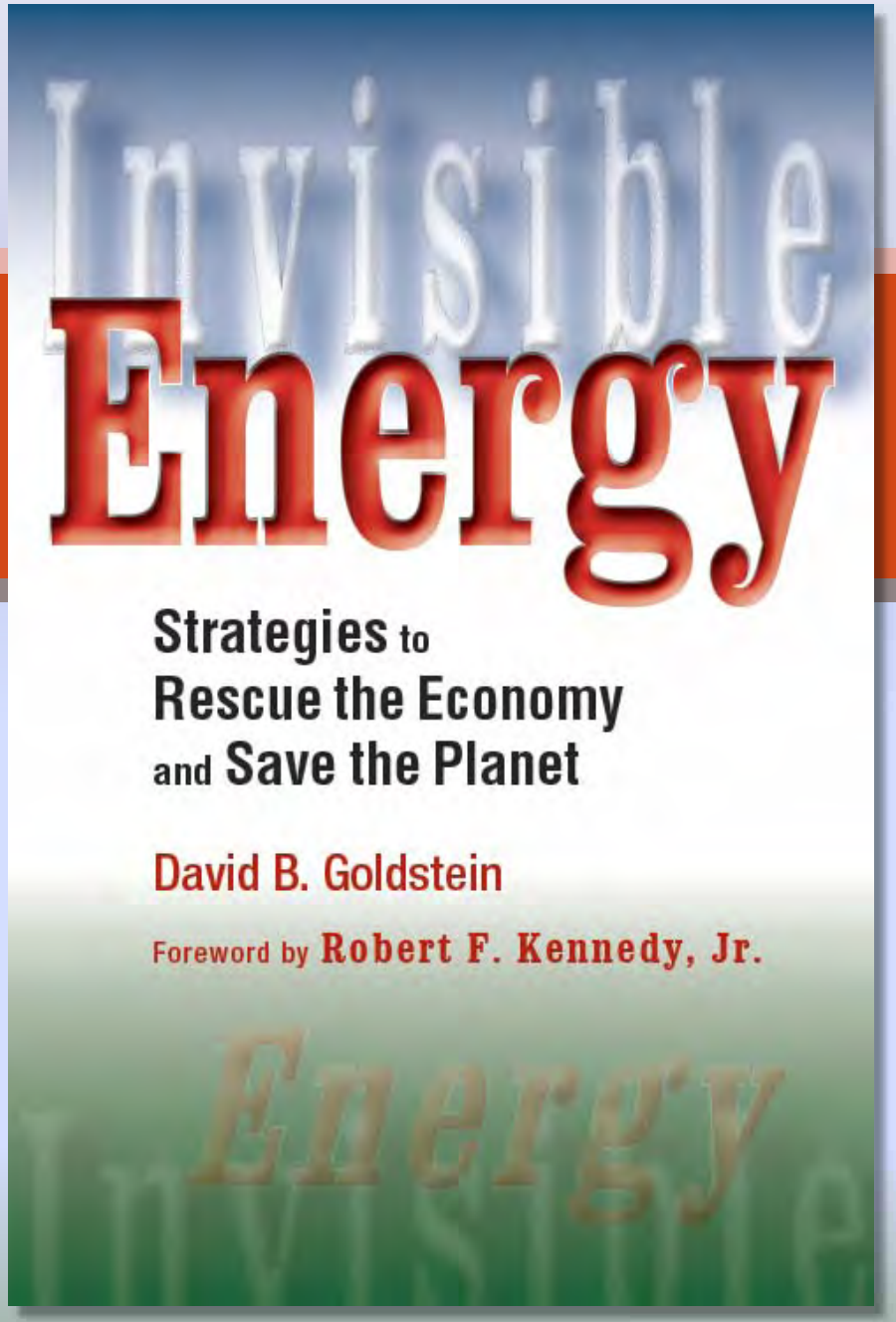

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NRDC
THE EARTH'S BEST DEFENSE

Efficiency is Invisible…

- Physically, which makes it hard to promote
  - What kind of picture do you use?
- Politically, because no one can get rich quick from efficiency
  - Instead, the economic benefits are distributed more democratically
- In the press, because there is no broad efficiency trade association, much less one each for housing, smart growth, commercial buildings, etc.

The Public Still Does Not Understand What Energy Efficiency is

- Debates over energy in Washington DC often ignore efficiency or put it last
  - Even the President's speeches are not very explicit about efficiency, compared with *several different types* of renewables
- Even people who should know better still confuse conservation (cutbacks) with efficiency

Size of the Efficiency Resource

- Conventional analyses show 30% savings from measures already available and cost effective.
  - These measures cost less than half of new energy supply
- Conventional analyses low-ball the efficiency resource due to systematic biases.
  - Details to follow;
  - But this results in less attention to efficiency

Why Invisibility is a Problem

- Because efficiency becomes a lower priority than other resources that are more costly and less green
  - Lower budgets
  - Fewer “asks” on a list of top-3 priorities
- $ tens of trillions of potential efficiency benefits get lost in dialogues about alternatives with much smaller benefits

Efficiency Policy Provides the Centerpiece of the Solution to Critical Problems

- Climate change
- “Peak oil” and high fuel prices
- Global security
- The Great Recession (what we’re in now)

Why Should We Care About Energy Efficiency in the Middle of a Recession?

- This recession did not just occur randomly. It is largely a predicted result of fundamental problems.
- Weak energy efficiency policy is at the heart of many of them and is related to all of them.

Causes of the Recession I

- The mortgage meltdown
- The risk of inflation
- The large trade deficit
- The low savings rate

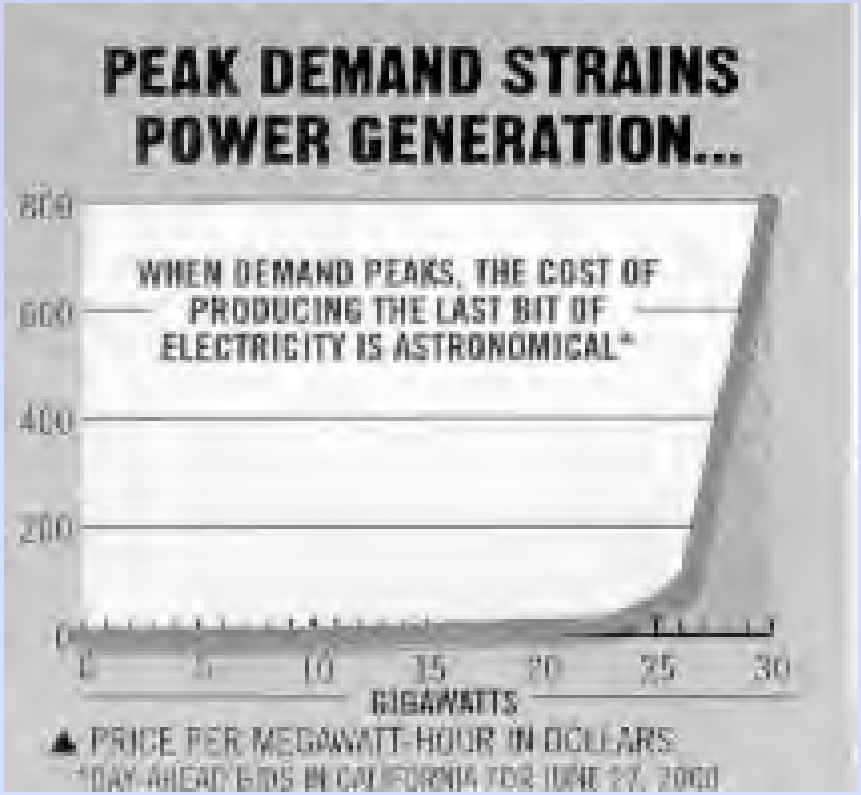
Causes of the Recession II

- Government deficits
- Weak consumer spending
- Too few jobs

A Generation-Long Problem

- Almost all of these imbalances have been afflicting the economy since 1973.
- And, median per-capital income has not grown since 1973: the first time in American history that a new generation has not been better off than its parents'.

Small Reductions in Peak Yield Huge Reductions in Cost

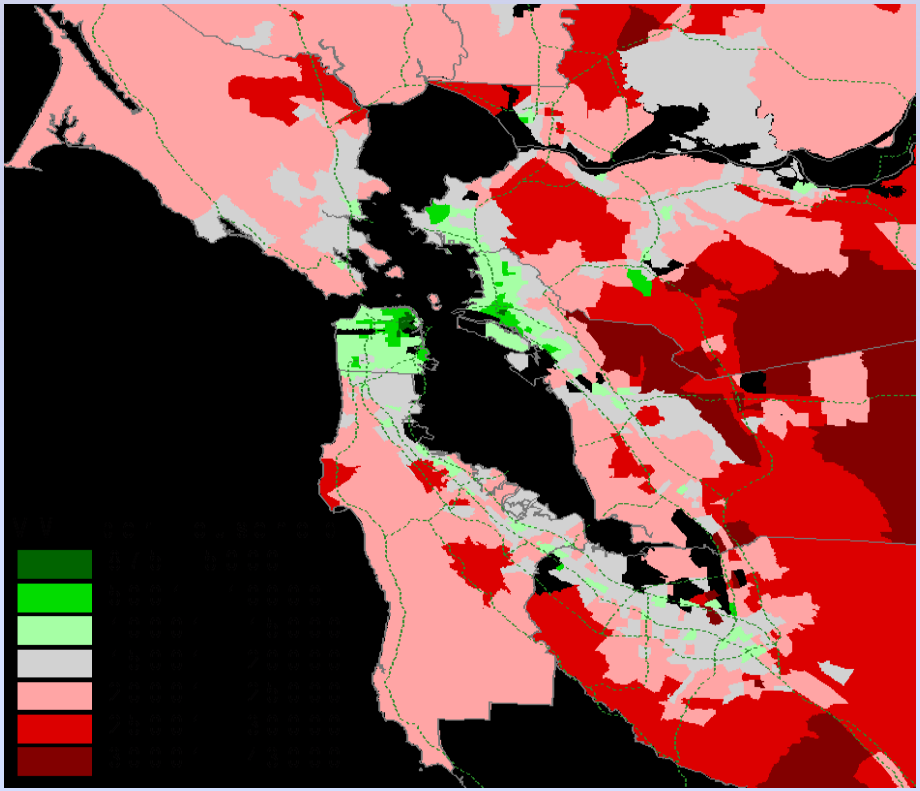


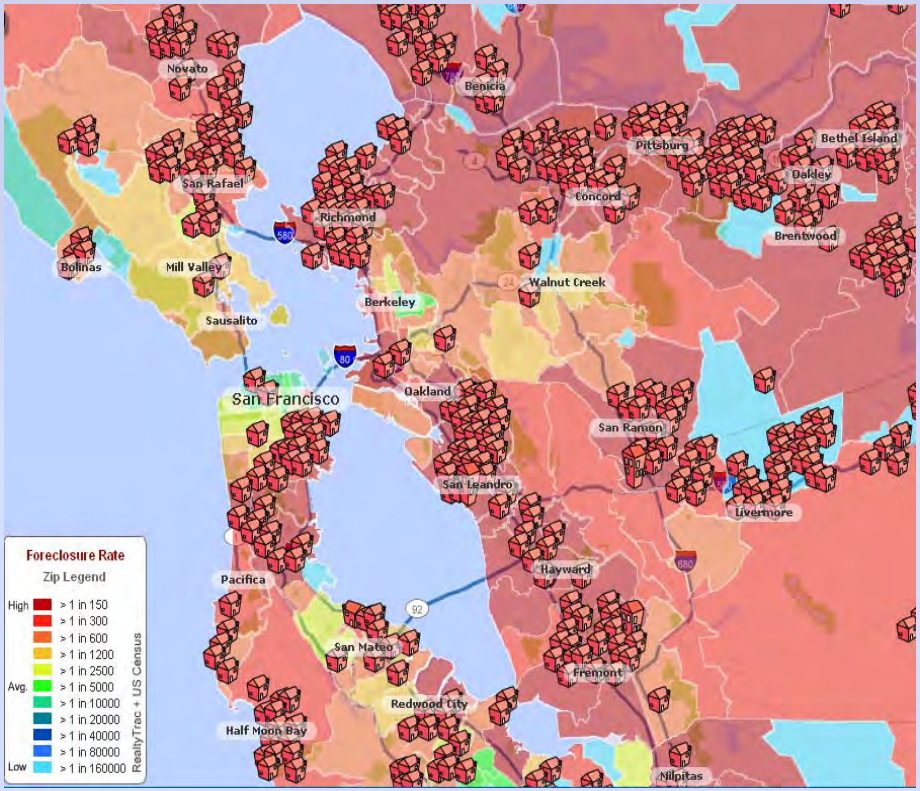
Business Week, March 26, 2001 p. 114

Another Primary Cause

- For a typical house in suburban sprawl:
  - The median price is $175,000
  - The average 30-year commitment to utility costs is $75,000
  - The cost to drive to and from it is $300,000.
  - (Utilities and transportation could be cut in half by green building practices and smart growth)
- It is not surprising that a lending system that looked only at the $175,000 commitment and not the $375,000 went wrong.

Household Mileage v. Foreclosures





Sources: Center for Neighborhood Technology; http://hotpads.com.

Digging Out

- Unless we correct the fundamental causes of the recession, we will not recover fully
- Conventional stimulus is less effective in the mid and long term if the starting point is high debt and low savings
- Spending must be accompanied with a payback
- We can’t cut interest rates any more

Energy Efficiency as the Cornerstone

- Investments in efficiency pay back quickly, allowing short term stimulus and long term responsibility
- Many efficiency investments allow immediate investments of modest amounts to eliminate the need for larger investments in the future.
  - E.g., California High Speed Rail business plan

Efficiency mitigates ALL of the causes of the recession

- Incorporating energy and location efficiency into underwriting mortgages reduces risk
- Lower energy demand reduces inflation
- Less energy use means less imports
- Lower energy costs allows for more savings

Efficiency mitigates ALL of the causes of the recession II

- Lower energy costs mean more tax revenue from greater corporate profits and less government spending on energy
- Lower energy bills allows more consumer spending
- Efficiency investments create local jobs; savings from efficiency also create jobs when they are re-spent or invested
- Efficiency increases productivity and competitiveness

Stabilizing Global Climate: How Much Efficiency is There?

- Efficiency is cheaper than business-as-usual
  - If there is a lot of it, solving climate will save money, not cost money
- The efficiency resource is much larger than the 30% savings over 20 years identified in conventional studies
  - This is true because no one has tried to evaluate the long term resource in a context of mitigating cumulative worldwide greenhouse gas emissions at least cost.
- We best discover the size of the resource by going out and acquiring it.
  - A goal, not a forecast

Why the Efficiency Resource is Always Understated

- A large number of studies try to estimate the potential *savings from efficiency* by adding up the combined effect of hundreds or thousands of energy efficiency measures
  - This talk identifies 8 different systematic biases towards low savings in potentials studies
- What is a “conservative” assumption for addressing climate change?

What Does "The Technical Potential for Efficiency" Mean?

- Potentials studies provide specific answers to specific policy questions
  - Thus they are limited by the portfolio of the agency that commissioned them
- How motivated is the sponsor of the potentials study?

Examples of Dramatic Success with Strong Motivation

- 1992 refrigerator standards
- Hood River Conservation Project and PG&E Delta Project
- California's 2001 efficiency program

Systematic Biases Resulting in Low Potentials

- Subjecting efficiency measures to a criterion of proof beyond a serious doubt
- Assuming arbitrary realization factors less than 100% due to questions about social acceptance of energy efficiency
- An implicit assumption that a lack of research on the cost or feasibility of a particular measure means that it is excluded from the study

Systematic Biases Resulting in Low Potentials II

- A failure to consider issues of systems integration (see next slide for example)
- An assumption that once known efficiency measures are implemented, technological progress ceases and no further improvements are possible
- Ignoring the economic value of non-energy benefits such as increased thermal comfort at higher levels of information, or increased productivity of high efficiency commercial space


VIKING

Systematic Biases Resulting in Low Potentials III

- A reliance on projected costs of efficiency without looking at realized costs, which, whenever data has been available, have always been lower than projected costs and often lower than zero
- Ignoring the economic benefits of reductions in energy price due to reductions in demand with the same amount of supply

What is a Conservative Assumption?

- "Conservative" depends on the context
- Most potential studies directly define conservative as meaning "biased low" because supply-side capacity is being cancelled in favor or cheaper efficiency: KEEP THE LIGHTS ON!
  - Or because they will define a goal with penalties for failing to meet it
- Climate policy leads to the opposite definition: an underestimate of efficiency will entail overinvestment of both money *and management attention* in more expensive and problematic resources

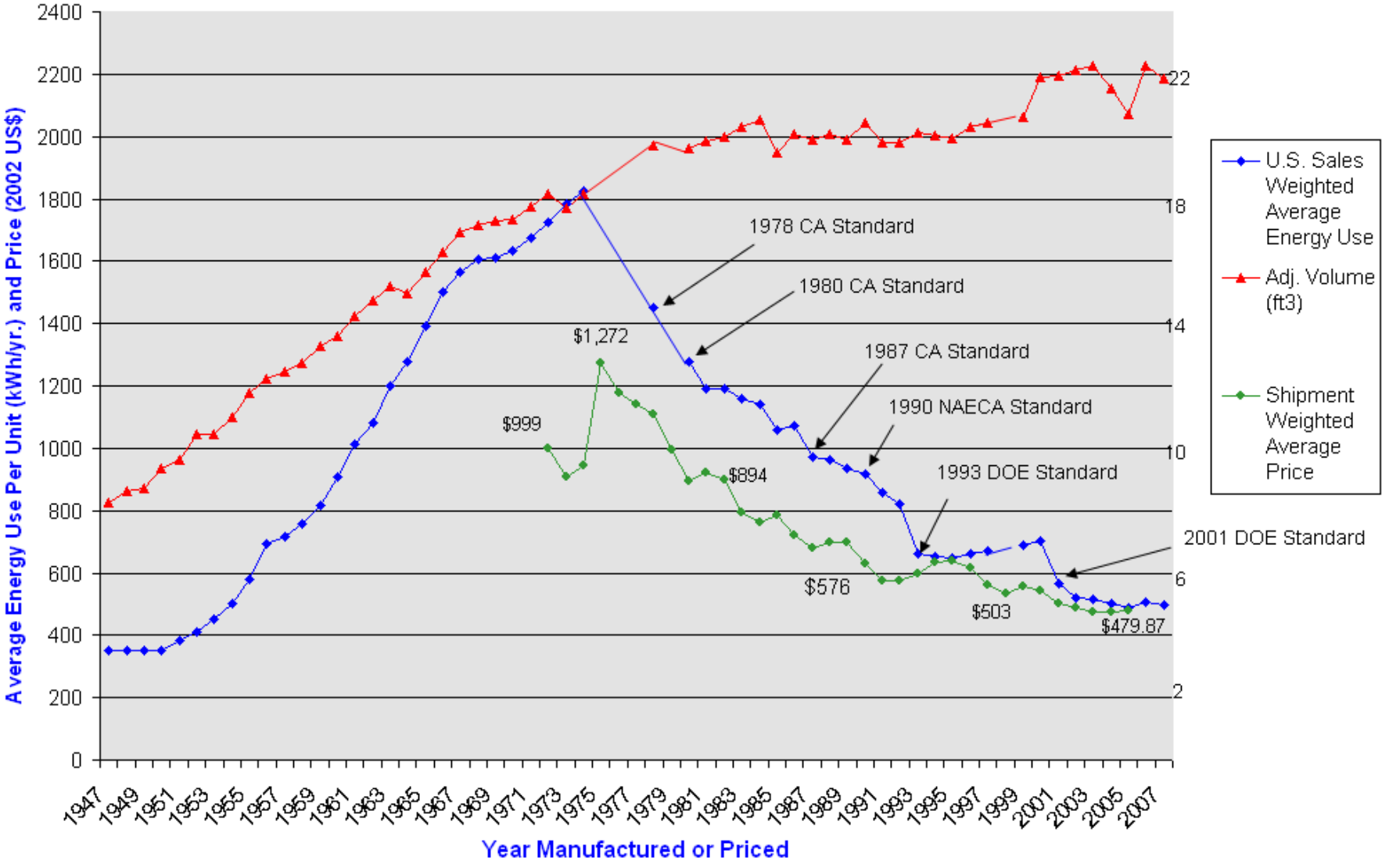
How Much Energy Do We Really Need?

- There is not much up-to-date analysis of the physical limits to how efficiently an energy service can be provided
- But looking at all of the major consumer end-uses of energy, the limits to plausible efficiency are at least an order of magnitude higher than current efficiencies; more careful research is needed

So How Far Can We Really Go?

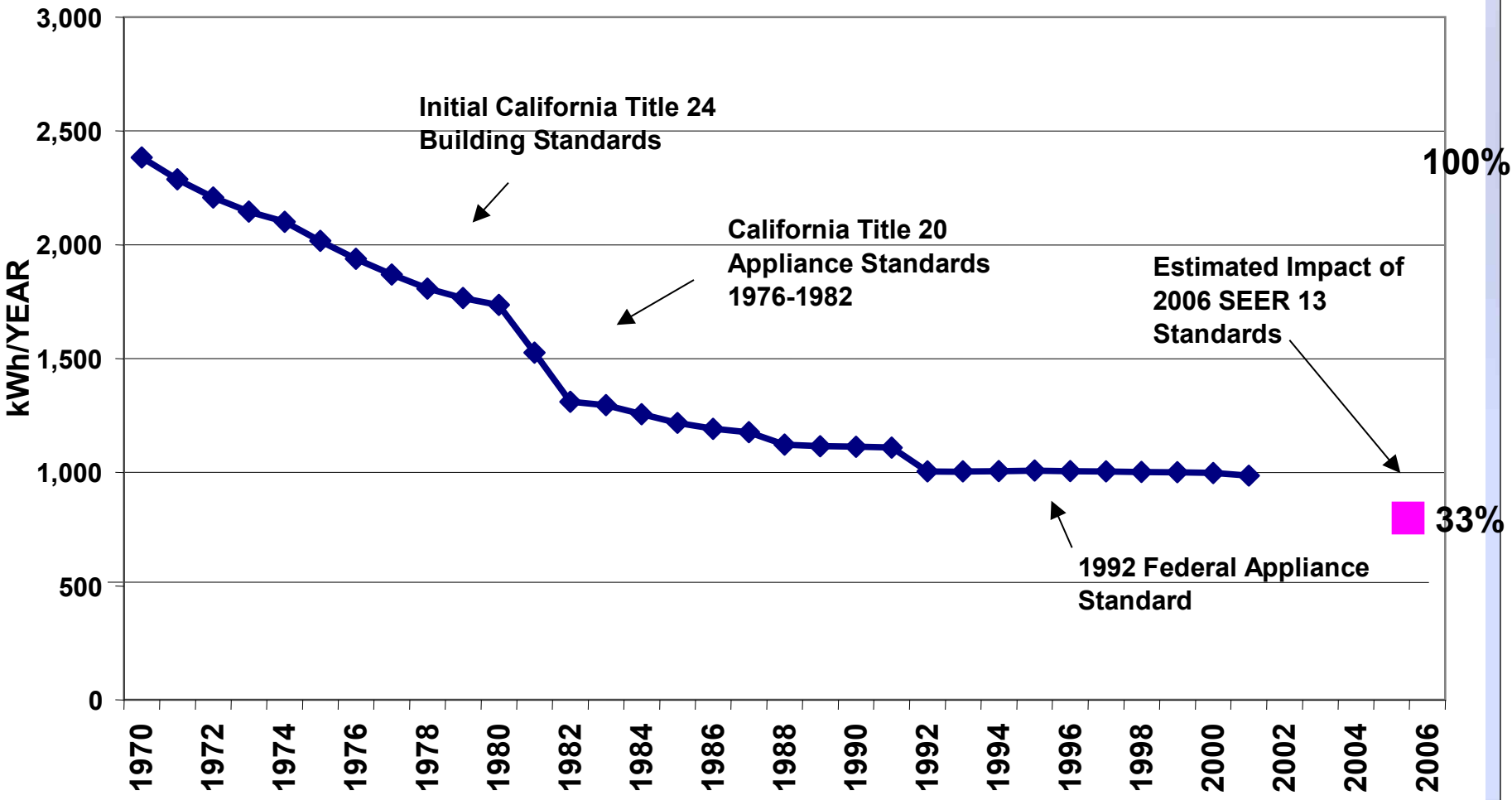
- Even with their biases, potentials studies suggest 30% to 50% savings after 20-40 years
- I believe the right answer is 80% to 90% within 10-20 years, plus some time lag for stop-turnover
  - This is consistent with the 2030 Zero Energy Challenge
- The key is in establishing markets that provide continuous improvement (Moore's Law)
  - What can the exponent be?
  - For refrigerators and CA Title 24 it is about 4-5%/yr
    - And we weren't even trying very hard for much of that time

U.S. Refrigerator Energy Use v. Time with Real Price



Annual Usage of Air Conditioning in New Homes in California

Annual drop averages 4% per year



Source: CEC Demand Analysis Office

So How Far Can We Really Go?

- The limits to efficiency have never been tested in the real world
- We have always run out of budget or will before we ran out of opportunity.
  - California's emergency 2001 efficiency program

It All Depends on the Rate of Improvement

- With the 4% rate (shown in previous slides) extended to the whole economy, U.S. energy use in 2050 will be about 65% of what it is today.
- If we can double the improvement rate, it will be less than 30%.
  - This is clearly within the range where it can be 100% renewables

Economic Benefits Just Keep Growing

- For 2010 to 2020, clear agreement on the ability to save ~20% with about $1 trillion of net benefits to consumers in energy terms alone.
- For 2020 to 2030, we can generate new efficiency technologies and methods that renew or increase this potential: another $1T.
- Once markets support efficiency, this process can continue indefinitely

We Are in a Crisis, but Don't Panic!

- Bold solutions must build on 35 years of policy—successes and failures.
- The details matter. Careless program designs usually fail.
  - Base incentives on performance, not cost
  - Enhance markets by overcoming failures
- Create fast incremental change.

Thank You!

Annex 1

Failures of the Market

Failures of the Market

- ***Market Barriers*** include:
  - Split incentives
  - Lack of information
- ***Market Failures*** include:
  - Diffuse decisionmaking
  - Failures of price competition for new products

Failures of the Market II

- Human failures
  - Peer pressure
  - “Bounded rationality” – not paying attention
  - Loss aversion, risk aversion, status quo bias
- Institutional failures
  - The role of industry and industry associations in writing regulations
  - To the importance of mass markets
  - Informal private sector regulations that limit efficiency

Consequences of Failures of the Market

- Very low price elasticities for energy efficiency
  - A recent University of California at Davis study on gasoline price elasticity showed a short-term elasticity of -4% to -7%
  - Efficiency levels do not vary between U.S. states as a function of price or climate

Consequences of Failures of the Market II

- Therefore, pure cap-and-trade programs for emissions will not improve energy efficiency very much
  - If the current market ignores opportunities with a return on investment of 50%, and emissions trading raises the return to 60%, how much difference will that really make?
  - Emissions trading CAN affect fuel choice and behavior, however

Consequences of Failures of the Market III

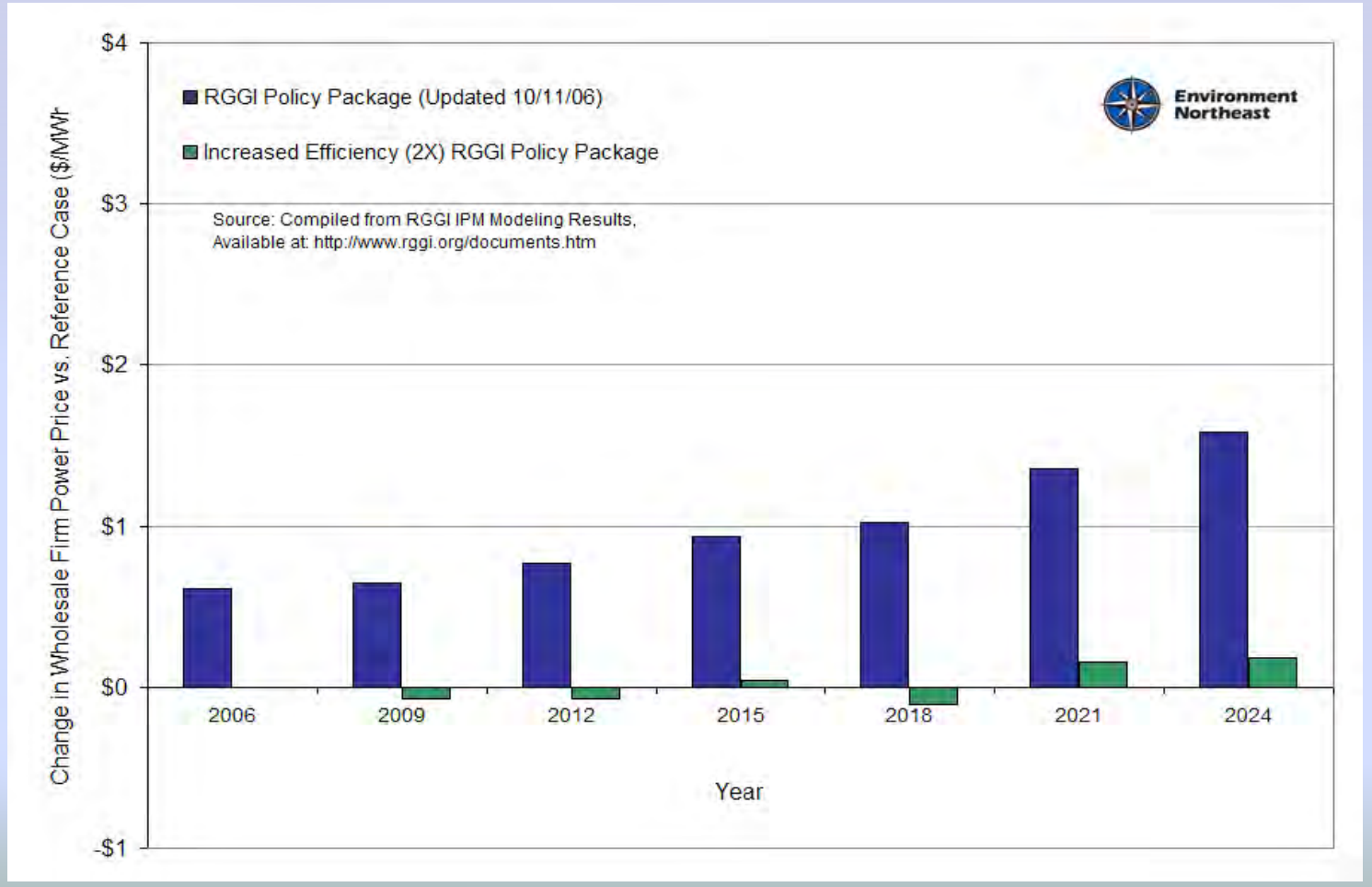
- Very low price elasticities for energy efficiency
  - A recent University of California at Davis study on gasoline price elasticity showed a short-term elasticity of -4% to -7%
  - Efficiency levels do not vary between U.S. states as a function of price or climate

Opportunities for Emissions Cap and Efficiency

- **Assembly Bill 32: California Global Warming Solutions Act of 2006 (http://www.solutionsforglobalwarming.org/) sets a carbon cap but allows the California Air Resources Board to develop implementing regulations**
  - **Current studies suggest that 80% of the emissions reductions will be obtained from direct efficiency and renewables policies and only 20% from emissions permit trading**

Energy Efficiency Offers Consumer Cost Benefit

RGGI Modeling Results: Wholesale Electric Price Increases with and without Expanded Efficiency Programs



Estimated cost without new efficiency

Estimated cost with expanded efficiency

Source: Daniel Sosland, Environment Northeast ACEEE Summer Study Paper 2008

Conclusions

- Cap-and-trade-and-walk-away may have impacts on energy costs that can affect the terms of trade, BUT
- Cap-and-invest can mitigate or reverse these effects by using proceeds of emissions permits to fund effective policies

Consequences for Climate Bill

- Predictions of impacts on business and consumer bills are greatly overstated
  - Even conventional static economic analysis shows that caps on fuel use lead to lower prices—or that taxes affect mostly producers
- Including efficiency policies means lower rates as well as lower bills, but
  - Current proposed bills do not go far enough to capture all efficiency opportunities: follow-on action will be needed

Annex 2

Policies to Make Markets Work

Policy Recommendations:

- *Set mandatory declining greenhouse gas emission caps*.
- Mandatory standards that encourage performance-based compliance.
  - Regular revisions to higher efficiency.
  - Standards include criteria for energy ratings.
  - Applicable to buildings, appliances, equipment, and cars.
- Simple normative labels to distinguish the most efficient buildings and equipment, such as the U.S. "Advanced Buildings Benchmark™", "Energy Star®" and "LEED™"

Policy Recommendations: II

- Informative labels to provide the information needed to establish property values for energy efficiency
  - The Russian “Energy Passport”
  - Building energy ratings required by the EU by 2006
- Managed incentives for modest improvements (~15%-30%) beyond the standards.
  - Some of these programs can be operated by utilities
- Long-term incentives for 50%-75% savings.
  - S.822/H.R. 1385 is a current example

Policy Recommendations III:

- Reform utility regulation to align customer benefit with utility profit
  - Require utilities to meet goals for renewable energy use
- Encourage location efficient development by:
  - Reducing regulatory restrictions on compact and mixed use development
  - Enhancing transit and other non-auto infrastructure

Policy Recommendations IV:

- Reform mortgage underwriting to account for energy and transportation costs
  - This will increase the security and transparency of lending and is needed for purely economic reasons
  - It will encourage more housing in smart growth areas and extend opportunities for home ownership to lower income levels