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ASSOCIATES**



If It Doesn't Perform, It Can't Be Green!



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Take-Aways



Green buildings are important for controlling CO₂ emissions



Many buildings do not perform as predicted or as needed



Without reporting actual performance, the entire exercise will be wasted

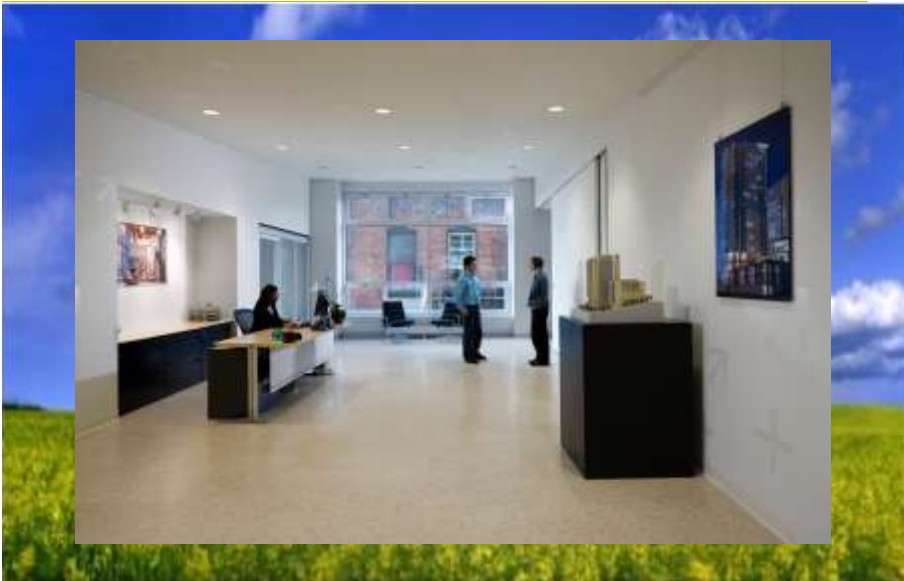


Water use an increasing concern

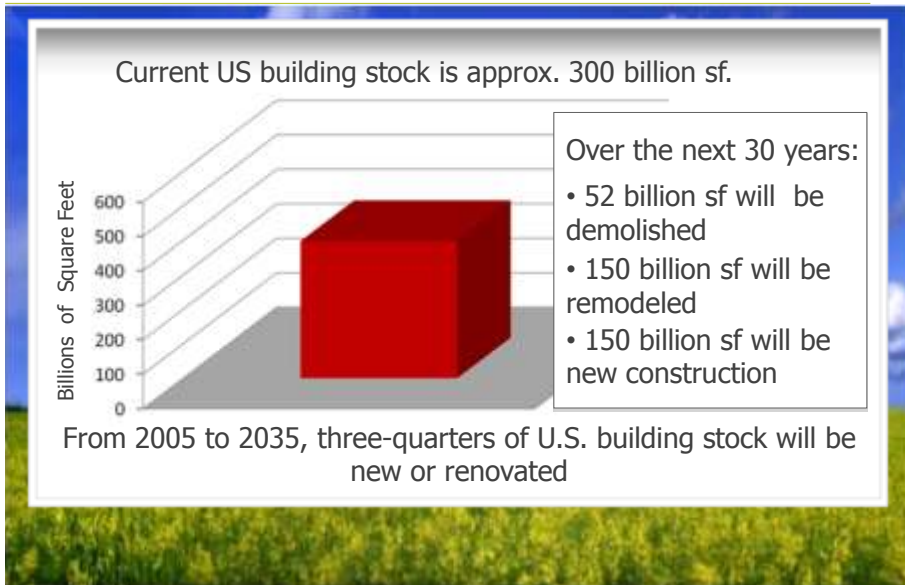
8 Testable Propositions

- Green building vital in the global carbon picture
- Green building growing rapidly in all sectors
- Green building cost-effective by almost any measure
- Many green buildings not performing as predicted
- Building energy performance reports all vitally needed
- Buildings must measure total carbon performance
- Zero-net-energy buildings are feasible today
- Water the next big issue

Green Building Important for Carbon Reduction




Our Opportunity to Build Green




Green Buildings Make Money Sense



Business Case for Green is Proven

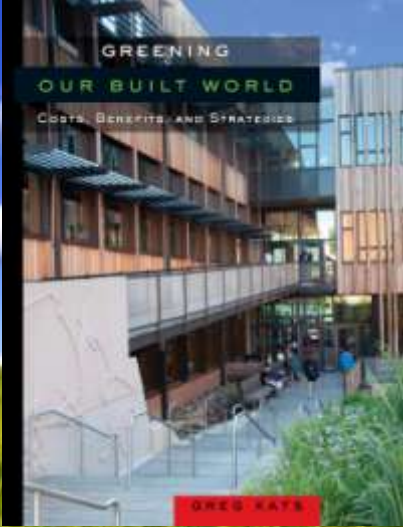


ASU Bidesign Institute B
LEED Platinum 

- Financial/economic return
- Risk mitigation
- Marketing/public relations
- Productivity/health gains
- Recruitment/retention
- Sustainability concerns

Potential Impact of Rapid Greening

- 14% reduction in CO₂, 2025 vs. 2005
- NPV of green building: \$650 billion in U.S.
 - 5x to 10x cost premium
- 2020 Prediction:
 - Green buildings 95% of new construction
 - Green retrofits are 75% of all retrofits



GREENING
OUR BUILT WORLD
COSTS, BENEFITS, AND STRATEGIES

ORIG KATZ

Green Building Is Growing Rapidly



Green Building Statistics




OREGON
HEALTH & SCIENCE
UNIVERSITY

- 30,000+ LEED registered projects (Dec. 2011)
- 10,000+ LEED certified projects (Dec. 2011)
- 175,000+ LEED Accredited Professionals

"In God We Trust; All Others Must Bring Data."
-W. Edwards Deming

Building Energy as a Carbon Solution



Choosing Green
Choosing Green

- ✎ Reducing energy use in buildings is the **only** Life Cycle Cost-positive carbon mitigation solution
- ✎ **25%** of total carbon solution can come from buildings
- ✎ Key issue today is finance, not economics

Building Energy Performance Reports Needed



Without Performance Reporting, We Know Nothing

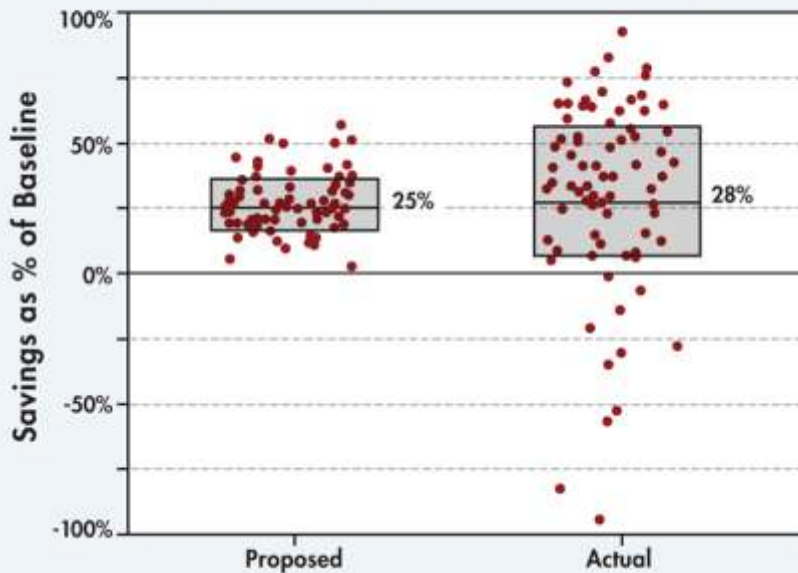
- “What gets measured, gets managed”
- If building energy use is this important to our collective future, why not know what’s going on?
- Without reports, we are flying blind/can’t fix
- Why should governments put their faith in green building without performance reports?



Certified New Green Buildings Under-Performing



Energy Savings in LEED Buildings

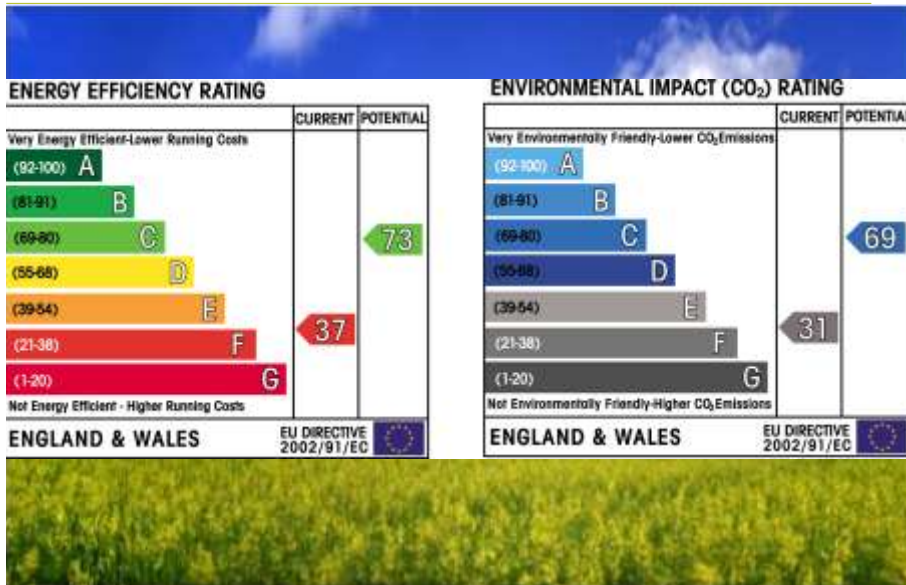


What's the Issue?

- Average savings is 35% vs. standard (Kats)
- BUT, about 25% underperform
- One LEED Platinum building:
 - Modeled at 61% savings
 - Performs at 48% savings
- Underperforming buildings harm validity of green building



Buildings Must Measure Carbon Performance



Total Carbon Emissions Count

- Total carbon emissions should be the only energy points in green rating schemes; this means:
 - 80% reductions with new buildings
 - 40% in older buildings
- Relative improvement (%) needs to be retired
- Real performance assessment
 - Buildings will be de-rated

Europeans Measure Total Carbon Emissions



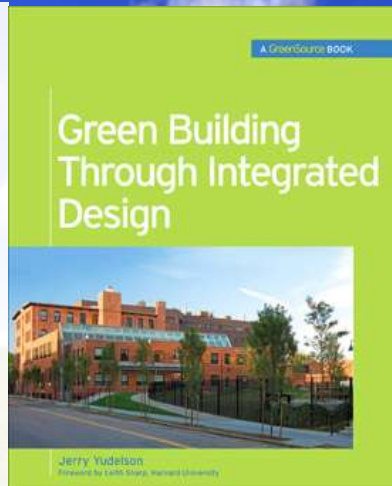
ZerO-Net-Energy (ZONE) Buildings Feasible Today



Learning from Lean Manufacturing

- Lean Themes

- Boeing 767: \$130 million ea.
 - Each plane performs identically
 - Compare with two 350,000-SF buildings
- Reduce energy & water use/carbon footprint
- Eliminate waste
- Build in resiliency
- Need to make *champagne* on a beer budget!
 - =>Process changes
- Key issue: get green cost premium down to zero, using *integrated design process*



How Much Energy Should A Building Use?



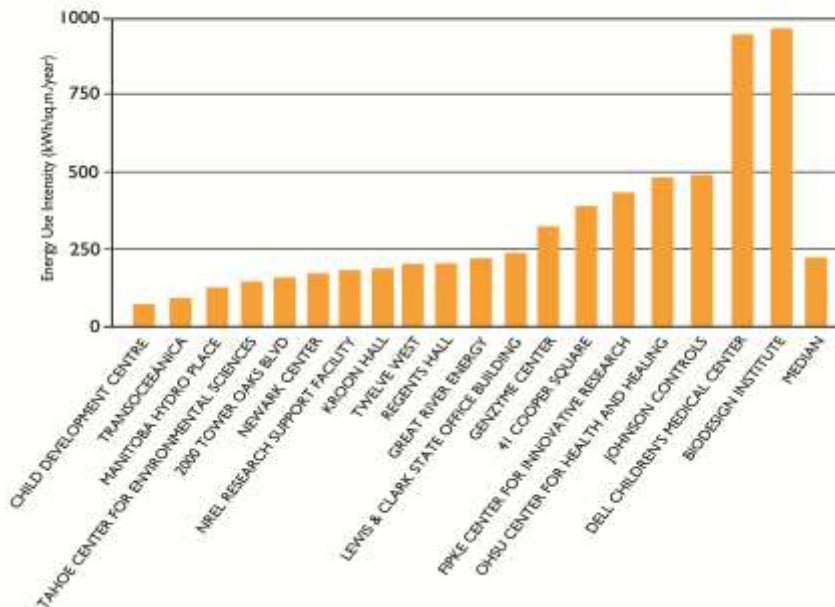
- European stretch goal: 100-150 kWh/m² PRIMARY energy use
- U.S. Average: 400 kWh/m²/a (2003)
 - 50% better than average still not good enough!
 - 60% to 90% required
 - 2030 Challenge

Research: The World's Greenest Buildings

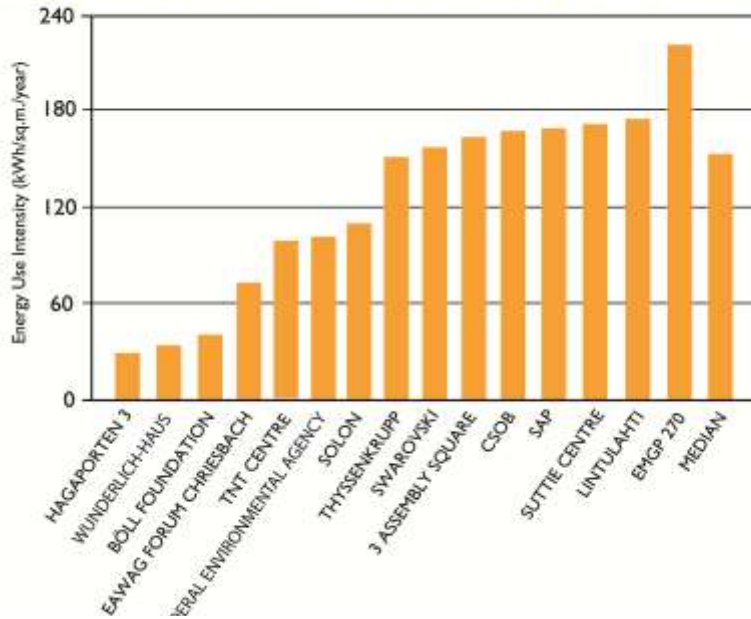
- LEED Platinum (or equivalent)
- Built since 2003
- >50,000 sq.ft.
- Non residential
- Provide energy data for one year
- Water data, as available



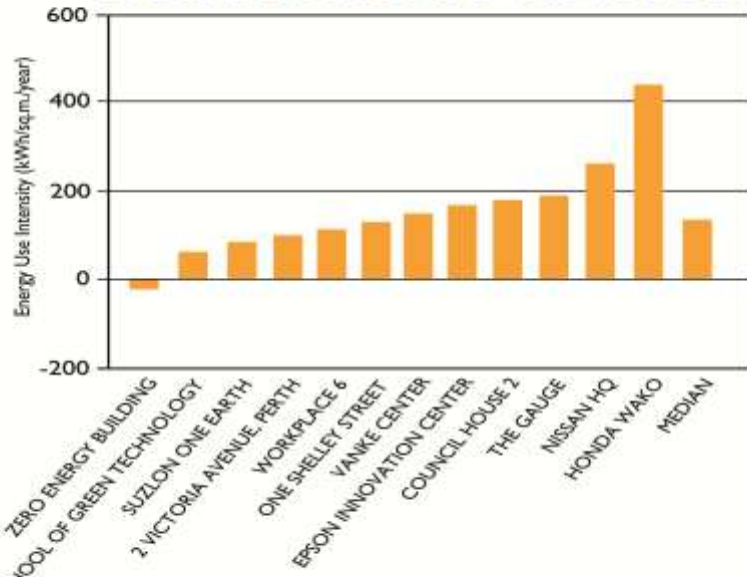
ENERGY USE INTENSITY- AMERICAS



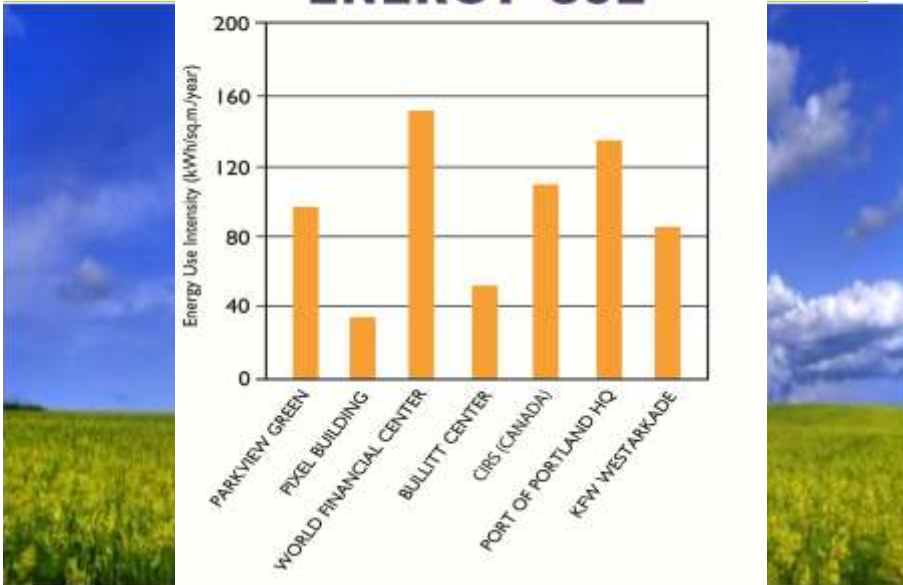
ENERGY USE INTENSITY-EUROPE



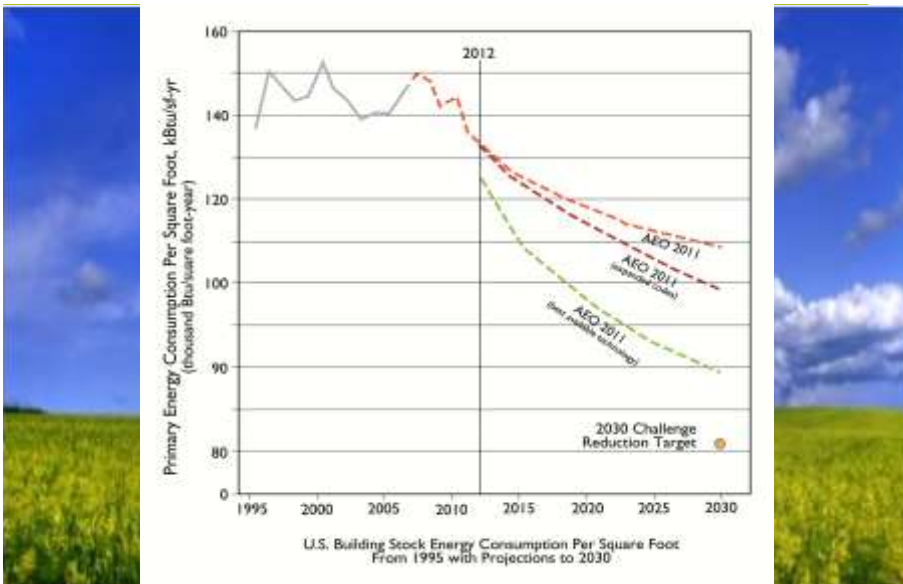
ENERGY USE INTENSITY ASIA/PACIFIC REGION



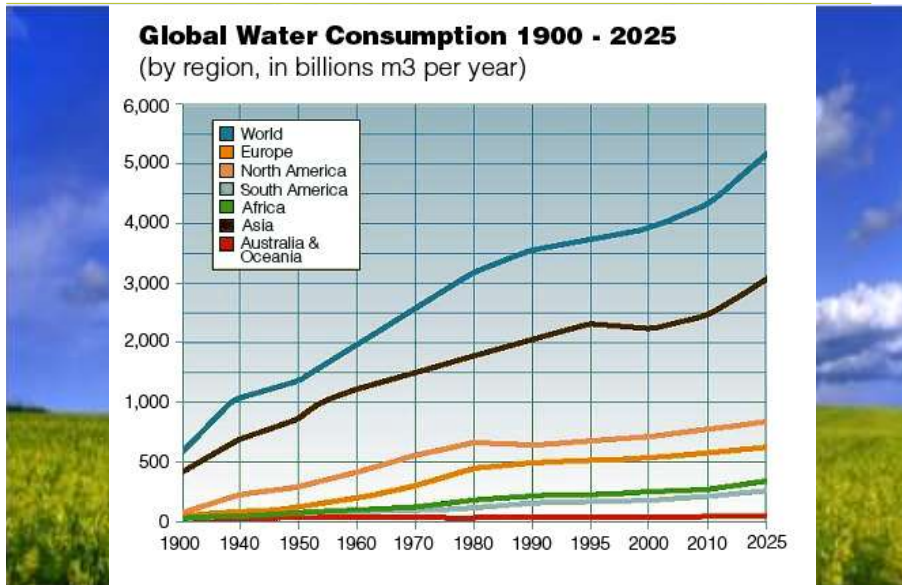
PROJECTS TO WATCH ENERGY USE



Where Do We Need to Get?



Water the Next Big Issue



Preventing Urban Water Crises

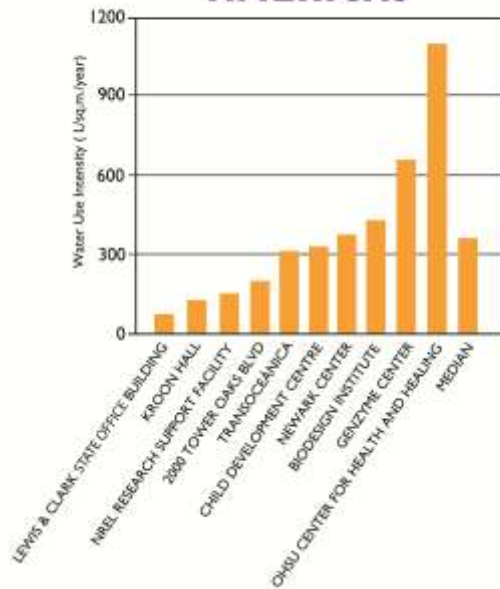
- Urban water crises are likely to increase in frequency, magnitude & duration
- Good design & practice can reduce water use +50% in buildings
- Retrofits can reduce water use 35% to 75%
- Australia is the case study, the testing ground
 - 150 liters/capita/day
 - U.S: 150 gallons/cap/day!

Water Design Standards

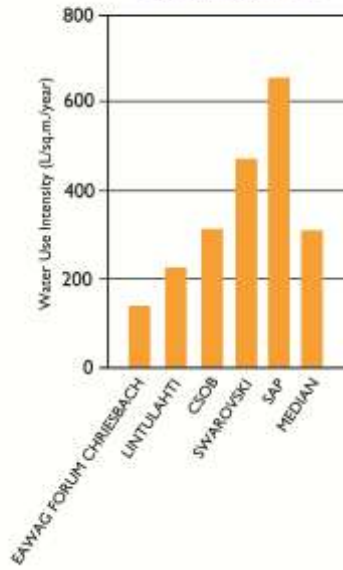


- Control irrigation/cooling tower water use
- Look at entire water cycle
 - Match quality with use
- U.S. good practice
 - 600 L/m²/year
 - 15 gals/sq.ft./year
- Australian best practices:
 - 400 L/m²/a
 - No cooling tower
- German *averages*:
 - 200 L/m²/a

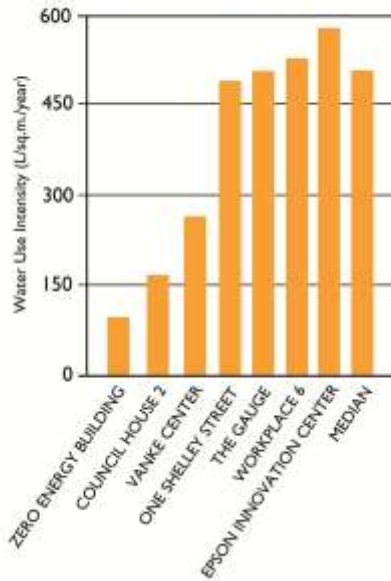
WATER USE INTENSITY AMERICAS



WATER USE INTENSITY EUROPE



WATER USE INTENSITY ASIA/PACIFIC REGION



The Future is Green, But...



- If you want to score, run to where the ball is headed, not to where it is.
- Ask yourself and your clients: how green will the built environment be in 2015 to 2020?
- Non-performing green buildings will pay a penalty in that market!

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