



International Commissioning

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rmf RMF Engineering
Reliability. Efficiency. Integrity.

AIA Quality Assurance



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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.



Learning Objectives

At the end of this session participants will be able to:

1. Demonstrate universal value of the Building Commissioning Process
2. Identify differences in design approach and installations in various areas outside of the USA
3. Highlight challenges and benefits of commissioning in a global market
4. Think "outside of the box", both in the home sector and abroad

**Design
Review**



**Commissioning
Plan**



**Component
Verification**



**System
Verification**



Training



**Project
Closeout**

- **Review of Concepts**
- **Who, What, Where, When, How**
- **Prefunctional Checklists**
- **Functional Performance Testing**
- **System Specific Understanding**
- **Final Documentation**







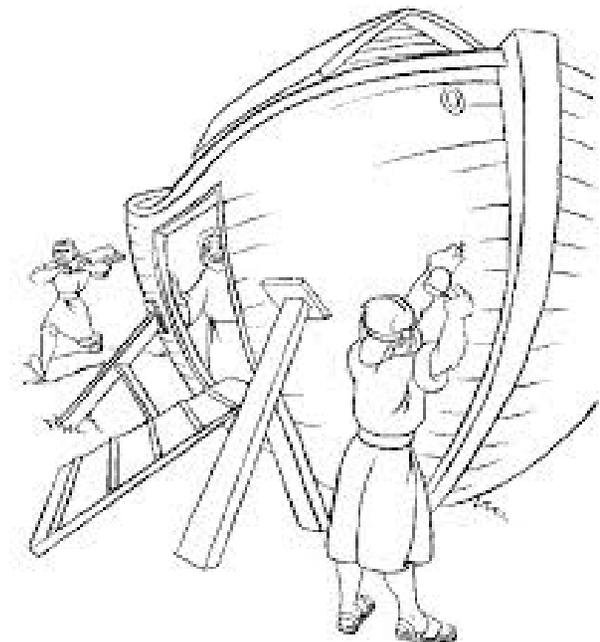
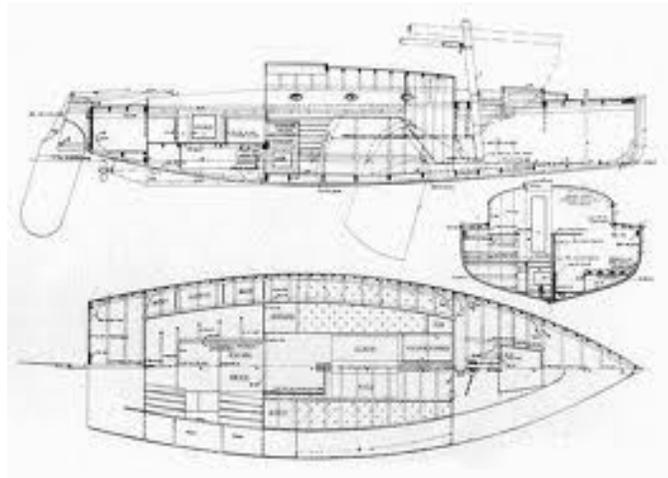


The term “commissioning” comes from shipbuilding. A commissioned ship is one that has been deemed ready for service. Prior to being awarded this title though, a ship must meet certain criteria:

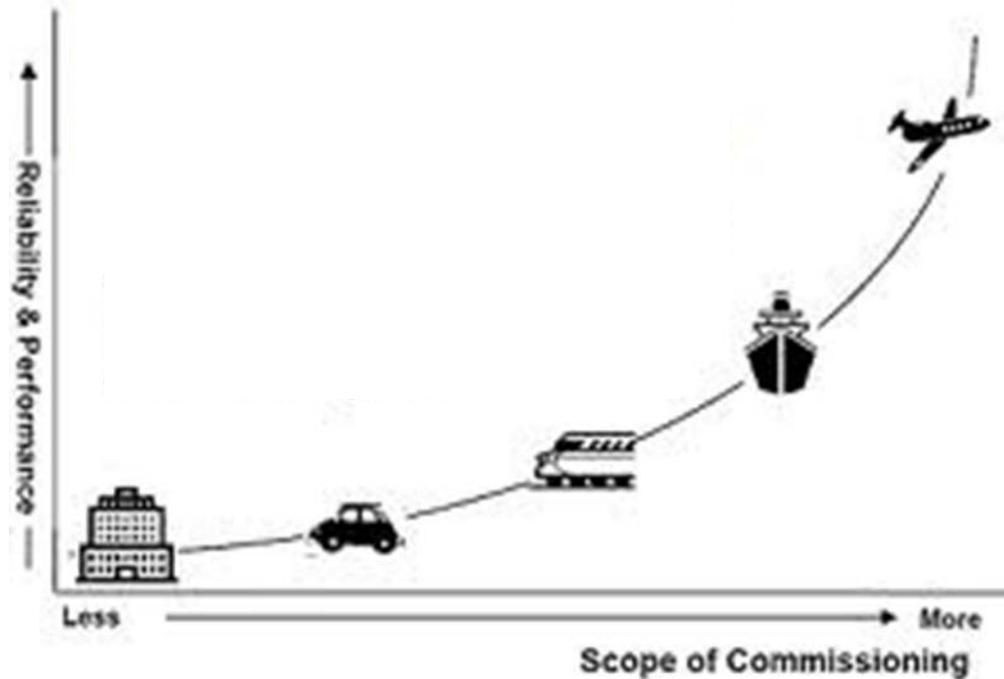
Equipment and systems are installed and tested.

Problems are identified and corrected.

The operating crew is thoroughly trained.



Imagine if Airplanes were Designed, Built, Commissioned, and Maintained in the same way we handle our Buildings...



Now imagine if international airline safety standards varied as greatly as facility construction standards and building codes around the world.





Thankfully, buildings rarely fail catastrophically. Instead, they routinely exhibit chronic operations problems and poor energy performance.

We need to become more conscious of ways to implement true commissioning processes and intent to our built environment....globally.

International Building Commissioning

Building Commissioning has international roots – stemming from a need to minimize construction problems, meet project goals, and predict/manage operating costs.

- First organized structuring dates to the 1960's – primarily in the United Kingdom and the United States.
 - UK = BREEAM - 1990
 - (Building Research Establishment Environmental Assessment Methodology)
 - 250,000 certifications & over 1,000,000 registered for certification
 - Mostly in the UK, and more than 50 countries around the world
 - US = LEED – 1994-1998
 - (Leadership in Energy & Environmental Design)
 - More than 60,000 registered and certified projects
 - Mostly in the US, and over 30 other countries

BREEAM[®]

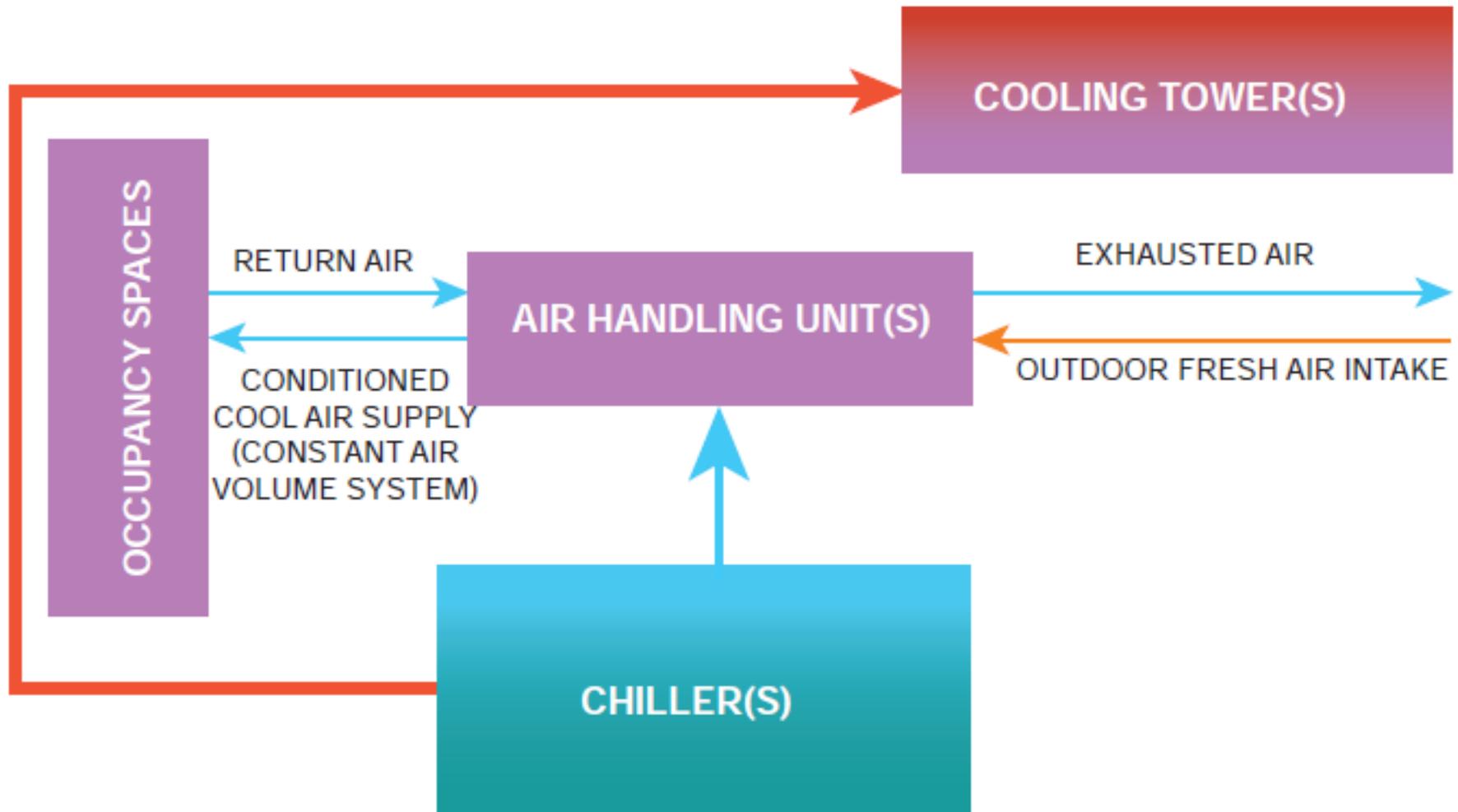


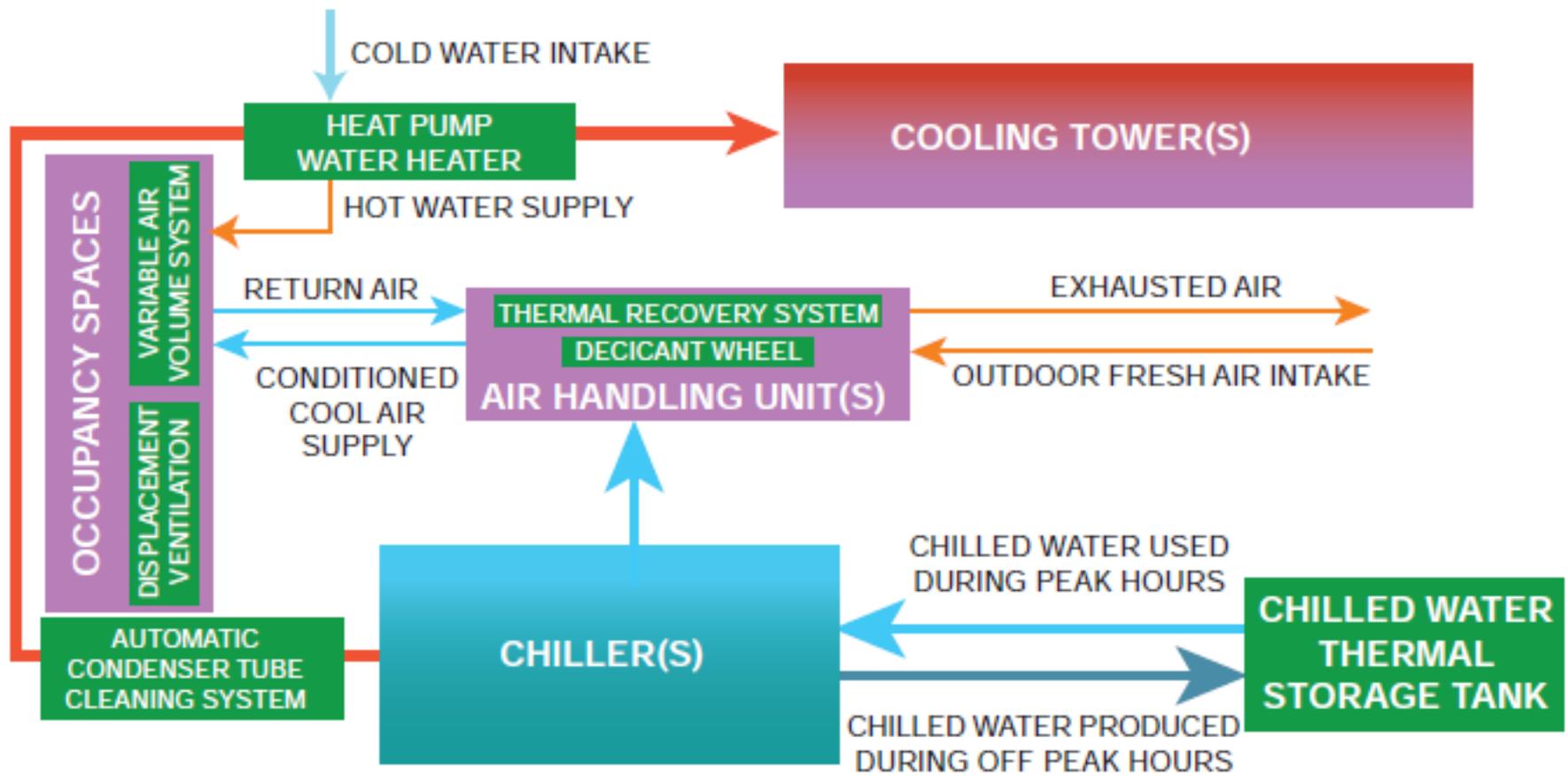


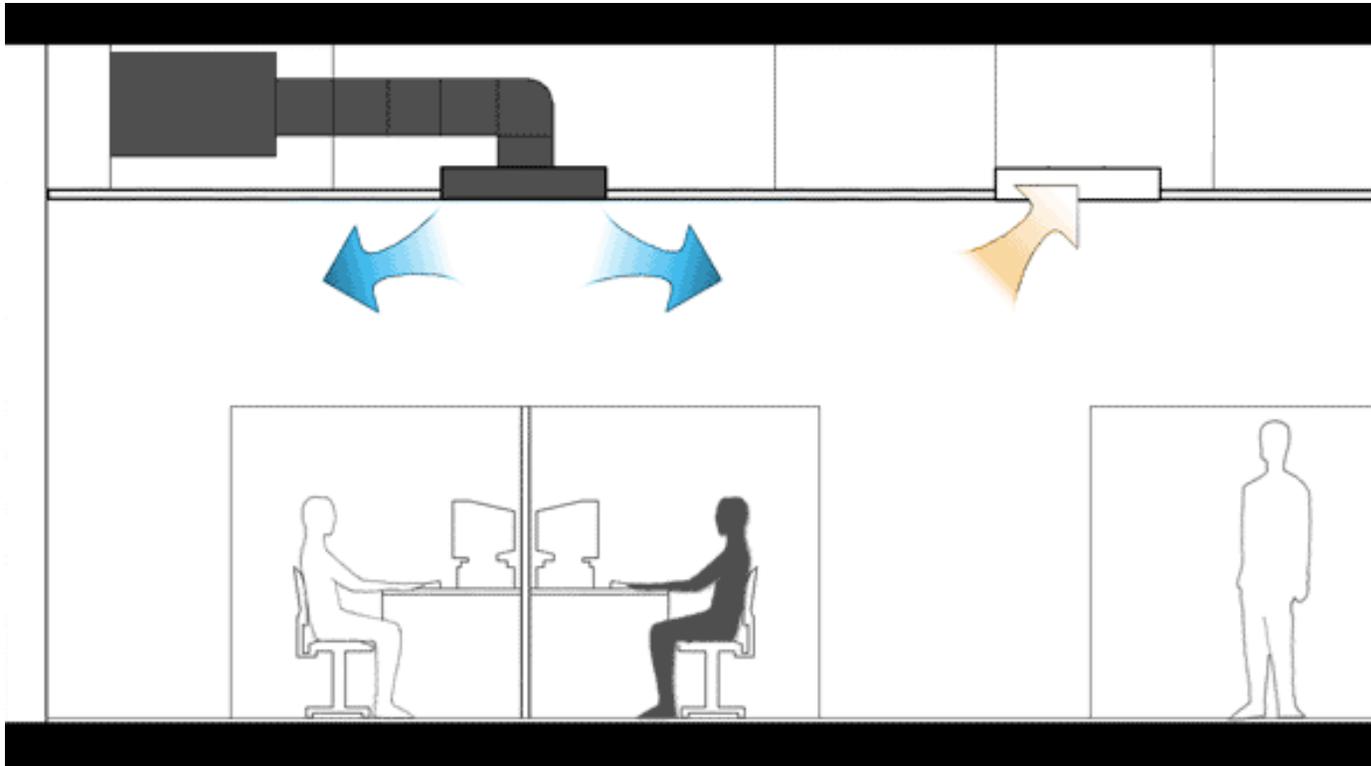
International Building Commissioning

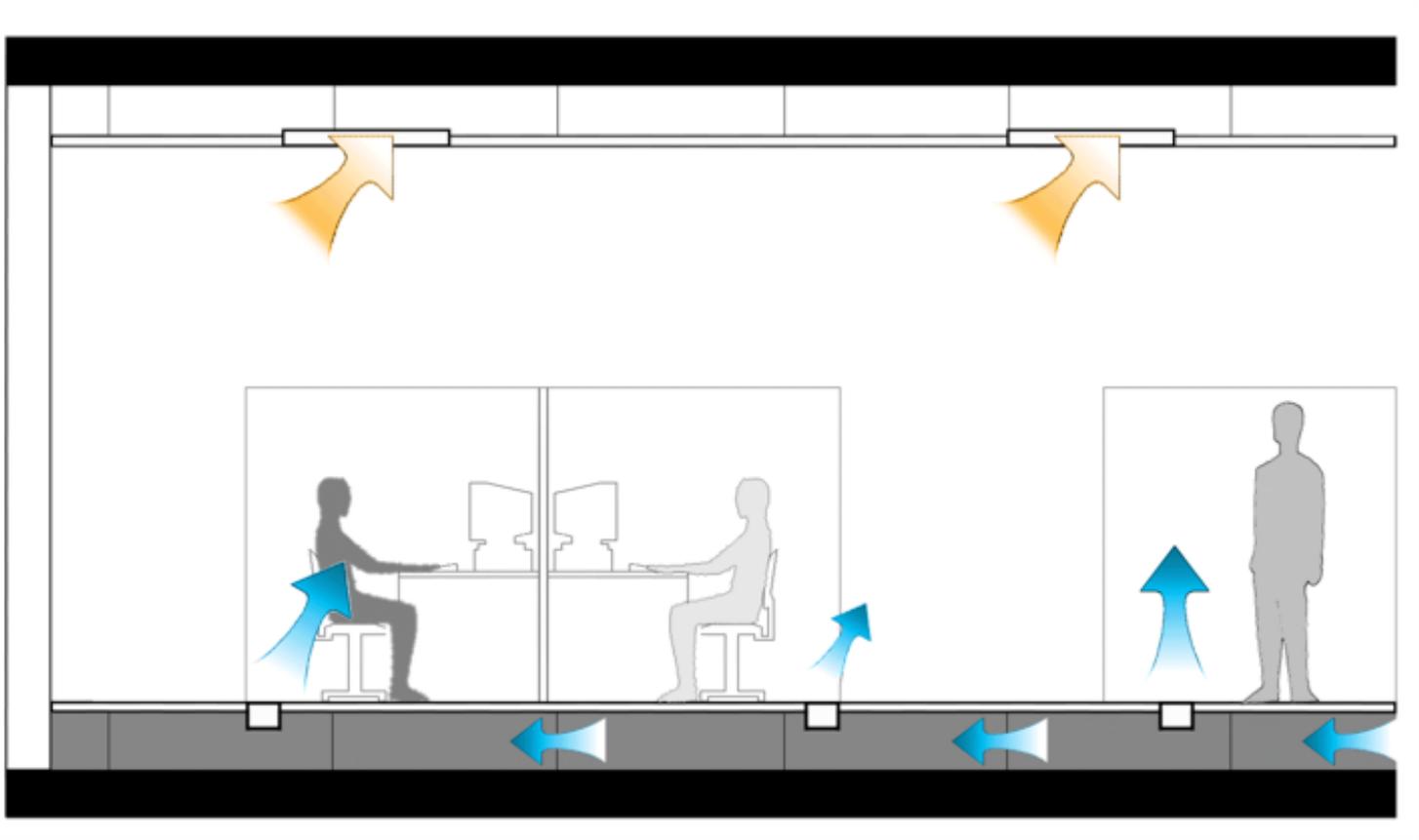
Even with over 25 years of formalized sustainability and Building Commissioning processes in place, most international entities are only recently embracing the notion.

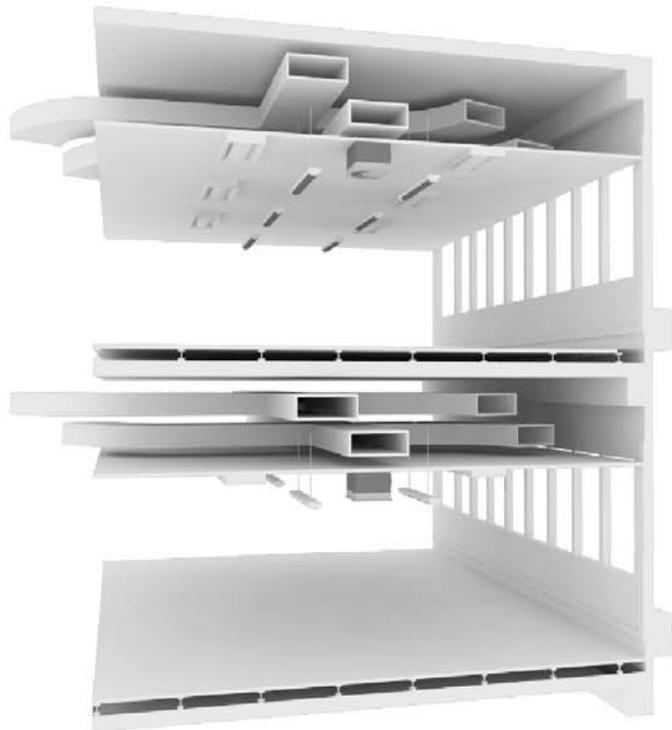
- No specific standards exist for International Commissioning
 - BCA – The Building Commissioning Handbook
 - ASHRAE Standard 202 – Cx Process for Buildings and Systems
- Global building and energy codes vary greatly – often based on climate and culture.
 - Experience from one region may prove beneficial for other areas.
- Local codes generally prevail
 - Commissioning provider must familiarize and advise as necessary.



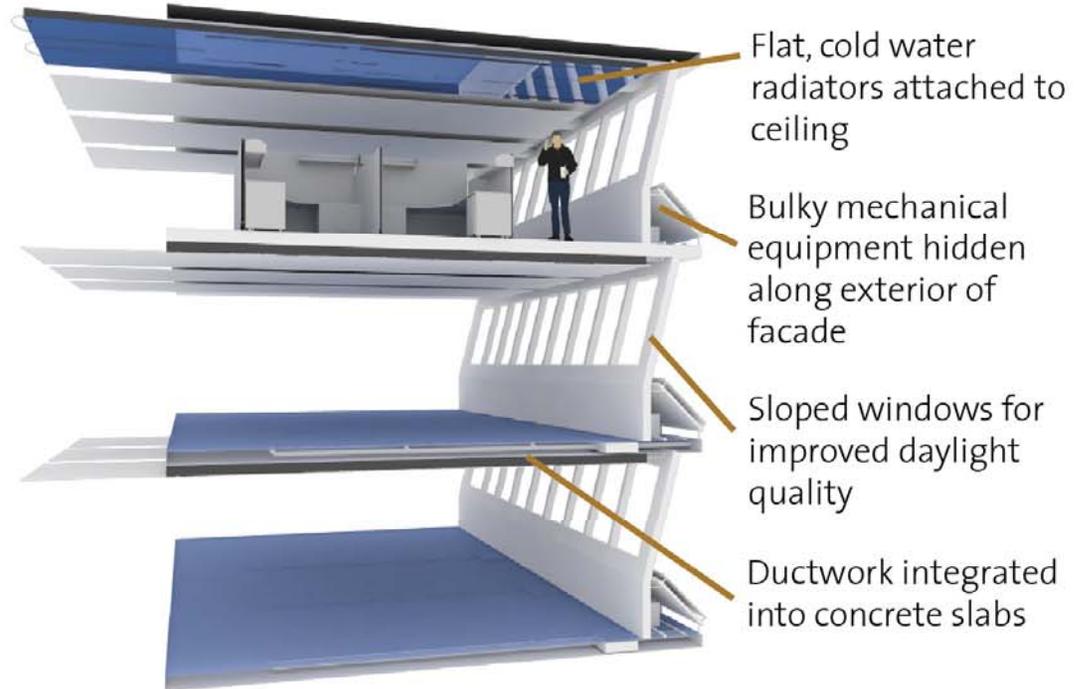




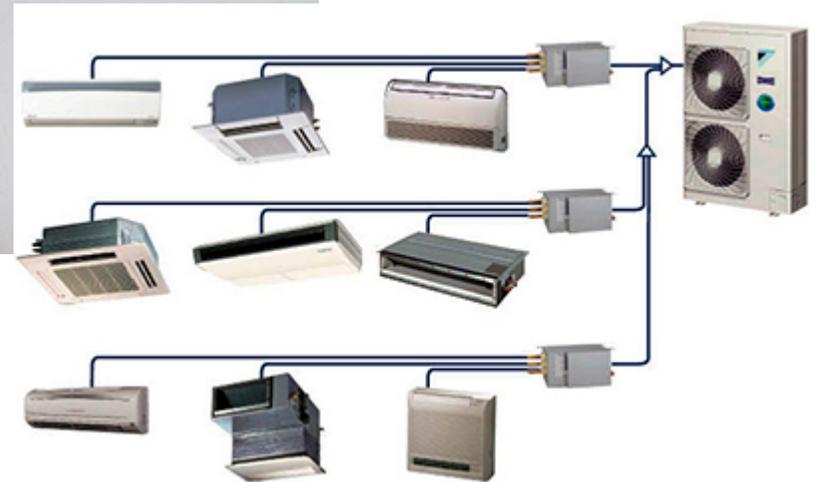




Conventional building



'3for2' building













1.08 x CFM x Delta T (F)



Sensible Heating or Cooling Loads

$$Q = 1.08 \times cfm \times \Delta t$$

Where :

Q = Load in btu/hr

1.08 = A units conversion constant

cfm = Flow rate in cubic feet per minute

Δt = Temperature difference across the element in °F



1.23 x L/S x Delta T (C)



500 x GPM x Delta T (F)



Formulas — Air vs. Water

$$\text{CFM} = \frac{\text{BTUs}}{\Delta T \times 1.08}$$

AIR

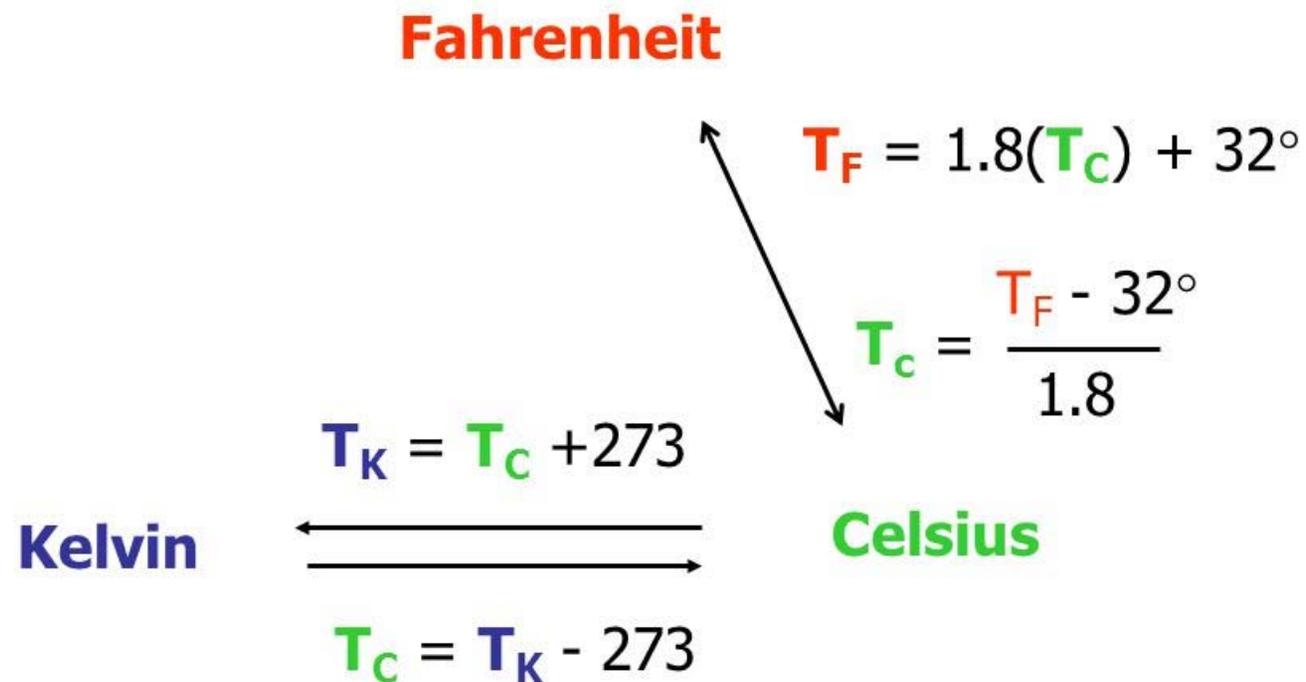
$$\text{GPM} = \frac{\text{BTUs}}{500 \Delta T}$$

WATER



4.19 kJ/kg x L/S x Delta T (C)

Temperature Conversion



No Cussing!

The following 4-Letter
Words are forbidden here:

Inch

Mile

Foot

Pint

Yard

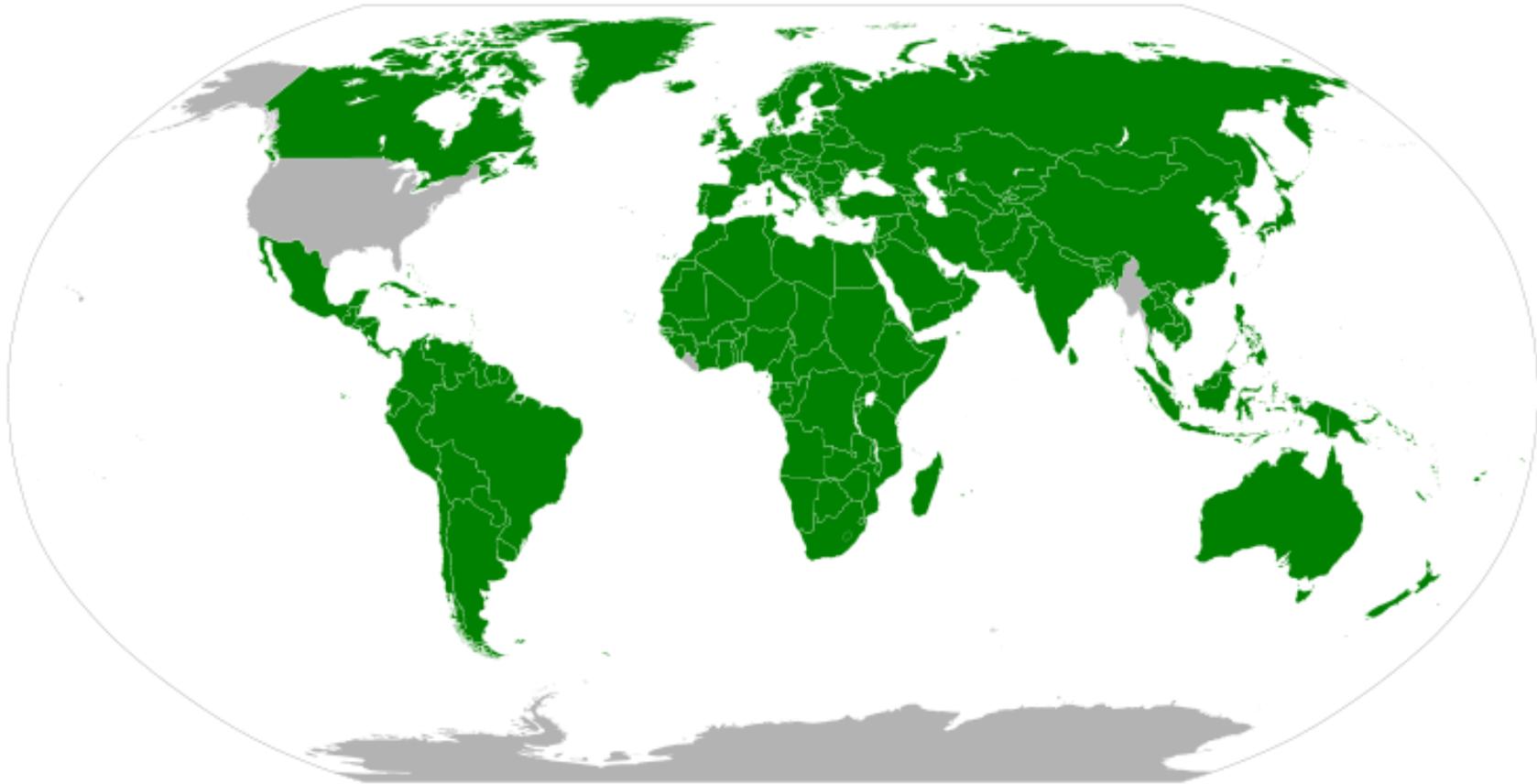
Acre

And we never swear the **Big F** (use °C)

Please keep it clean and

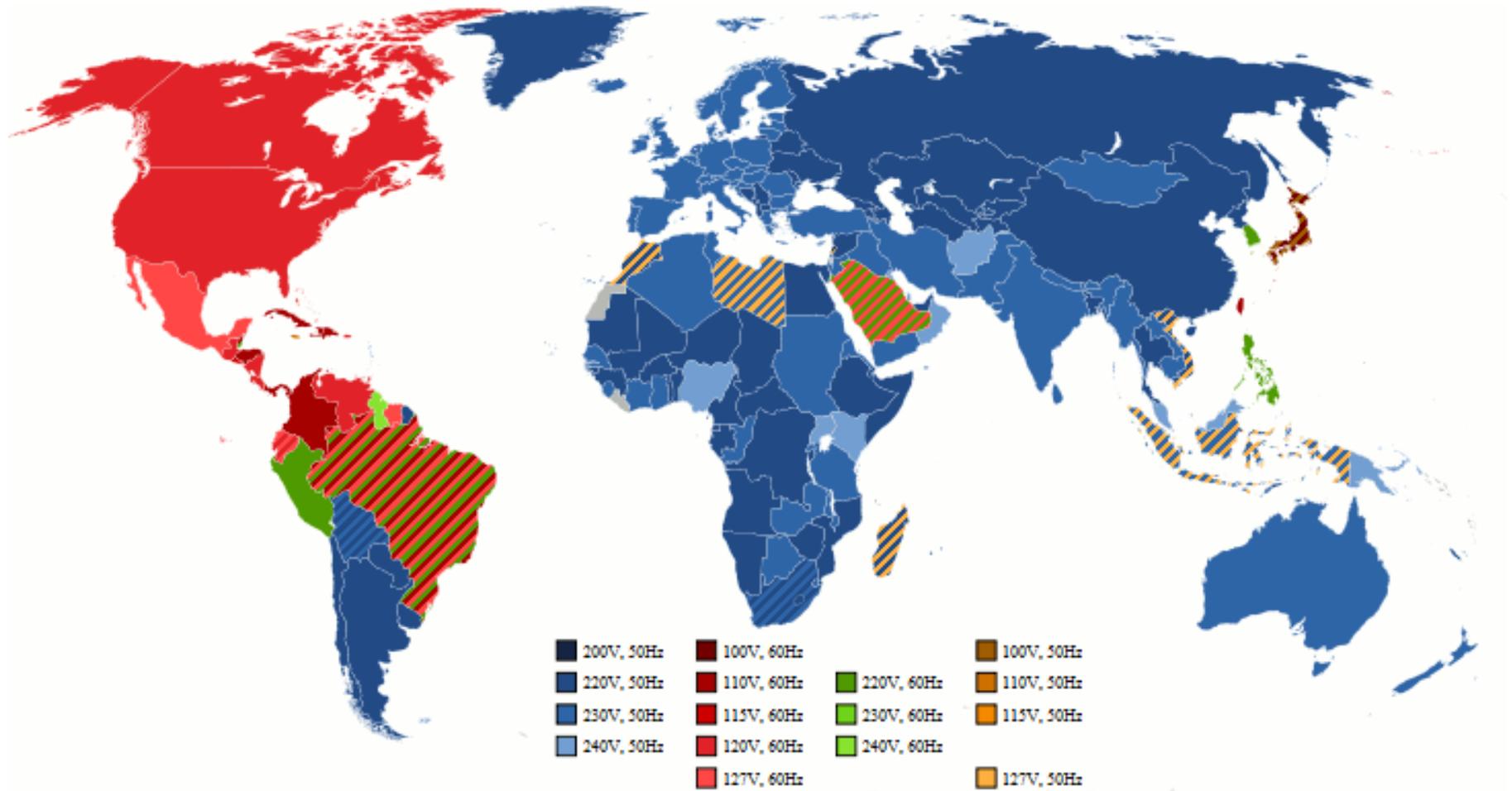
Metric

Metric System Adoption



-  Countries which have officially adopted the metric system
-  Countries which have not officially adopted the metric system (US, Myanmar, Liberia)

World Voltage / Frequency Map



Other International Commissioning Challenges

Time

- Differences in time zones from home office to project sites
 - Impacts communications, meetings, and schedules
- Travel logistics and frequency
 - Can often take days (each way), and security may be a concern
- Site duration, efficiency and productivity
 - Information exchange and networks/communications can be spotty



Other International Commissioning Challenges

Training

- More – much, much more than you probably expect!
 - Comprehensive & continuous – beyond typical construction industry
- Not just MEP Systems and/or O&M focused
 - Anticipate need for basic fundamentals and design theory as well
- Early and Often
 - Consider incorporating assessment and/or training into kick-off



Other International Commissioning Challenges

Culture

- Multi-faceted influences and impact potential
 - Social and religious, work ethic, business philosophies
- Ensure your team is trained in the host country etiquette
 - Asses importance of formalities and avoid inadvertent “slip-ups”
- Prioritize establishing a Positive Commissioning Culture
 - Patience, coaching, motivation, constructive cooperation are key





Instead
of thinking
outside the box,
get rid of the box.

Deepak Chopra

Consider opportunities for us to think outside of the typical “Design Box”.

We like to believe that we are on the leading edge of design innovation and energy-efficiency...when we are often late to that party based on certain “standard approaches” in other countries.

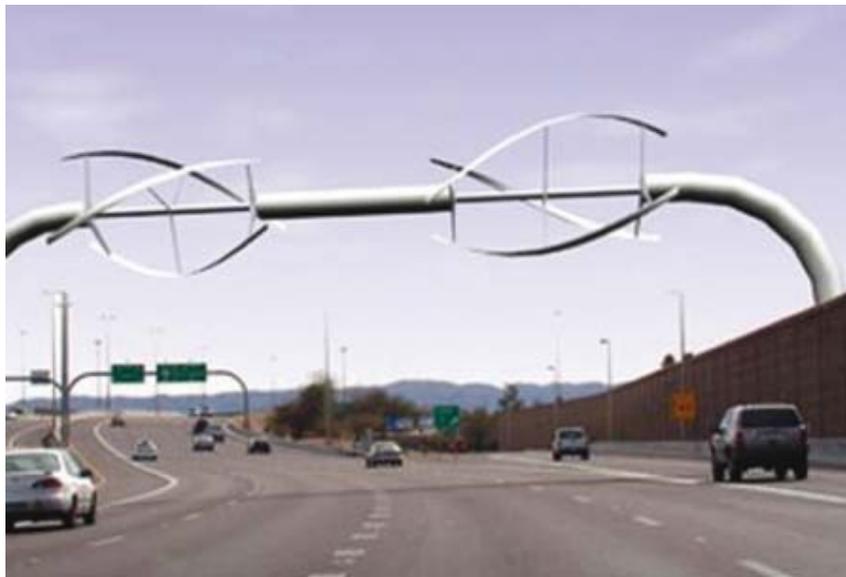




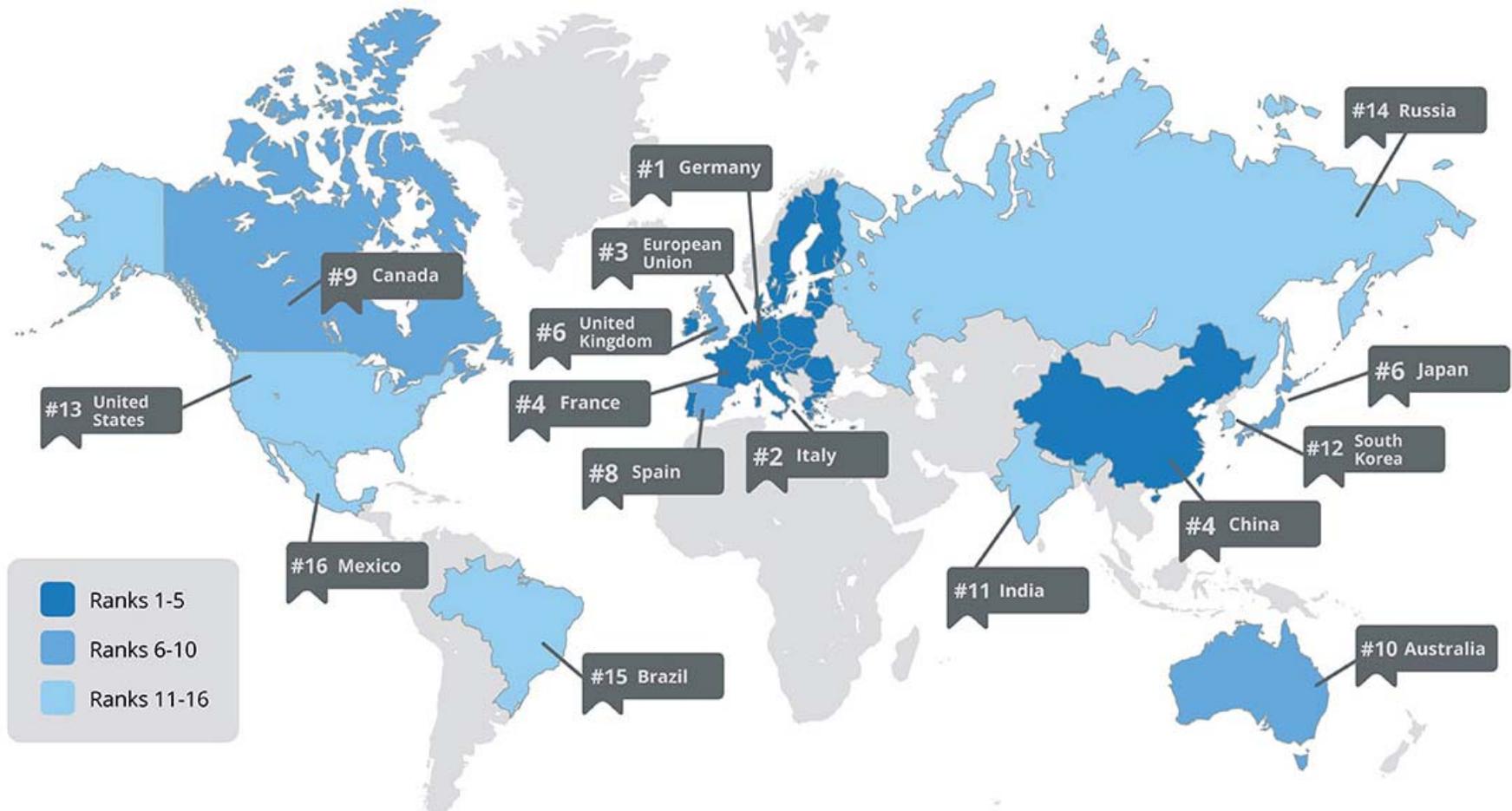








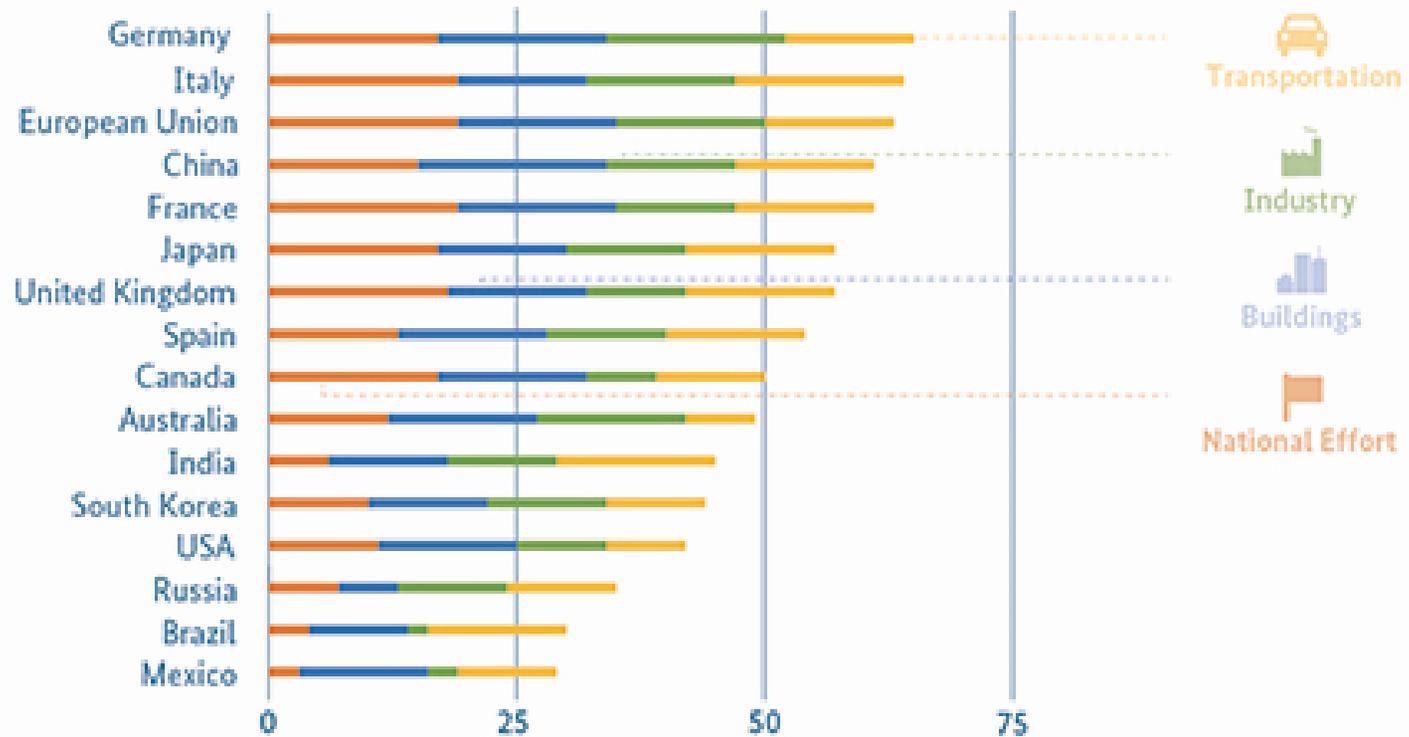
The World's Most Energy-Efficient Countries



American Council for an Energy Efficient Economy (ACEEE) International Scorecard
Factoring Buildings, Industry, and Transport

Courtesy Ben Schiller, 2014

US-Study: Germany is world champion in energy efficiency





The U.S does best in the Buildings category – Ranking 8th overall

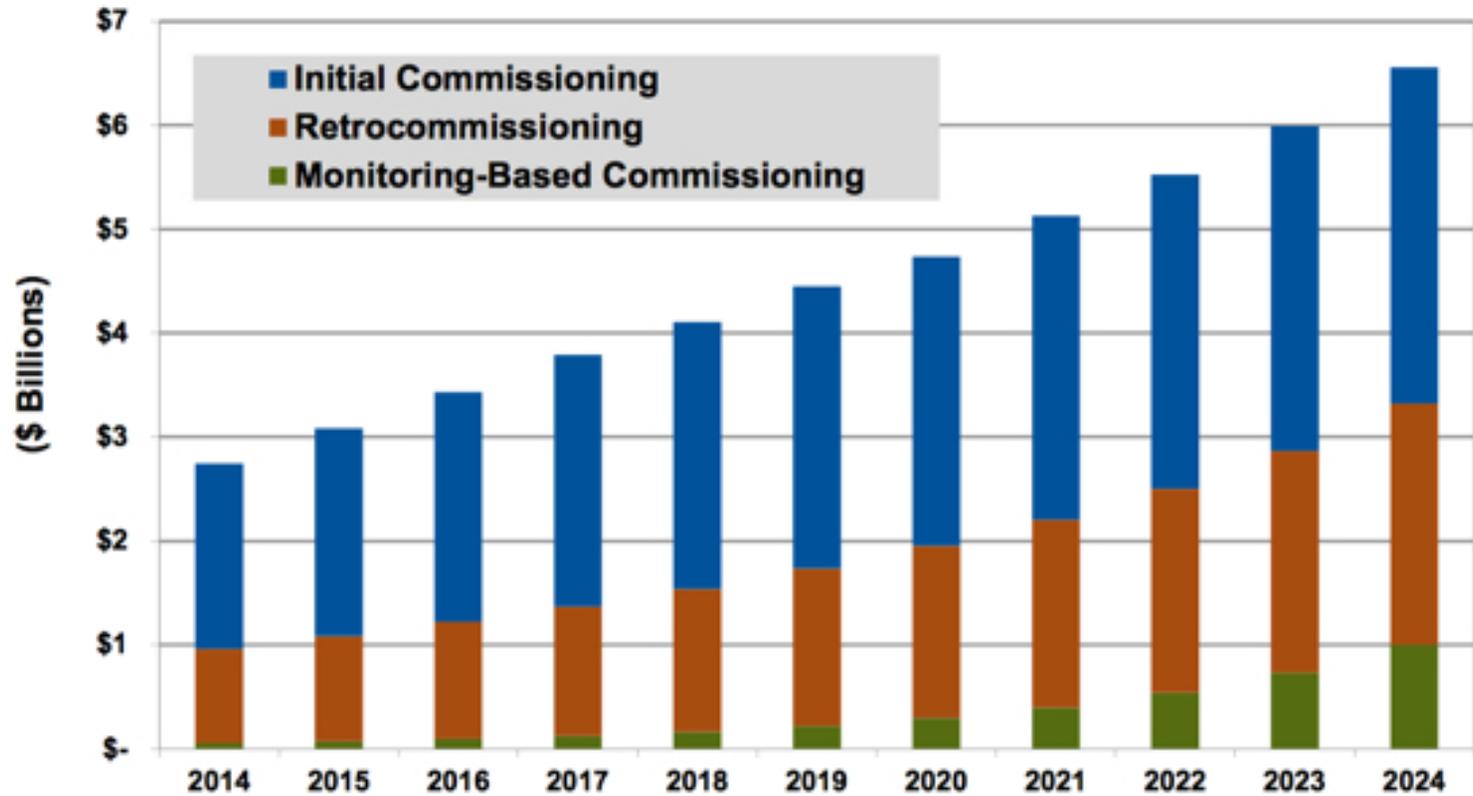
- The United States has made some progress toward greater energy efficiency in recent years, particularly in areas such as building codes, construction standards, and voluntary partnerships between government and industry.
- A collective pat on our backs for the positive impact of the Commissioning Process and improved industry awareness.

The U.S. ranks worst for Transportation – 15th (out of 16 countries)

- We all know that we have room to improve here (and this is a significant influence on the overall rating)

(Consider the Future of Commissioning, and the continued impact we can impart)

Chart 1.1 **Commissioning Services Revenue by Service Type, World Markets: 2014-2024**



(Source: Navigant Research)



Summary

- Familiarity
 - Presence
 - Leadership



Thank you!

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