

Appliance Standards

Where have we been?

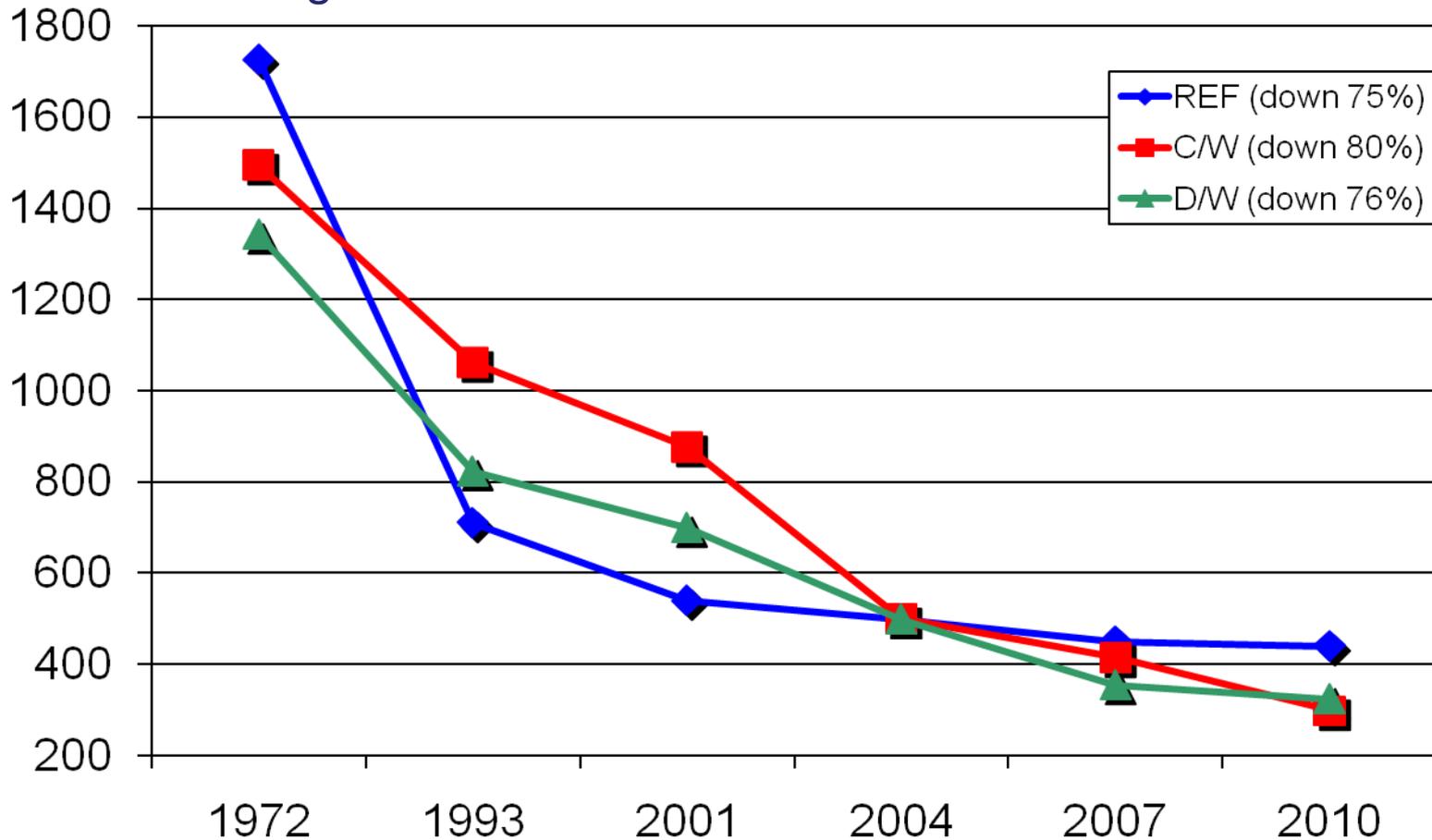
Where are we going?

North American Regional Policy Dialogue
Washington, DC, April 18-19 2012

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What Has Whirlpool Done to Address Energy Efficiency?

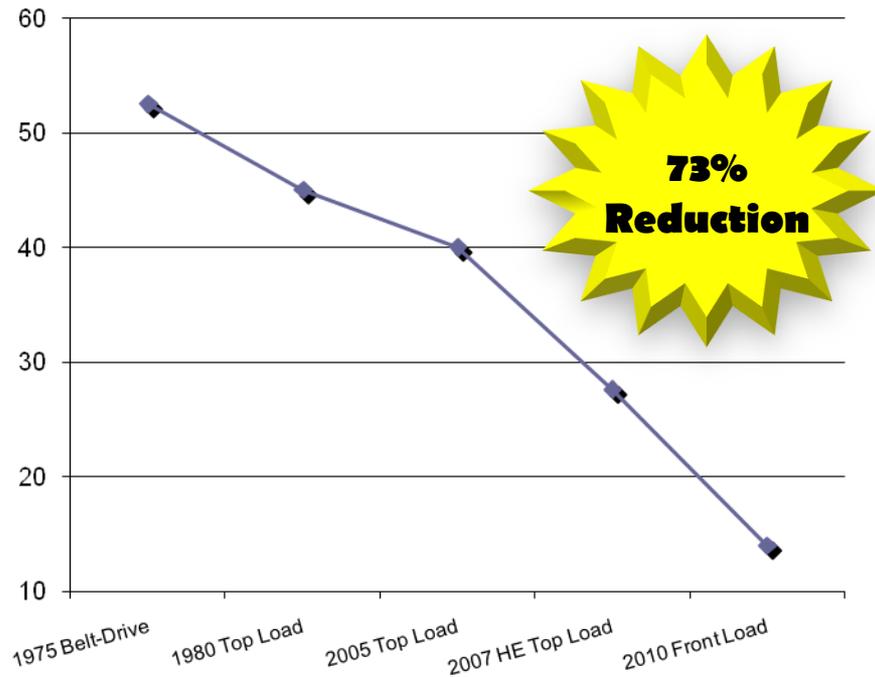
Annual Average Kilowatt-Hours Used



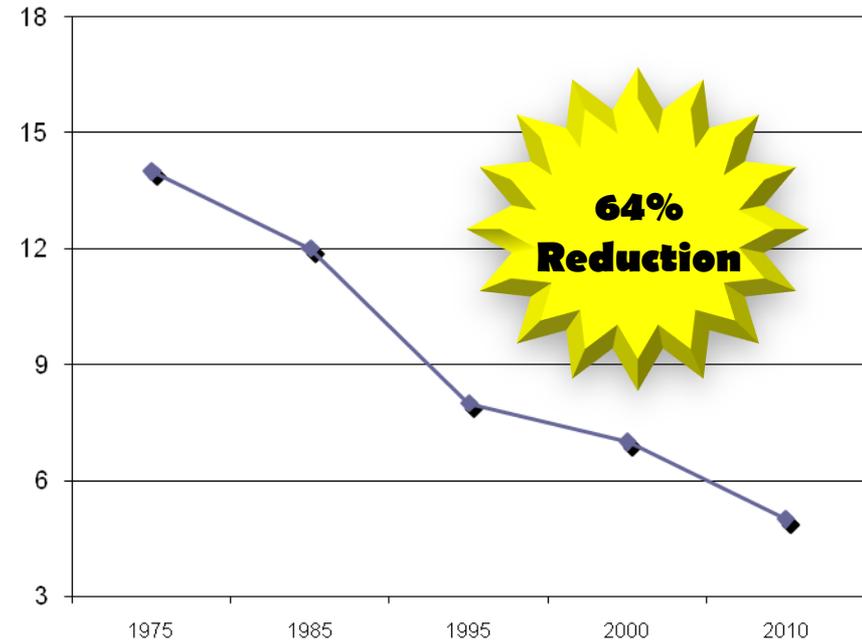
What has Whirlpool Done to Address Water Efficiency?

Average Water Usage in Gallons per Cycle

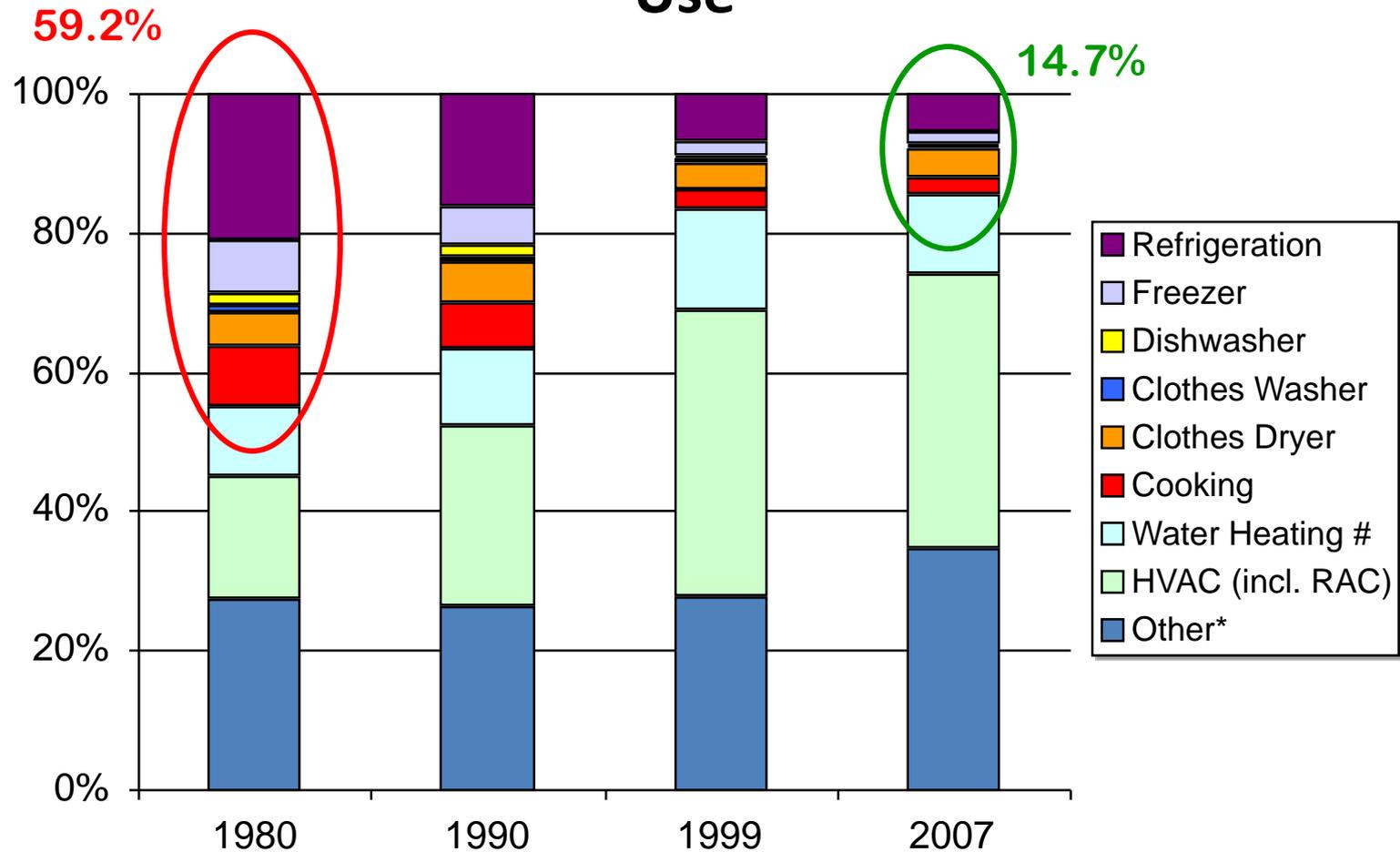
Clothes Washers:



Dishwashers:



Relative Appliance Energy Consumption has Dropped by 75% ...Appliances are no Longer a Major Source of Energy Use

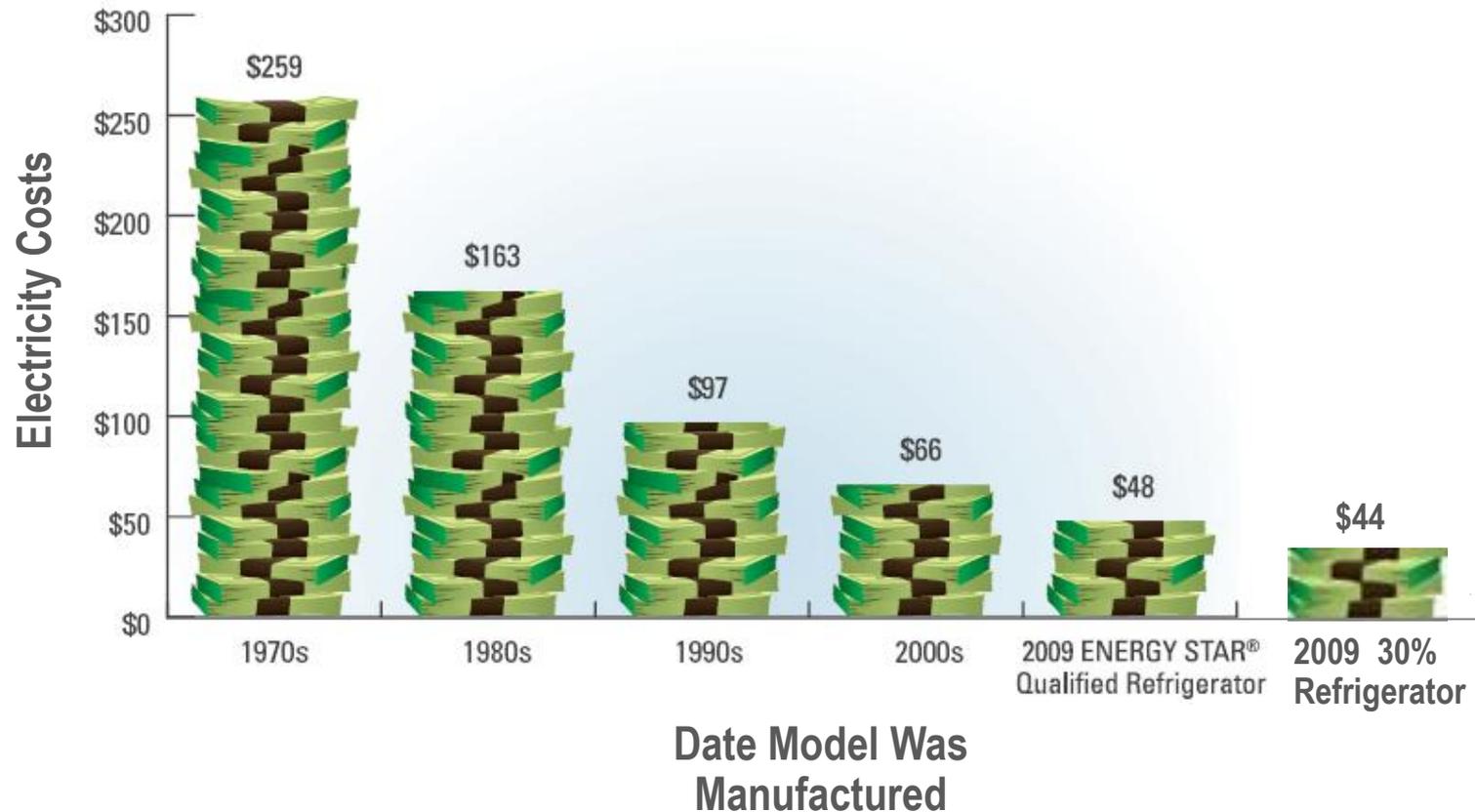


Source: Energy Information Administration/Annual Energy Outlook 1997-2004
Data consider saturation

* Other: Includes electronic items not listed, such as small cooking appliances, electric tools, home electronics
17% of Water Heating is for washers & dishwashers

DIMINISHING RETURNS TO ABSOLUTE ENERGY EFFICIENCY STANDARDS

REFRIGERATOR ANNUAL ENERGY COSTS



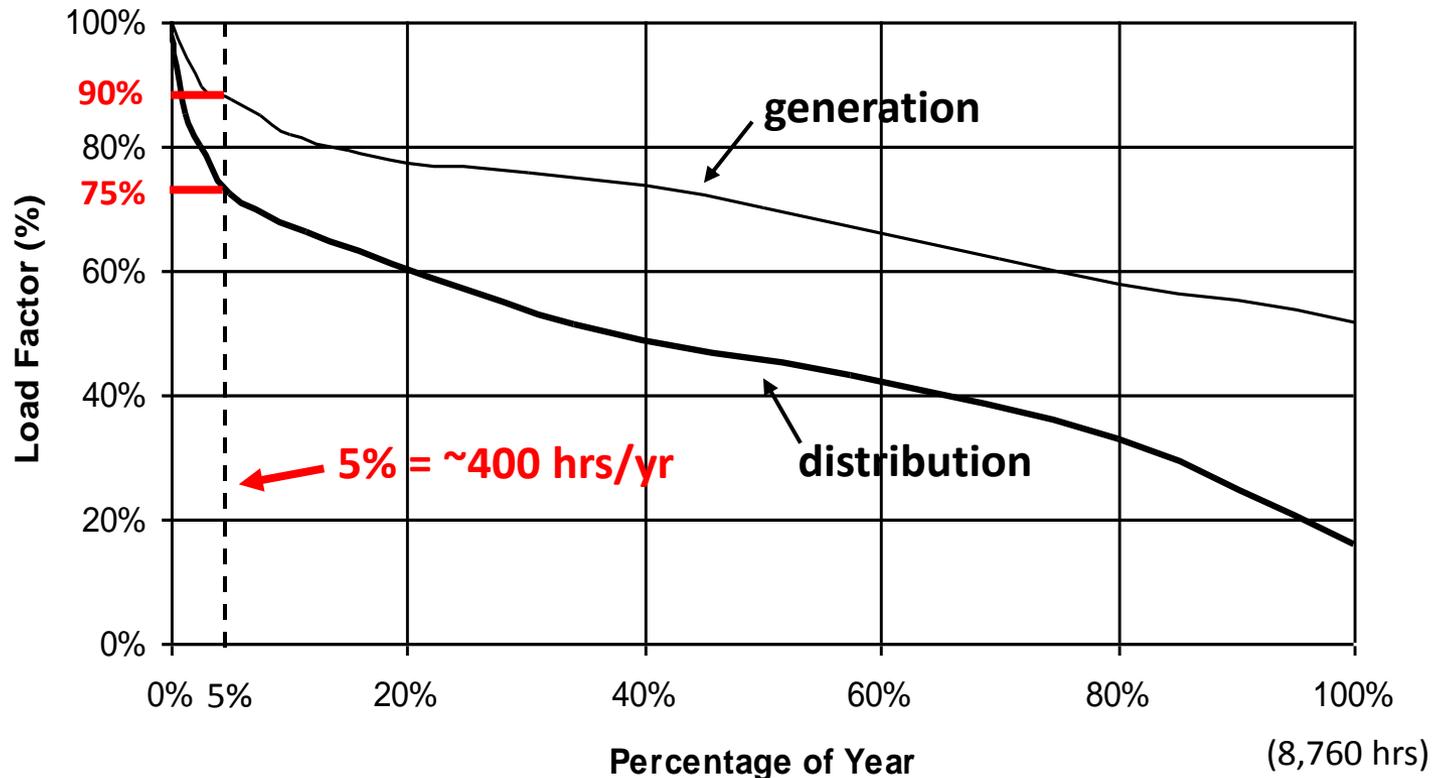
The relentless march of the regulatory escalator

- After decades of regulation the home appliance industry is faced with:
 - Declining volumes (since 2005 peak)
 - Declining operating margins
 - Escalating material and input costs
 - Consolidation among retailers
 - Escalating costs to achieve marginal environmental benefits
 - Conflicting regulatory mandates
 - Energy efficiency, water efficiency, reduced carbon footprint, reduced material choices
 - Declining government and utility incentives/appliance rebates
 - More aggressive foreign competition
 - Relentless ratcheting of Energy Star levels

“Nothing concentrates the mind more than the prospect of a hanging in the morning”

VALUE OF DEMAND RESPONSE: LOWER PEAK DEMAND REDUCES INFRASTRUCTURE INVESTMENTS

Hourly Loads as Fraction of Peak, Sorted from Highest to Lowest



25% of distribution & 10% of generation assets (transmission is similar), worth of 100s of billions of dollars, are needed less than 400 hrs/year!



Cutting the Gordian Knot

Making the Business Case Work for Smart Appliances Requires Smart Public Policy

The Case for Smart Appliances

- 1) Absolute product efficiency **running out of steam** after decades of progress
- 2) **Residential peak demand and loads** can be significantly reduced and shifted with modest consumer behavioral change or performance compromise
- 3) Smart products enhance the value of **episodic renewable generation** and can make the overall system more efficient
- 4) **Smart public policy** must accompany smart products to maximize their market penetration and societal benefits
- 5) **Greater visibility for consumers** of real time energy consumption and cost will lead to changes in consumption patterns and behaviors that add to absolute savings

Smart Appliances: An industry game changer

SMART APPLIANCES FEATURED AT CES

Las Vegas-- (January 10, 2012) — The Association of Home Appliance Manufacturers (AHAM) will give consumers a peek inside the home of the future when it hosts a panel discussion titled “Window to Tomorrow’s Connected Home” on smart appliances at the International CES being held in Las Vegas, January 10-13.

AHAM AND EFFICIENCY ORGANIZATIONS SEEK RECOGNITION OF BENEFITS OF SMART APPLIANCES FROM ENERGY STAR

WASHINGTON, DC -- (January 18, 2011) The Association of Home Appliance Manufacturers (AHAM) and efficiency organizations together have submitted a petition to the ENERGY STAR program to recognize the benefits of smart appliances and jump start the smart grid.

Beside AHAM and ACEEE, other parties to the agreement are the many companies in AHAM’s Major Appliance Division, the Alliance for Water Efficiency, Alliance to Save Energy, Appliance Standards Awareness Project, Consumer Federation of America, National Consumer Law Center, Natural Resources Defense Council, Northeast Energy Efficiency Partnerships, and the Northwest Power and Conservation Council.

"Smart Home" Appliances Expand Apps, Ramp Up Competition

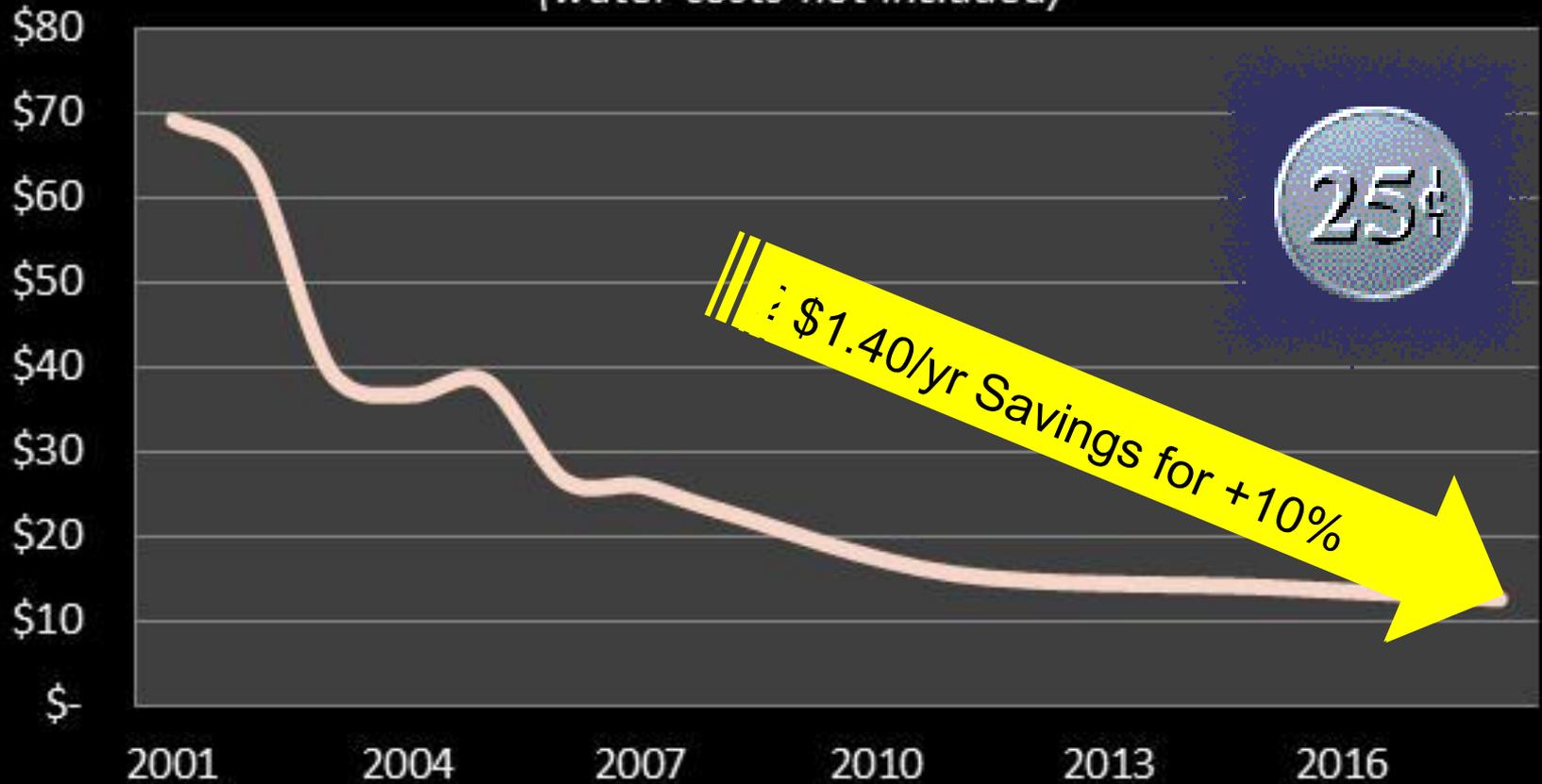


Key Policy Elements

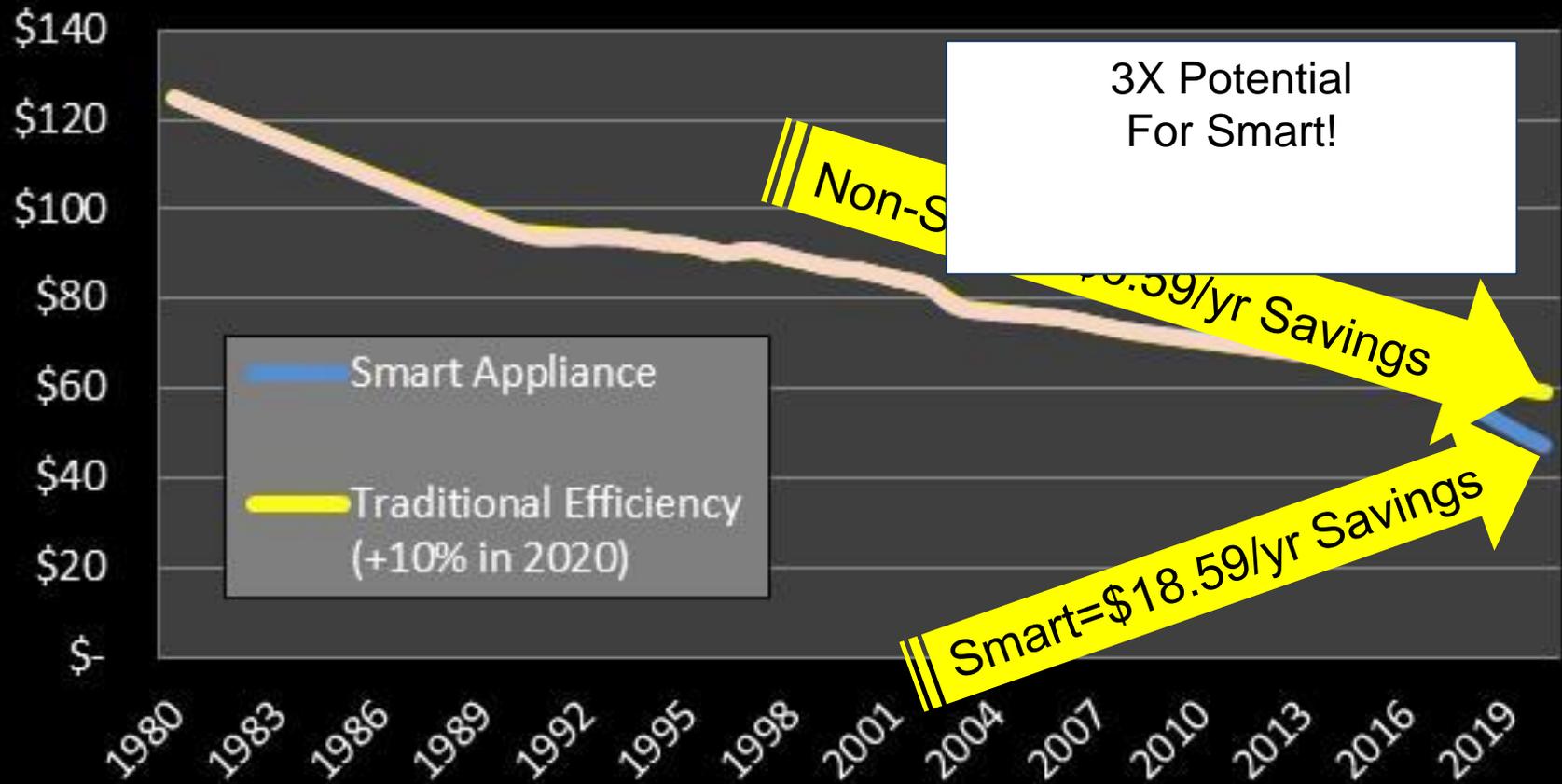
- Manufacturer Product Cost Savings Sufficient to Materially Defray Cost of Adding Demand Response Capability – 5% Allowance Against Energy Star
- Energy Star is a Voluntary Program with High Public Recognition and Flexibility
- This allowance was a lynch-pin to achieving voluntary agreement to higher efficiency standards
- Natural connection between this new connected appliance capability and utility consumer appliance rebates, because system benefits now even greater than traditional individual product efficiency
- Can be readily integrated with National Peak Demand Reduction Target and Integrates well with national efforts to expand renewables and growing addition of electric vehicles

Cost of Washing Clothes

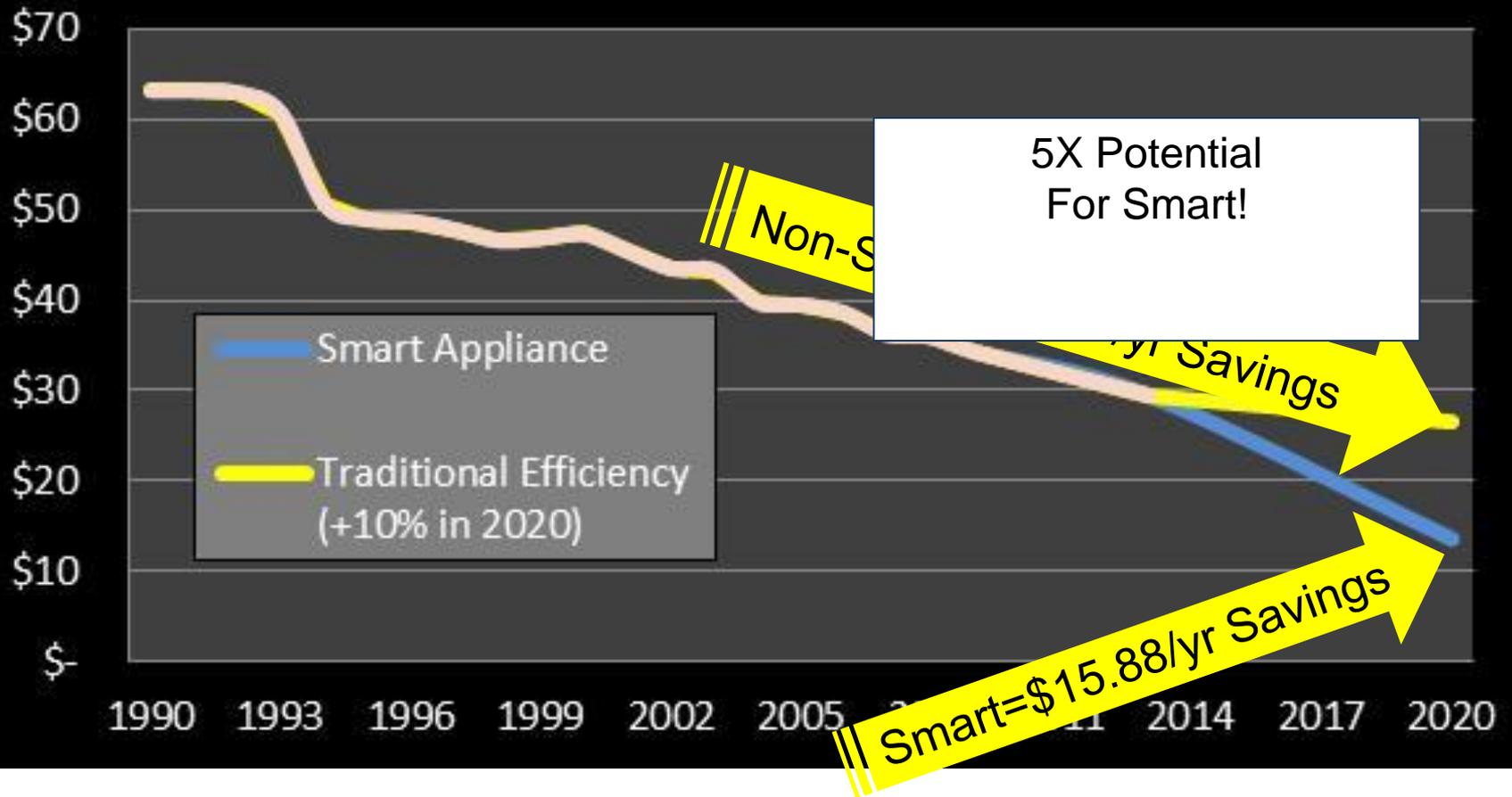
(water costs not included)



Cost of Room AC Over Time



Cost of Washing Dishes Over Time



Early Draft of Energy Star Specification for a “Connected” Refrigerator

- **“Connected” Product Criteria:**
 - To be eligible for the “Connected” allowance, a refrigerator, refrigerator-freezer, or freezer shall have the following capabilities. The product must continue to comply with the applicable product safety standards – the addition of the functionality described below shall not override existing safety protections and functions. Any reduction in load cannot adversely impact the product’s operation, e.g., food preservation.
- Home Energy Management (HEM) Functionality:
- A. “Connected” refrigerator, refrigerator-freezer, or freezer shall have the following capabilities:
 - 1. *Energy Consumption Reporting: The product shall be capable of providing feedback on its to an energy management system or other consumer authorized device, service or application via a communication link. Energy consumption data shall be reported by the product in intervals of 15 minutes or less.*
 - 2. *Remote Management: The product shall be capable of receiving and responding to remote requests, via a communication link, similar to consumer controllable functions on the product. The product is not required to respond to remote requests that would compromise performance and/or product safety as determined by the product manufacturer.*
 - 3. *Operational Status & Alerts: The product shall be capable of providing the following information to the consumer either on the product or via a communication link:*
 - a. Demand Response (DR) status (e.g., normal operation, delay load, temporary load reduction), and
 - b. At least two types of alerts relevant to the energy consumption of the product. For example, alerts for refrigerators, refrigerator-freezers and freezers, might address: door left open notification, reminder to clean refrigerator coils, or report of energy consumption that is outside the product’s normal range.

Connected Energy Star Refrigerator Specification (continued)

- B. Embedded Delay Defrost Capability
 - A “Connected” refrigerator, refrigerator-freezer, or freezer shall have an embedded delay defrost capability active by default, where the consumer can input or the product itself shall identify, the time of day, and the product shall automatically move the defrost function outside of the 4-hour peak load period specified by the local utility or the traditional peak period e.g., defined as 3pm to 7pm in most parts of the United States. The product may provide the consumer with the option to modify the scheduling of this functionality in order to, for example, respond to a short term request from the utility, or adjust to a utility service territory that peaks during a different time period. In the event of a power outage of 24-hours or lesser duration, after power is restored the product shall not require any interaction from the consumer to maintain this defrost deferral feature with the same settings as prior to the power outage.
- Note: Products with embedded delay defrost capability could automatically (communications not necessary) avoid defrosting during traditional periods of peak energy consumption. This capability does not require interconnection with the Smart Grid and thus can provide grid benefit as soon as these products are put into service. EPA estimates that this function, deployed across 1 million refrigerators could reduce power during the assumed peak period (3-7pm) by about 3.5 megawatts (MW) and would shift approximately 8.4 gigawatt-hours (GWh) annually from peak to non-peak periods. In order for the embedded delay defrost capability to operate as intended, the product must maintain time correctly. In addition, to ensure the identified benefit is not sacrificed after a power outage, EPA is also specifying that the product continue to deliver this function after a power outage of 24 hours or less, without any interaction from the consumer. This duration of 24 hours is intended to capture the majority of outages, while allowing stakeholders to comply without the use of batteries for time retention. The proposed language provides manufacturers with flexibility in how they comply. For example, the refrigerator may be designed to maintain time set by the installer or consumer or may have access to an external time signal. If and how the product responds to daylight savings time would also be at the discretion of the manufacturer. EPA notes that this capability, while included in this bundle of connected criteria, does not necessarily rely upon any communication link.

100 million refrigerators = 840 gigawatts off peak annually!
(a single typical coal plant is 667 megawatts of output)



**Smart Appliances
create
“storable demand”**