



WHAT IS A SUSTAINABLE BUILDING?

GREEN

ENVIRONMENTAL

HIGH PERFORMANCE

ENERGY EFFICIENT

CARBON NEUTRAL

NET-ZERO

SUSTAINABLE

WHAT DOES SUSTAINABLE EVEN MEAN?

Merriam-Webster

- capable of being sustained
- a: of, relating to, or being a method of harvesting or using a resource so that the **resource is not depleted or permanently damaged** (sustainable techniques) (sustainable agriculture)
- b: of or relating to a lifestyle involving the use of sustainable methods (sustainable society)

Brundtland Commission

- Sustainable development is "development which meets the needs of **current generations without compromising the ability of future generations** to meet their own needs".

John Elkington

- “Triple Bottom Line”
- "social, economic and environmental" or "people, planet, profit"

HOW DO WE TRANSLATE THAT TO THE
BUILT ENVIRONMENT?

Wikipedia

- The philosophy of designing physical objects, the built environment, and services to comply with the principles of social, economic, and ecological sustainability
- The intention of sustainable design is to "eliminate negative environmental impact completely through skillful, sensitive design". Manifestations of sustainable design require **no non-renewable resources**, impact the environment minimally, and **relate people with the natural environment**.
- Beyond the "elimination of negative environmental impact", sustainable design must create **projects that are meaningful innovations that can shift behavior**. A dynamic balance between economy and society, intended to generate long-term relationships between user and object/service and finally to be respectful and mindful of the environmental and social differences.
- Common Principles – Low-impact materials, energy efficiency, reuse and recycling, carbon footprint and life cycle assessment, sustainable design standards, biomimimcry, renewability, robust eco-design.

About.com

- Green architecture, or green design, is an approach to building that minimizes harmful effects on human health and the environment. The "green" architect or designer attempts to safeguard air, water, and earth by **choosing *eco-friendly* building materials and construction practices.**
- Green building uses construction practices and materials that are environmentally responsible and resource-efficient from the design phase **through to maintenance, and ideally to renovation and deconstruction** as well.

COTE

- Thought design that integrates architecture, technology, and natural systems
- Sustainability **envisions the enduring prosperity of all living things.**

Sustainable design seeks to create communities, buildings, and products that contribute to this vision.

To paraphrase educator and author David Orr: Sustainable design is the careful meshing of human purposes with the larger patterns and flows of the natural world.

To paraphrase architect Bill Reed: Sustainable design is a process that supports and **improves the health of the systems that sustain life.**

EPA

- Green building is the practice of creating structures and using processes that are **environmentally responsible and resource-efficient throughout a building's life-cycle** from siting to design, construction, operation, maintenance, renovation and deconstruction. This practice expands and complements the classical building design concerns of economy, utility, durability, and comfort. Green building is also known as a sustainable or high performance building.

McGraw Hill

- We define green building as one **built to LEED standards**, an equivalent **green building certification program**, or one that incorporates numerous green building elements across five category areas: energy efficiency, water efficiency, resource efficiency, responsible site management and improved indoor air quality. Projects that only feature a few green building products (e.g., HVAC systems, waterless urinals) or that only address one aspect of a green building, such as energy efficiency, are not included in this calculation.

WHAT DO DIFFERENT SUSTAINABLE
BUILDING GOALS MEAN THEN?

LEED

- Transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life
- **High performance in key areas of human and environmental health:** sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality.

Net Zero Energy

- A building that, on an annual basis, **produces as much energy as it uses**. This means that at certain times of the year it may produce more energy than it needs, while at other times it produces less. The balance is traded back and forth between the building and utility company in the form of electricity.

Carbon Neutral

- A building that **uses no fossil fuels in its operation**, creates no direct greenhouse gases, and, as a result, does not contribute to global warming. The energy it uses may be produced on site or may be drawn from a utility grid but it must be "clean," produced by wind turbines, photovoltaics, or other renewable energy system.

Living Building

- A structure that **generates all of its own energy** with renewable nontoxic resources, **captures and treats all of its water**, and **operates efficiently and for maximum beauty**.

Regenerative Building

- Term used to describe buildings that **generate more power than they use and share the power with other users**. The basic concept is that the building goes beyond being a building that is less harmful to the environment than other buildings; it is a building that actually **improves the environmental damage from other buildings**. For example, buildings in urban areas take in contaminated air from the outside and filter it for the building occupants. The end result is that the air leaving the building is cleaner than the air outside the building, and people outside the building benefit from the cleaner air.

IS IT A MEASUREMENT OR A FEELING?

Recycled/Durable/Local Materials



Concrete



Steel

Natural/Low-Embodied Energy

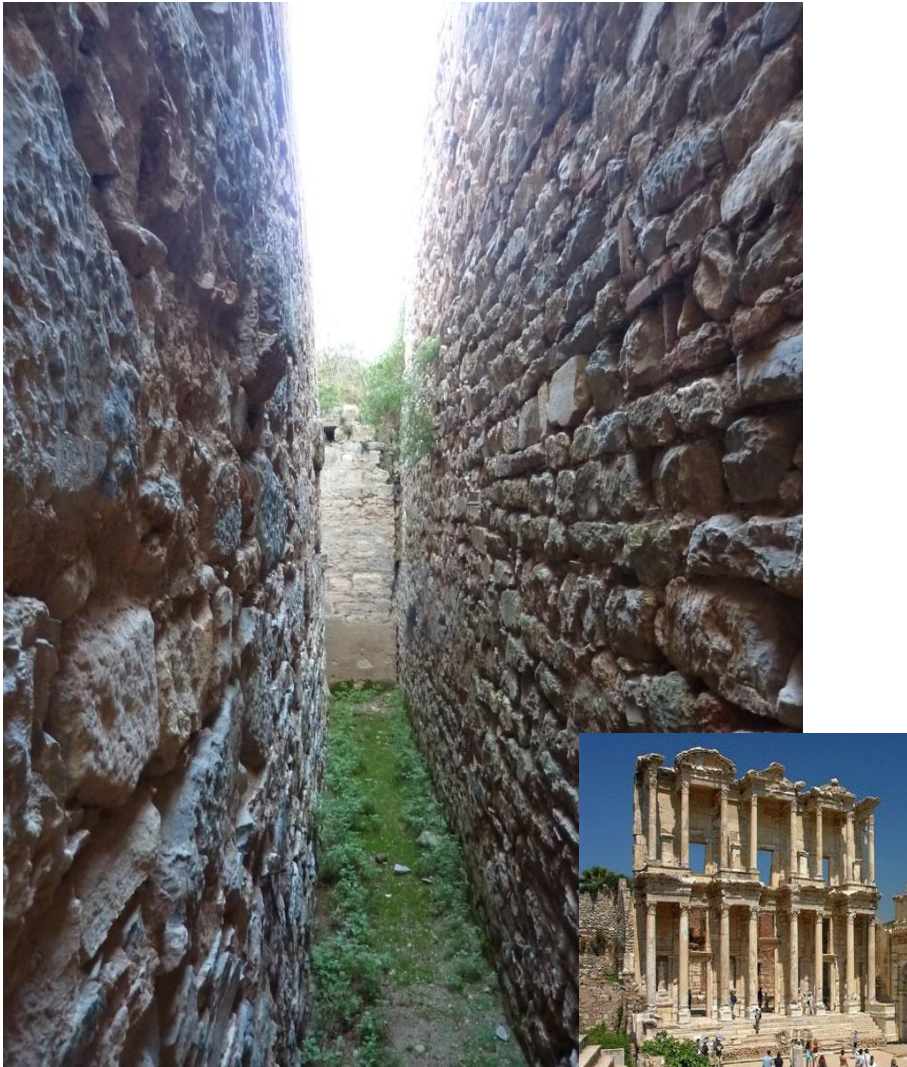


Bamboo



Rammed Earth

Durable



Roman Library of Celsus in Ephesus, Turkey



Palace of Versailles, France

Adaptable & Temporary



Shigeru Ban's Paper House, Japan



Wampanoag Wetu, Massachusetts

Urban/Existing Infrastructure



Atlantic Wharf, Boston



Bank of America Tower, New York

Low Impact Development



Omega Institute, Rhinebeck, NY



Evelyn P. Tyner Interpretive Center, Glenview, IL

Passive Strategies



Trombe Wall



Natural Ventilation

High Technology

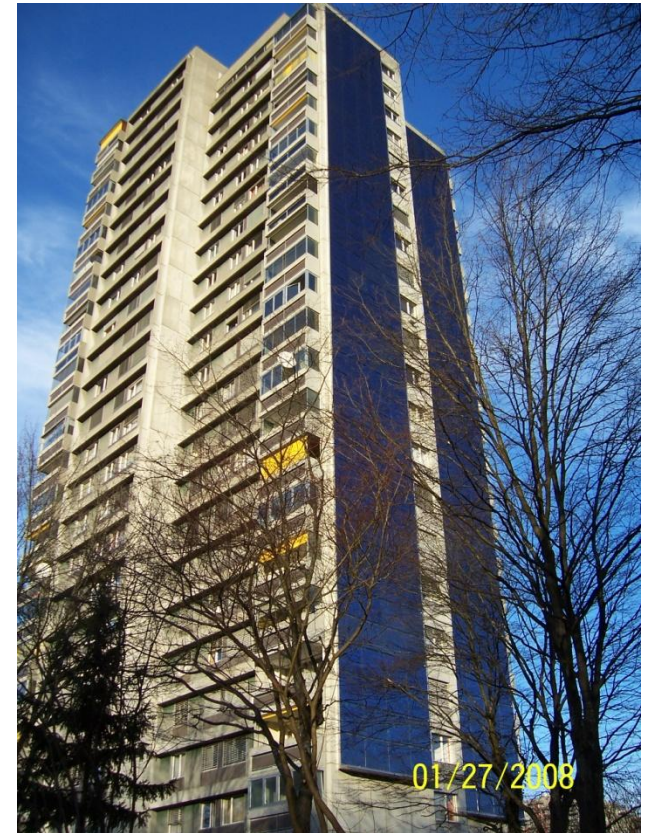


Double Skin Façade



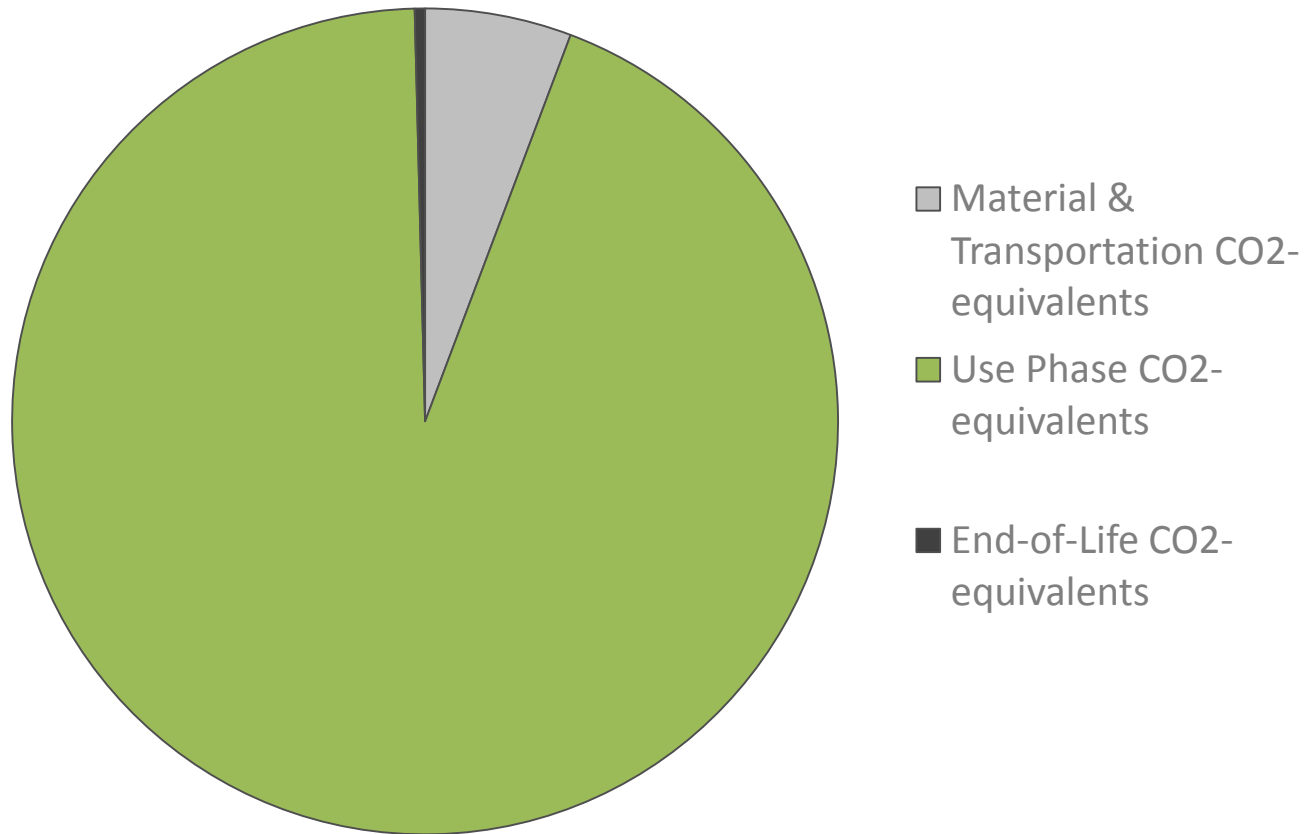
Advanced Control Systems

Renewable Energy

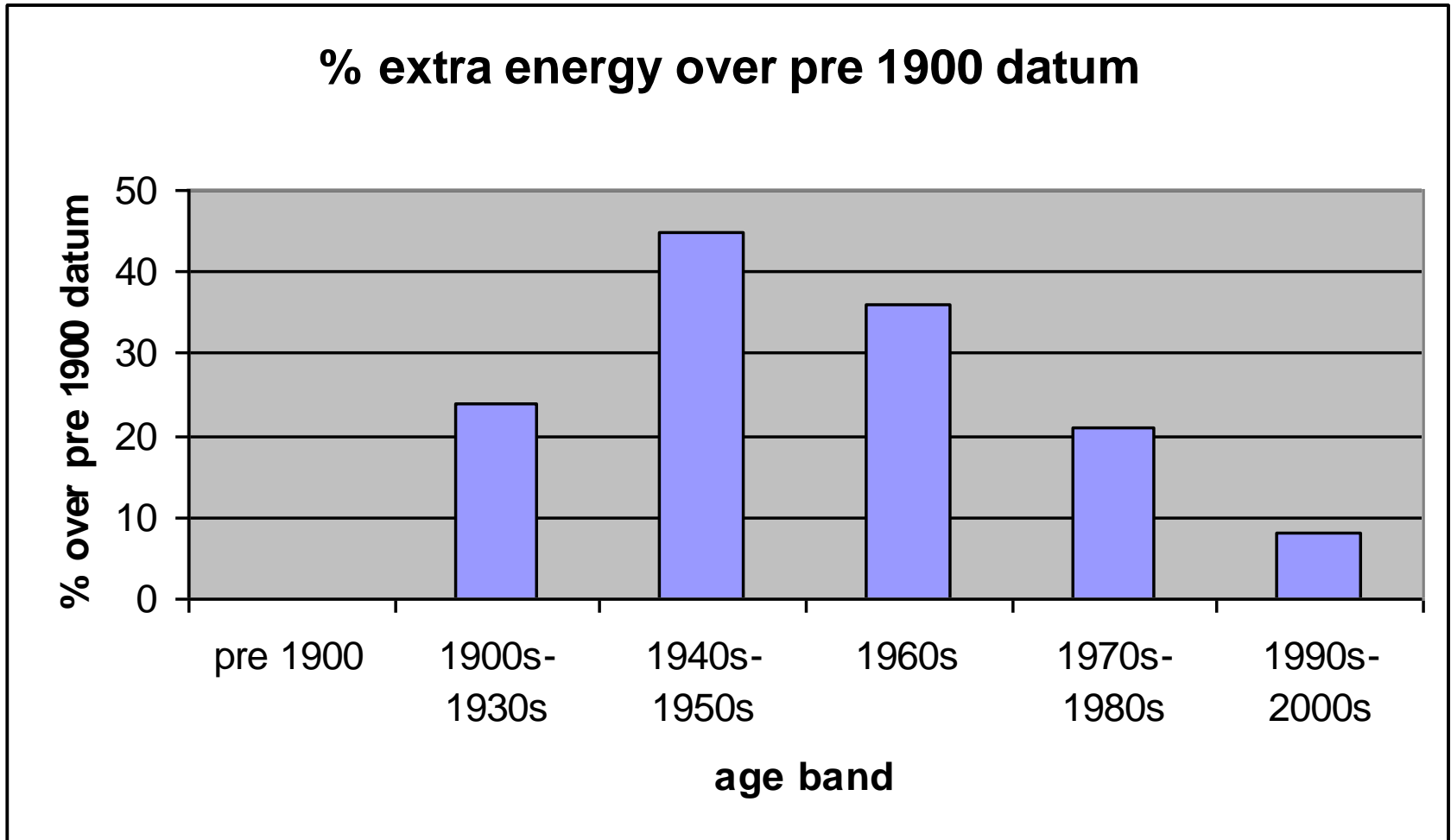


HOW ARE WE DOING?

Life Cycle Emissions



Age of Building & Energy Usage



Predicted vs. Actual

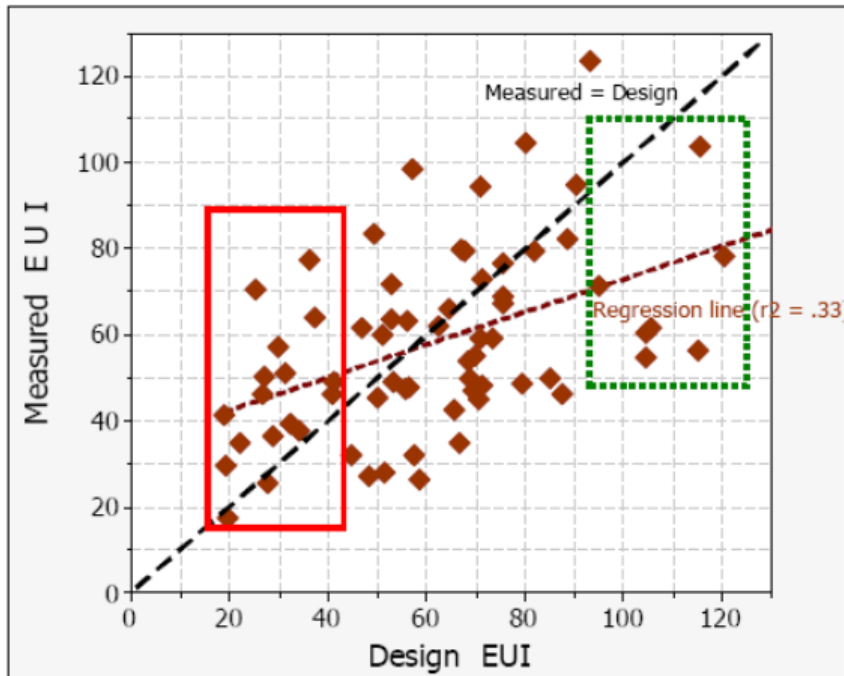
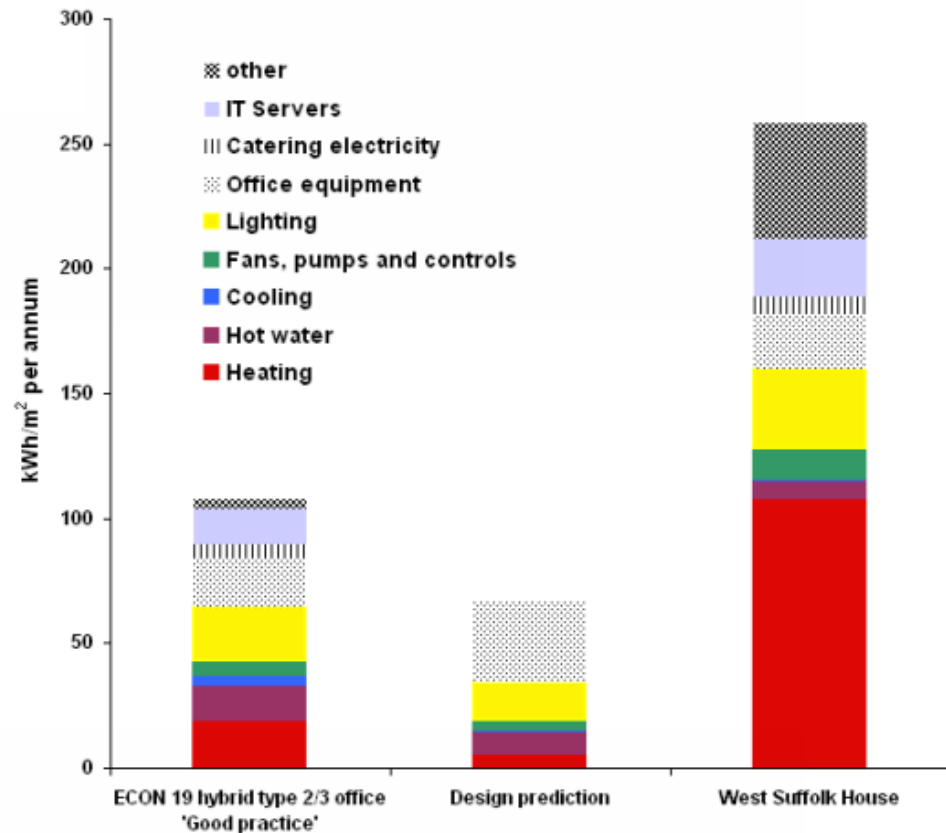
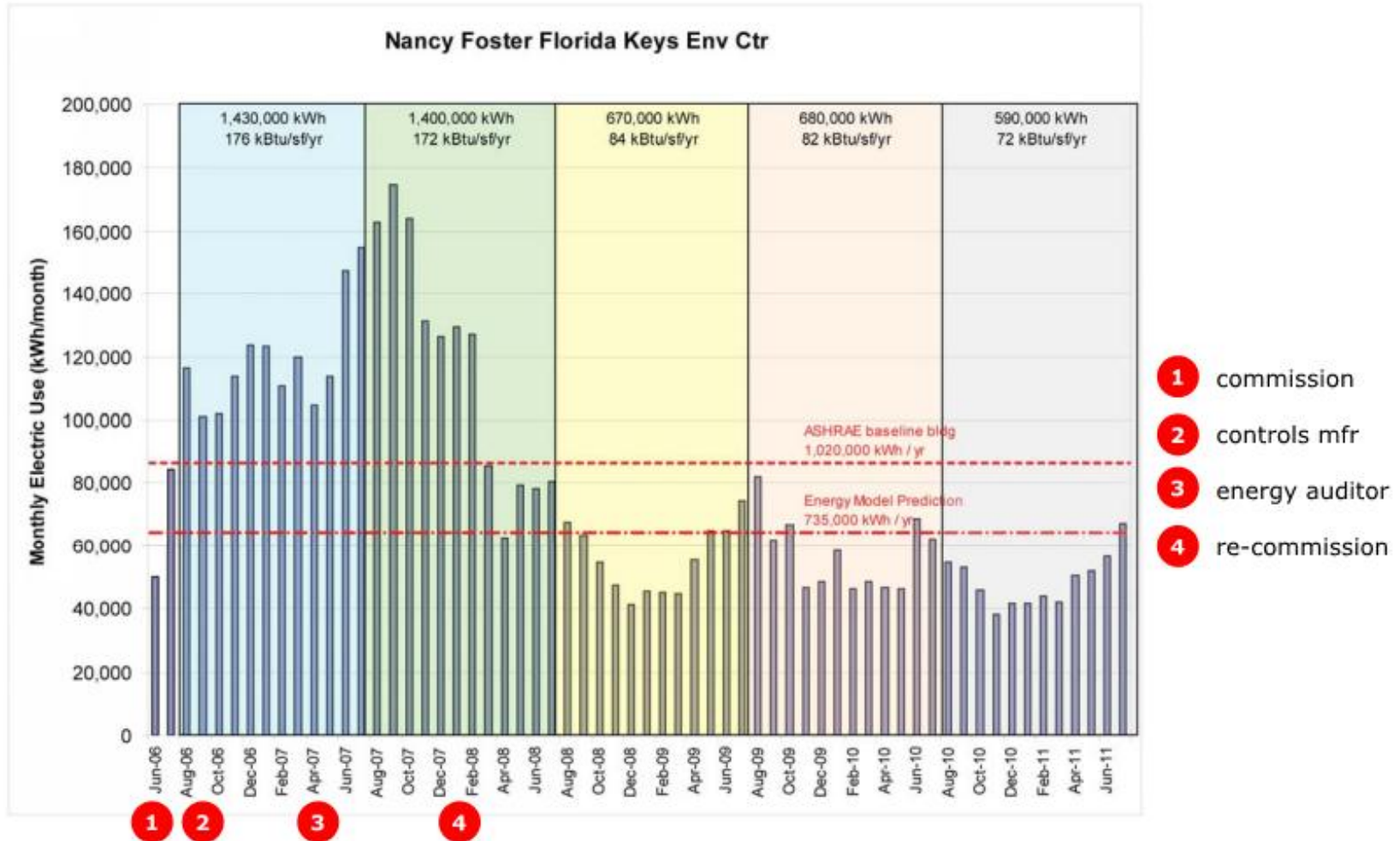


Figure 21: Measured versus Design EUIs (kBtu/sf)

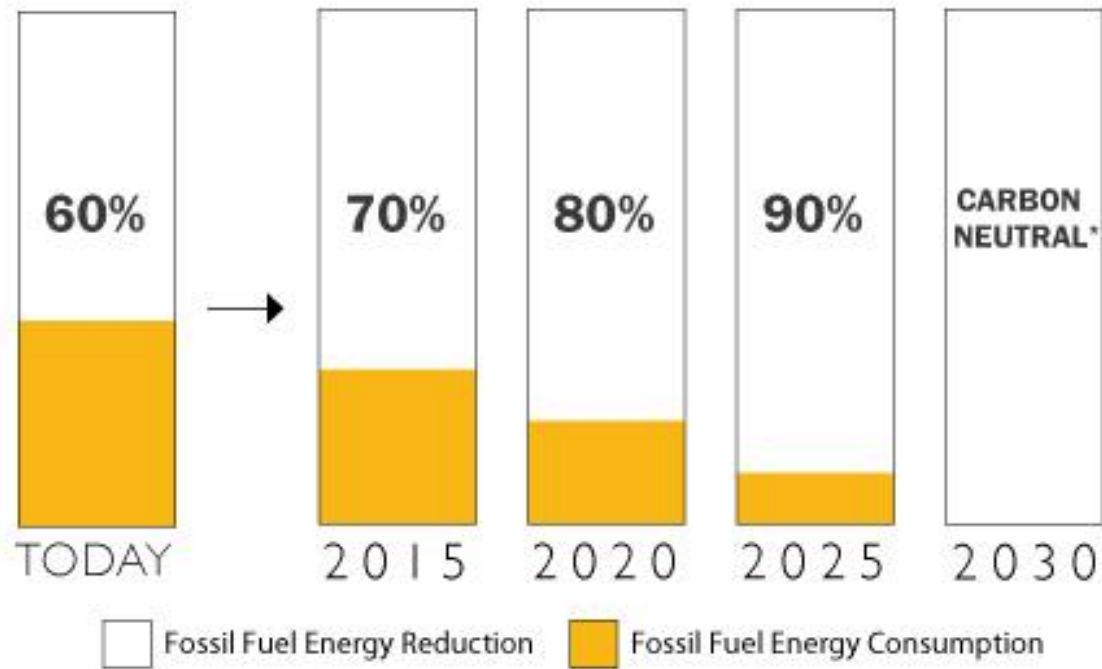
Initial energy consumption at West Suffolk House, October 2009 to November 2010



Predicted vs. Actual



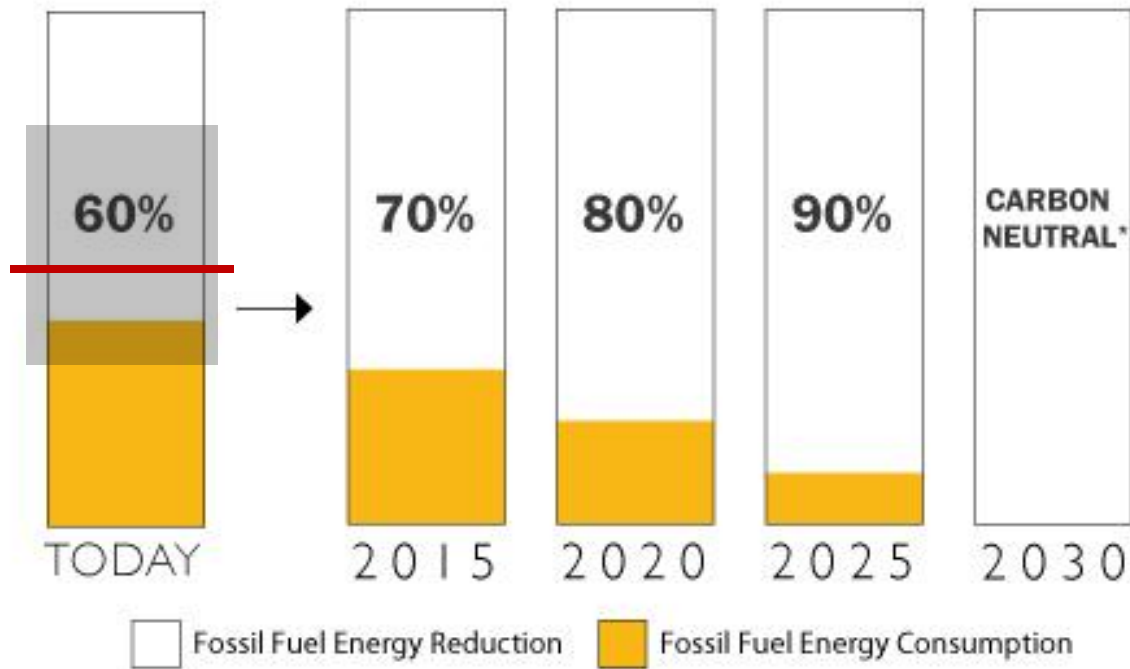
2030 Commitment



The 2030 Challenge

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*Using no fossil fuel GHG-emitting energy to operate

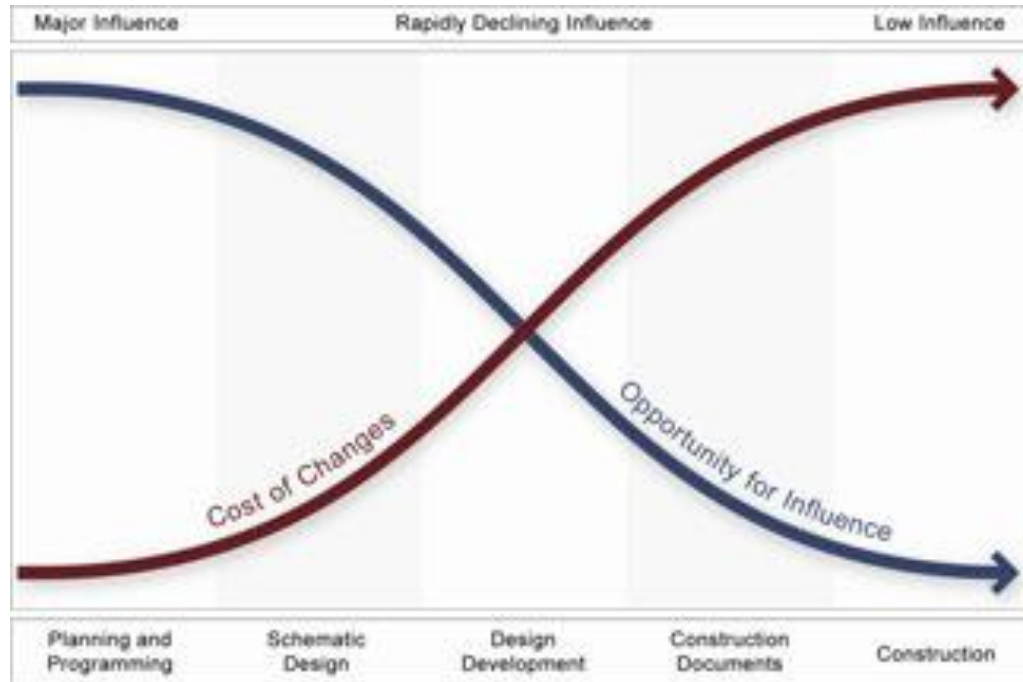
2030 Commitment at Payette



The 2030 Challenge

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*Using no fossil fuel GHG-emitting energy to operate

Process Integration



WHAT SHOULD WE BE DOING?

What should we be doing?

- Energy should be the 1st priority
- Setting Measurable/Definable Goals
- Predict early & measure late in the process
- Base strategies on the fundamentals of building physics rather than iconic technologies
- Renewables are the last option, not the first
- Zero is definable – Can we hit it?

