit revised reference language within the bill to approve the GTEC
- Energy Efficient Mortgage
  - The EEM recognizes it costs less to operate an energy efficient residence
  - Money not spent on energy can be used to pay a higher mortgage
  - EEM allows borrowers to include the costs of energy improvements into the total (higher) mortgage amount
  - 100% of energy improvements, typically up to 15% of the value of the home, can be financed over the life of the mortgage

## 2012 Guam Tropical Energy Code

- Reductions in Envelope Requirements
  - Exempt rural and small unconditioned residences
  - Coordinate square foot exemption limits with the Affordable Housing Coordinating Council
- Cost vs. Energy Savings
  - Identify a low cost residence being constructed on island
  - Compare construction costs with and without the GTEC
  - Model the energy savings with GTEC requirements
  - Document the return on investment



GUAM BUILDING CODE COUNCIL

## 2014 Guam Tropical Energy Code



## 2014 Guam Tropical Energy Code

- Implementation
  - Update 2012 energy code per findings
  - Review Documentation with Governor's Office
  - Submit the 2014 GTEC as new legislation
    - As before, include timing for implementation (6 months)
  - Aiming for legislation submittal this spring
  
- Enforcement
  - Guam's Department of Public Works (DPW) will be responsible for enforcing compliance to the energy code.
  - Licensed architects, mechanical, and electrical engineers must seal plans submitted for permit. Per PEALS standards and Guam Law, these signatures will certify compliance to the new code.



## 2014 Guam Tropical Energy Code

- Education
  - The *Energy Code Workshop*, October 2012, was hosted by the Guam Energy Office (GEO).
  - Today's *Guam Tropical Energy Code Conference* is being hosted by the Guam Community College (GCC), through grant money from the Guam Energy Office.
  - GCC is planning targeted workshops to focus on specific GTEC education and training.
  - GCC is reviewing curriculum for educating and training tradespersons for energy technology.
  - International Code Council (ICC) is offering to partner in future energy code workshops.



GUAM BUILDING CODE COUNCIL

## 2014 Guam Tropical Energy Code

- 1. Purpose
- 2. Scope
- 3. Administration and Enforcement
- 4. Envelope
  - Mandatory Provisions
  - Prescriptive Envelope Requirements
  - Prescriptive Envelope Requirements for Naturally Ventilated Homes
  - Building Trade-Off Options
- 5. Ventilation and Air Conditioning
- 6. Water Heating
- 7. Lighting

## 2014 Guam Tropical Energy Code

- Who will it impact?
  - Any new construction, including new buildings, additions, alterations, renovations, or repairs to existing buildings (requiring a permit)
  - New or replacement air conditioning, water heating, and lighting equipment in existing buildings
  - Replacement roofing
  - Existing buildings with major alterations (construction cost is greater than 50% of building value), the entire building would need to comply
  - Existing buildings with a change in occupancy, where the energy demand increases

## 2014 Guam Tropical Energy Code

- Who will it not impact?
  - Registered Historical Buildings, when complying with the energy code would compromise or damage the historical character of the building
  - Unconditioned Groups S & U Occupancy buildings (IBC), exempted from Section 5
  - Temporary structures (IBC), exempted from Section 5
  - Single Family Residences in Agricultural and One-Family Dwelling Zones, with less than 800 sf area, exempted from Sections 4 & 5
  - Low-rise Residential buildings exempted from Section 7
  - Several minor repair and replacement conditions

## 2014 Guam Tropical Energy Code

- Changes from the 2009 IECC
  - The national standard doesn't work effectively for hot humid tropical climates. Zone 1 includes Hawaii, a different climate.
  - Took out all the space heating requirements
  - Reduced insulation values for concrete roofs (R13 vs. R30)
  - Eliminated residential insulation values for concrete walls (none vs. R4)
  - Reduced commercial insulation values for metal building walls (R13 vs. R16)
  - Reduced residential glazing SHGC req's (none vs. 0.30)
  - Reduced commercial glazing SHGC req's (0.30 / 0.61 / none vs. 0.25 / 0.33 / 0.40)
  - Reduced commercial skylight glazing SHGC req's (0.40 vs. 0.35)
  - Eliminated residential lighting req's (none vs. 50% high efficacy lamps)
  - GTEC allows for naturally ventilated homes, IECC does not

## 2014 Guam Tropical Energy Code

- Mandatory & Prescriptive Requirements
  - Seal the envelope. Usually done to avoid water penetration, especially in storms. Keep the warm air out, and the cool air in. Windows rated for typhoons already meet air infiltration requirements.
  - “Cool Roofs”. Everyone knows the benefit of a power washed roof. Minimal cost impact for rated material.
  - Insulate the roof. Concrete roofs are a huge thermal mass.
  - Insulate the walls. Feel your walls on a hot, sunny day.
  - Tint windows and skylights. Everyone tints their cars. Same difference.
- Negotiated publishing rights with the ICC and ASHRAE.
  - Included tables from the IECC, so prescriptive users wouldn't have to purchase the IECC.

## 2014 Guam Tropical Energy Code

- The GTEC is available at:  
<http://www.guamenergy.com/outreach-education/guam-tropical-energy-code/>
- The Guam Building Code Council can be reached at [contact@guambcc.org](mailto:contact@guambcc.org)
- My name is Brent Wiese, Chairman of the GBCC, and can be reached at [wiese@guambcc.org](mailto:wiese@guambcc.org)



GUAM BUILDING CODE COUNCIL

Thank You

