Infrastructure Management and Needs for Sustainability

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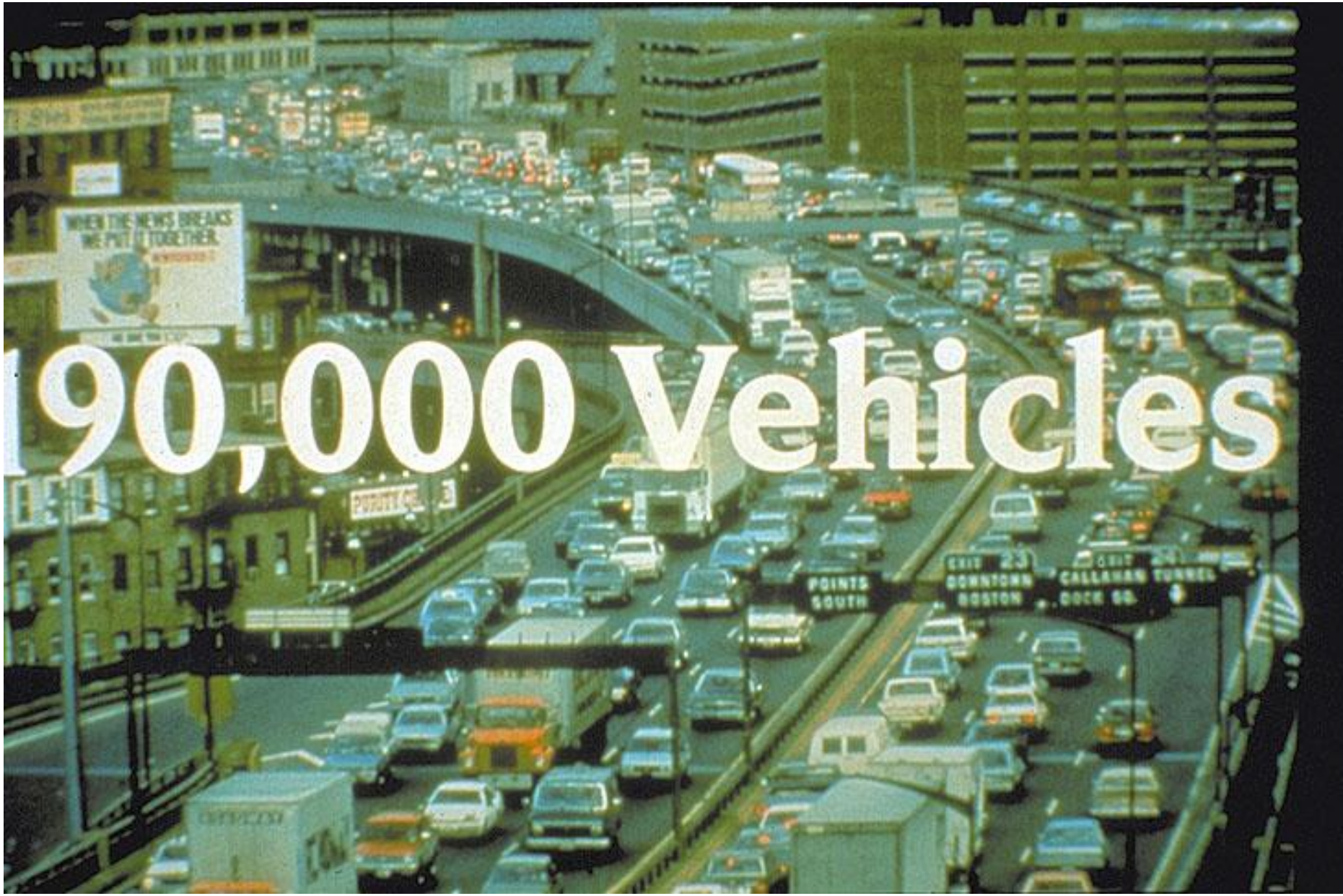
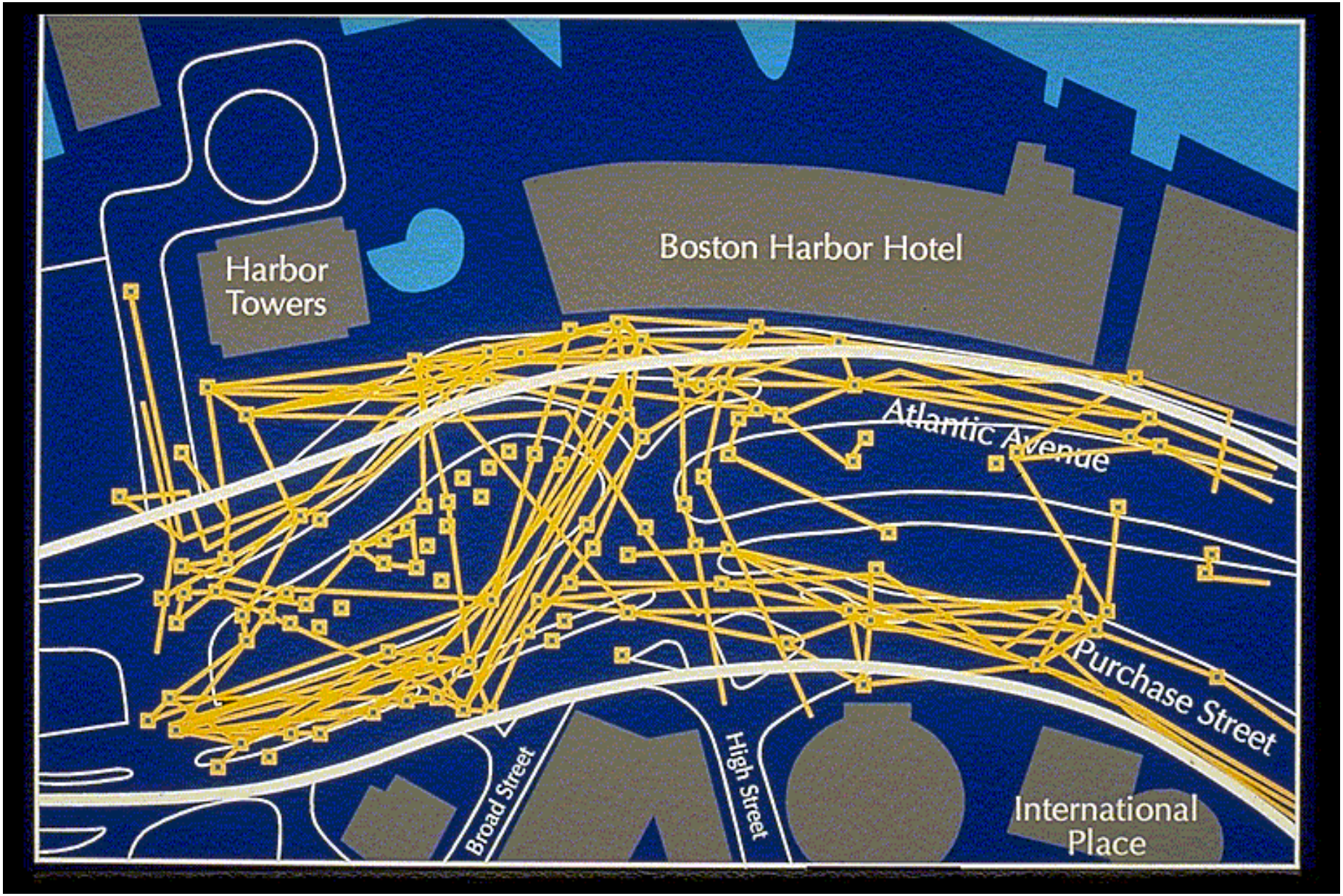
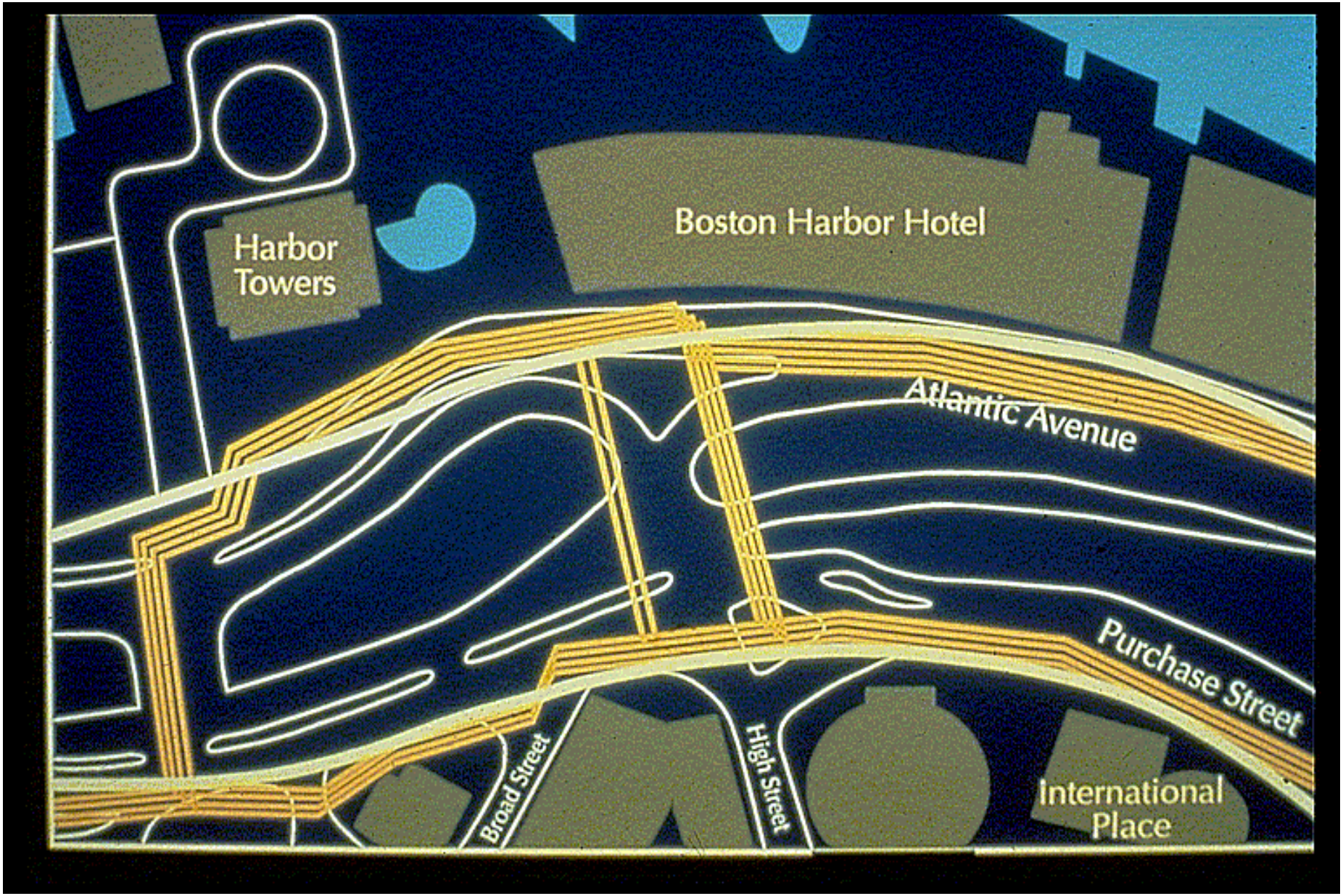
NRC ‘Underground Engineering for Sustainable Urban Development’

- Underground space resource often ignored or treated as first come-first served.
- Underground development is typically a classic high initial cost, long term return trade-off.
- Underground development should consider economic, environmental and social (psychological) factors plus resiliency.
- International development of underground technology common.


190,000 Vehicles
WHEN THE NEWS BREAKS WE PUT IT TOGETHER
POINTS SOUTH
EXIT 23 DOWNTOWN BOSTON
CALLAHAN TUNNEL


Harbor Towers
Boston Harbor Hotel
Atlantic Avenue
Purchase Street
Broad Street
High Street
International Place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Resiliency requires preparing for extreme events – Hurricane Sandy aftermath in New York City Subway.

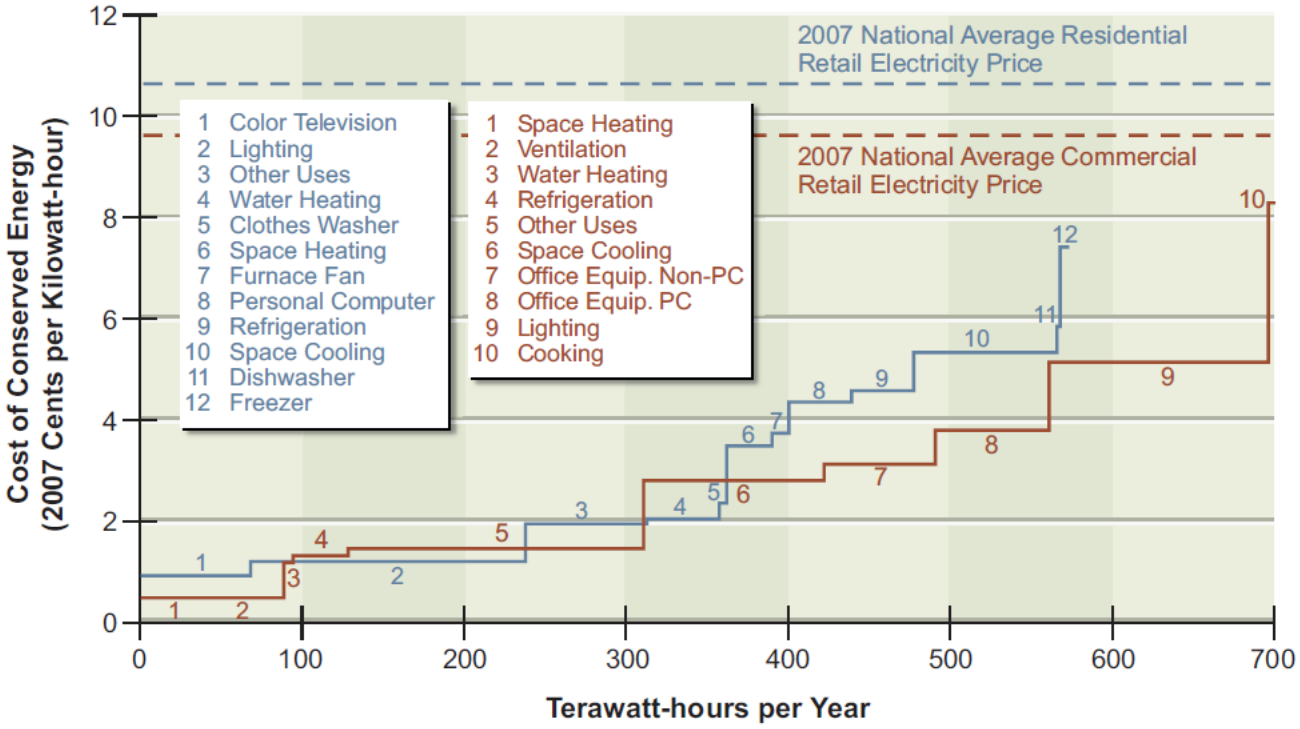
NRC: 'Energy-Efficiency Standards and Green Building Certification Systems Used by the DoD for Military Construction and Major Renovations'

- Early standards didn't ensure energy efficiency.
- Energy and water use models not particularly accurate (especially for high performance bldgs).
- Long term energy and productivity monitoring data is poor (but starting to appear).
- New green bldg. standards seem to be cost-effective, but some prescriptions may not be DoD appropriate.
- Again, classic higher initial cost, long term return trade-offs with economic, environmental and social impacts.

Green Building Certifications

- Competing standards: Leadership in energy and environmental design (LEED), Green Globes, ASHRAE, Energy Star
- Standards changing over time
- Adoption procedures differ among systems
- National standards may not reflect local priorities or specific building requirements.

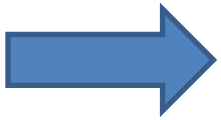
Potential Bldg Energy Savings Could be Substantial



Source: NRC Real Prospects for Energy Efficiency in the US, 2010, based on LBNL

Implications for Sustainable Infrastructure Management

- Adopt a long term planning horizon.
- Consider a wide range of impacts and operating conditions.
- Look for useful new technologies, pollution prevention and waste reductions.



New mindset for decision-makers and managers!

Long Term Planning Horizon

- Good news – low discount rates.
  - 30 year Federal rate 1.1% real, 3.0% nominal
  - 5 year Federal rate is -0.8% real, 1.1% nominal
  - OMB Circular A-94, 2012.
- Avoid mis-incentives
  - Urban Redevelopment Bldg. at Carnegie Mellon reverts to university in 20 years, but can we build to 50 year standard?
  - Ignoring potential for flooding costs.
  - Provide possibility of battery vehicle charging infrastructure in new buildings.

Wide range of impacts and operating conditions

- Triple bottom line – economic, environmental and social.
  - Example: Transportation Research Board committees often stove-piped to one impact.
- Range of climate change impacts critical.
  - Extreme events, flooding, water shortages, etc.
- Technologies will be changing.
  - Roadway infrastructure changes for autonomous, connected and alternative fuel vehicles.

New technologies, pollution prevention and waste reduction

- Learning curves on semiconductors, batteries, software.
- Major switch in end-life waste management – e.g. demolition wastes.
- Modest gains can accumulate over time.