

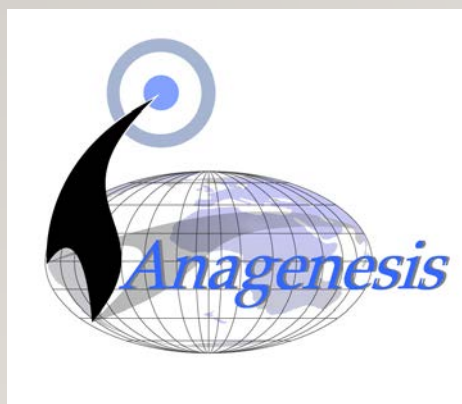
IF YOUR EFFICIENCY IS TOO LOW, YOUR SALES WILL BE TOO LOW

ADA CHENG, ADACLOCK

ARNOLD ALDERMAN, ANAGENESIS

SPONSORED BY THE PSMA

ENERGY MANAGEMENT COMMITTEE



OUTLINE

- Definitions & Load Line
- Efficiency Impact on Market
- Information Source: PSMA EEDB & SCDB
- Interrelationship Between Regulations & Standards
- U.S. Example: California Energy Commission
- European Example: Ecodesign
- Why Years 2020, 2030, and 2050 are Important
- Summary

DEFINITIONS & LOAD LINE

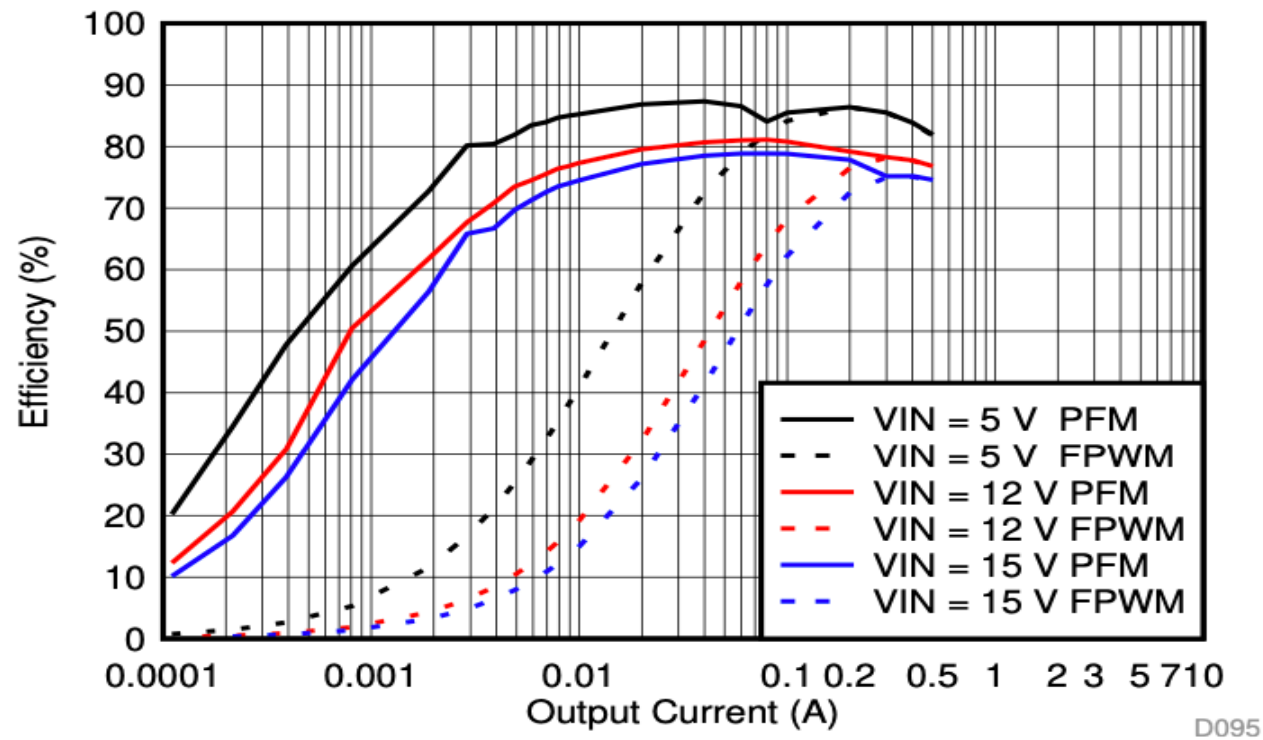
- Energy Efficiency = Energy Output / Energy Input
 - Varies with operating conditions & system type
 - Goal: reduce the energy required to produce products & services (Wikipedia)
- How it is measured
 - Preliminary test procedure defined
 - Using the test procedure, determine existing EE performance
 - Set initial regulatory specification at upper third
 - Subsequent specifications are set based on consumption reductions

- Is a rule or directive created and maintained by an authority such as
 - A country (U.S. DoE)
 - Federation of countries (EU)
 - State (California & Massachusetts), or province (Ontario, Canada)
- Enforcement is by law and identified by label
- Content is available to the public for free

Applicable regulations impacting power supplies and motor drives are in the agency's product appliance categories

- A document created in consensus and approved by a recognized body or organization
- For common or repeated use
- Standards may be international or regional
- Most standards are available to the public for a fee levied by the organization
- Enforcement occurs when a label is attached to the product indicating compliance (i.e. UL 969 label and marking standard)

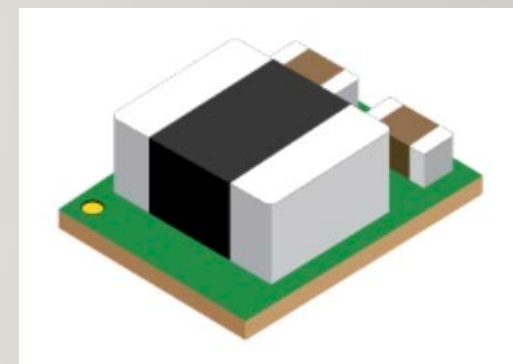
EXAMPLE OF LOAD LINE



MODE = Low for Auto PFM Mode 1.8-V Adjustable Output
 MODE = High for FPWM Mode

Figure 69. Efficiency for $V_{OUT} = 1.8\text{ V}$

For a buck (or step down) converter
 (source: LMZM23600)



80 PLUS CERTIFICATION: 115V POWER SUPPLIES



	Efficiency					
Load	80 Plus Basic	Bronze	Silver	Gold	Platinum	Titanium
10%	---	---	---	---	---	90%
20%	80%	82%	85%	87%	90%	92% / PFC .95
50%	80%	85% / PFC .9	88% / PFC .9	90% / PFC .9	92% / PFC .95	94%
100%	80% / PFC .9	82%	85%	87%	89%	90%

EFFICIENCY IMPACT ON MARKET



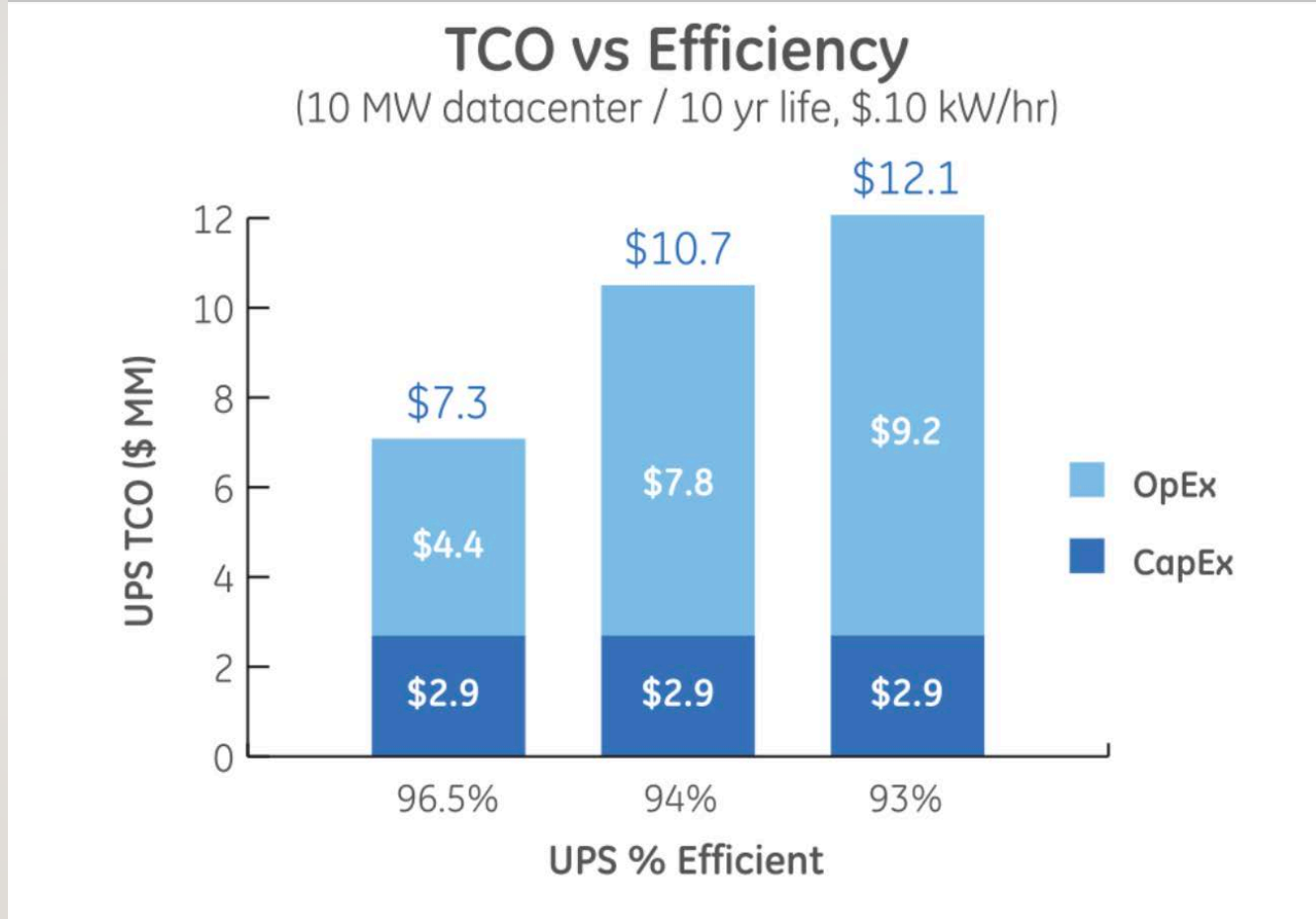
ENERGY EFFICIENCY IMPACT ON MARKET

- Saves energy
 - Lowers utility bills / reduces Total Cost of Ownership (TCO)
 - Increases battery life or reduces size/weight
 - Extends energy plants
- Lower thermal losses
 - Reduces system cooling requirements internally & externally
- Reduces audible noise
 - Especially fans & motors
- Promotes jobs in greener technologies

Energy efficient systems can lead to better sales

Energy efficient systems are better for the environment

If operating & maintenance costs > the initial capital costs: energy efficiency plays a bigger role in the total cost of ownership



Source: Datacenterknowledge.com

PSMA REGULATIONS AND STANDARDS DATA BASES

Home | Contact | Site map

Quick Links

- » Members only
- » Pay Your Membership Dues
- » Safety&Compliance database
- » Energy Efficiency database
- » PSMA newsletter "Update"
- » University resources
- » EPSMA
- » Industry links
- » Feedback and suggestions
- » Why join PSMA?
- » Technical forums

Home » Technical Forums » Energy Management

Energy Efficiency Database



Energy Management Info & Resources
for the Power Electronics Industry.

SCDB

EEDB

Please select from the menus above to view the database info ifo
by one of the search methods indicated.

Recent & Upcoming Events:

Upper right hand corner of
PSMA Website front page

EEDB DROP-DOWNS

- Agencies -

- Agencies by Country/

- Agencies -

80 PLUS

American Council for an Energy-Efficient Economy ACEEE

American National Standards Institute ANSI

Asia Pacific Partnership

56 Agencies

AZ House Bill

Blauer Engel / Blue Angel - Germany

CA Energy Commission

China Compulsory Certification (CCC)

China Energy Conservation Project (CSC)

China National Institute of Standardization

Clasp

Climate Saver's Computing Initiative

Consumer Electronics Association CEA

Directorate-General for Energy

Eco Mark Japan

Efficient Lighting Initiative

Electric Utility Consultants EUCI

November 2019

NUMBER OF REGIONS: 5

NUMBER OF COUNTRIES: 33

NUMBER OF AGENCIES ON THE DATABASE: 56

NUMBER OF REGULATIONS: 506

NUMBER OF APPLICATION CATEGORIES: 100

NUMBER OF SUB-APPLICATION CATEGORIES: 45

NUMBER OF MEETING IN DATABASE: 4050

NUMBER REGISTERED TO USE DATABASE: 454

- Agencies -

- Agencies by Country/State

- Agencies by Application -

- Agencies by Region -

- Regulations by Application -

- Regulations by Application -

Appliances - General

Audio

Batteries

Batteries

Batteries

Batteries

Computers

Copiers

Displays

External Power Supplies

Games

General Efficiency Standards

Home Appliances

Home Efficiency

HVAC

Imaging Equipment

Industrial Applications

100 Application Categories

U.S. EXAMPLE: CALIFORNIA ENERGY EFFICIENCY PROGRAM



- The early (1974) and strong advocate of efficiency regulations – Dr. Arthur H. Rosenfeld (1926 – 2017)
 - “There is an even cleaner form of energy than the sun, more renewable than the wind: it's the energy we don't consume.”
 - He believed that: If we can determine the micro-numbers for atoms, we can determine the macro-numbers for the world's energy
 - Insisted on the numbers...
 - 2002 – 2010 California Energy Commissioner

Source: <https://unquote.li/en/quotes/arthur-h-rosenfeld/there-is-an-even-cleaner-form-of-energy-than-the-sun-more-renewable-than-the-wind-it-s-the-energy-mgdw598yjr>

<https://eta.lbl.gov/about-us/arthur-h-rosenfeld>



CA ENERGY COMMISSION APPLIANCE DOCUMENTS

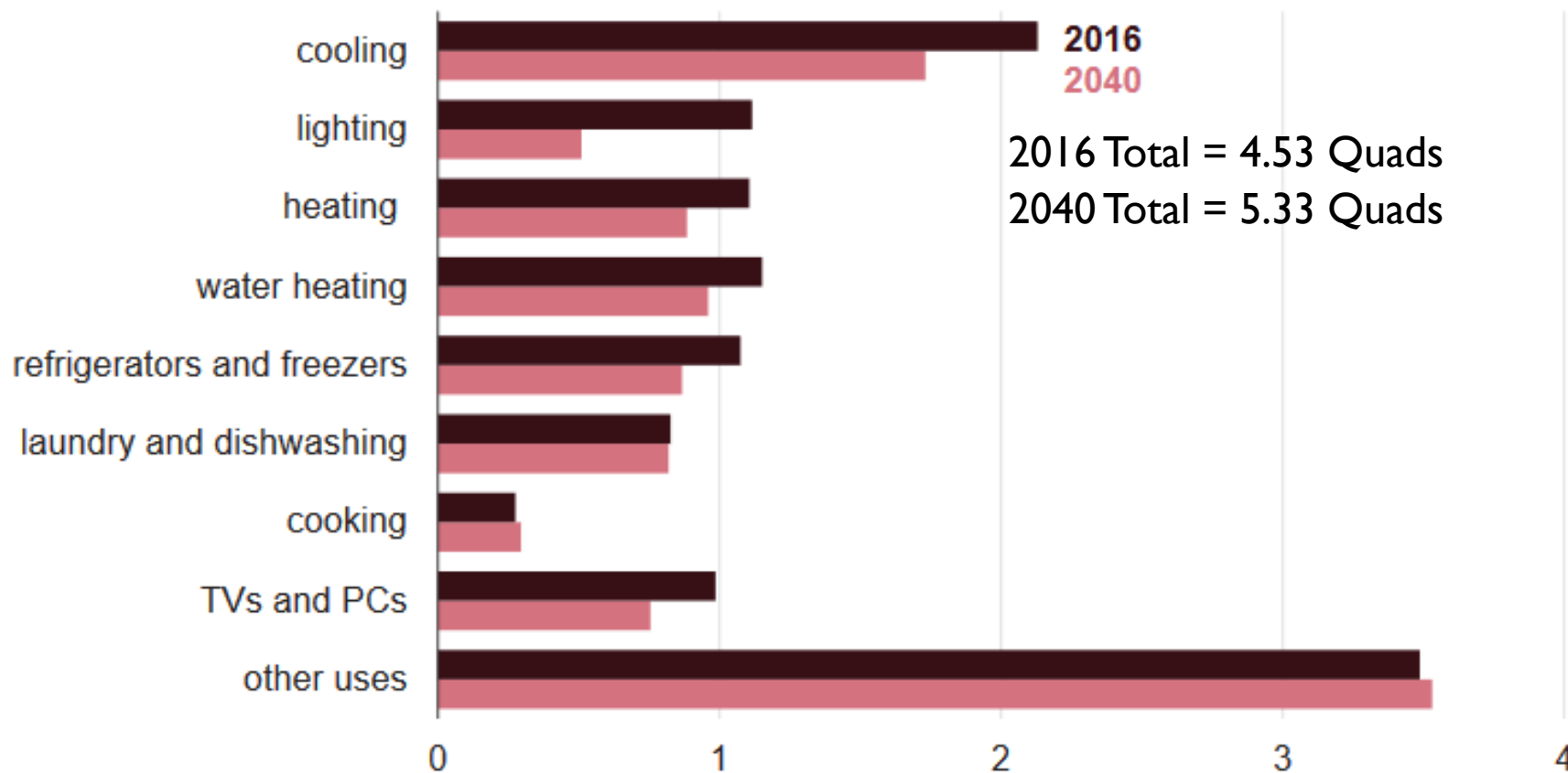


- Scope
- Definitions
- Rules of Construction
- Testing: All Appliances
- Test Methods for Specific Appliances
- Energy Performance, Energy Design, Water Performance, and Water Design Standards: In General
- Federal and State Standards for Federally-Regulated Appliances
- State Standards for Federally-Regulated Appliances
- State Standards for Non-Federally-Regulated Appliances
- Filing by Manufacturers; Listing of Appliances in the Maedbs
- Marking of Appliances
- Compliance, Enforcement and General Administrative Matters
- Administrative Civil Penalties



U.S. RESIDENTIAL LOADS CONSUMPTION 2016 - 2040

Residential electricity use per household
thousand kilowatthours per household



U.S. Energy Information Administration

#AEO2017

www.eia.gov/aeo

1

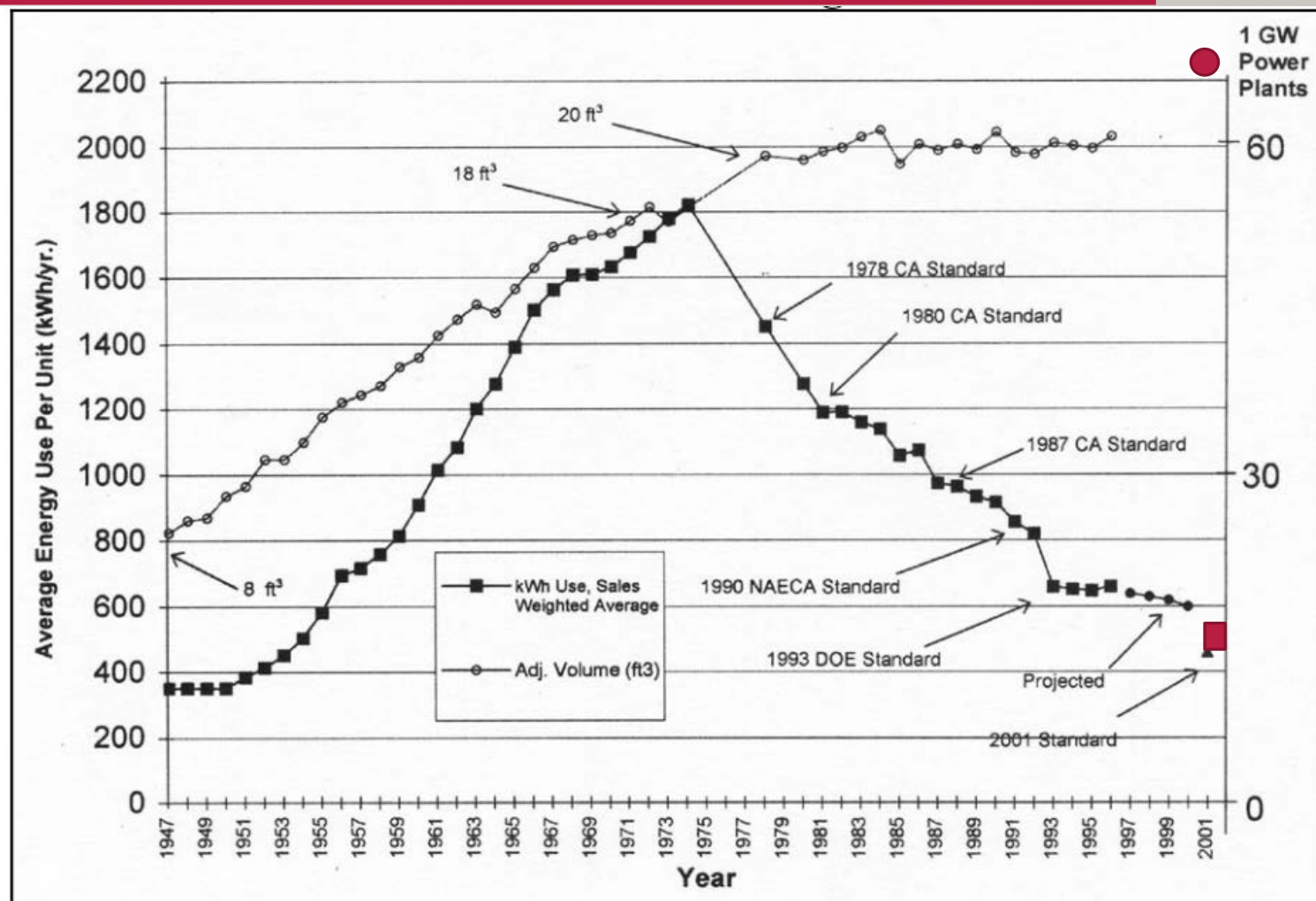


ARE ENERGY EFFICIENCY REGULATIONS EFFECTIVE? YES

- Jun 1, 2018 - A typical fridge of size 22.5 cubic feet can use around 495kWh of electricity each year, which equates to a cost of about \$163.35,

● 2018
■

Historic Changes in Average Per-Unit Use and Interior Volume of New Refrigerators in the U.S.



Source: Rosenfeld 1999 Updated

EUROPEAN EXAMPLE: ECODESIGN

World Leader in Region Efficiency Regulations & Standards



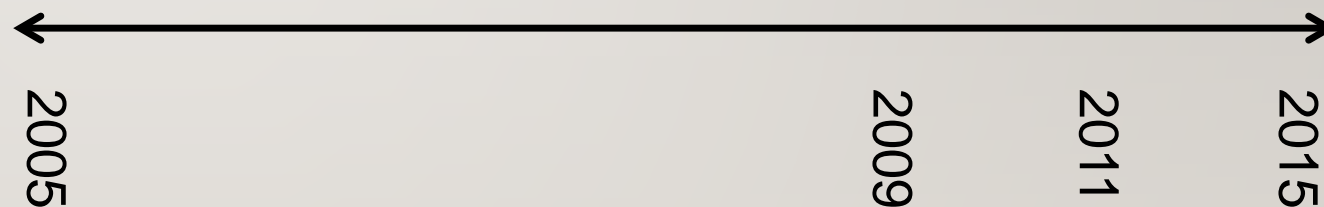
REGULATION/STANDARD RELATIONSHIP

- Gross Consumption Established
 - Establishes required power consumption reduction
- Regulation draft commences
- Upon creating the regulation, a Standard is drafted and approved by associated standards organization (IEC, BS, UL, ANSI...)

EU Gross Energy Consumption Reduction Regulation

Ecodesign Appliance Efficiency Regulation

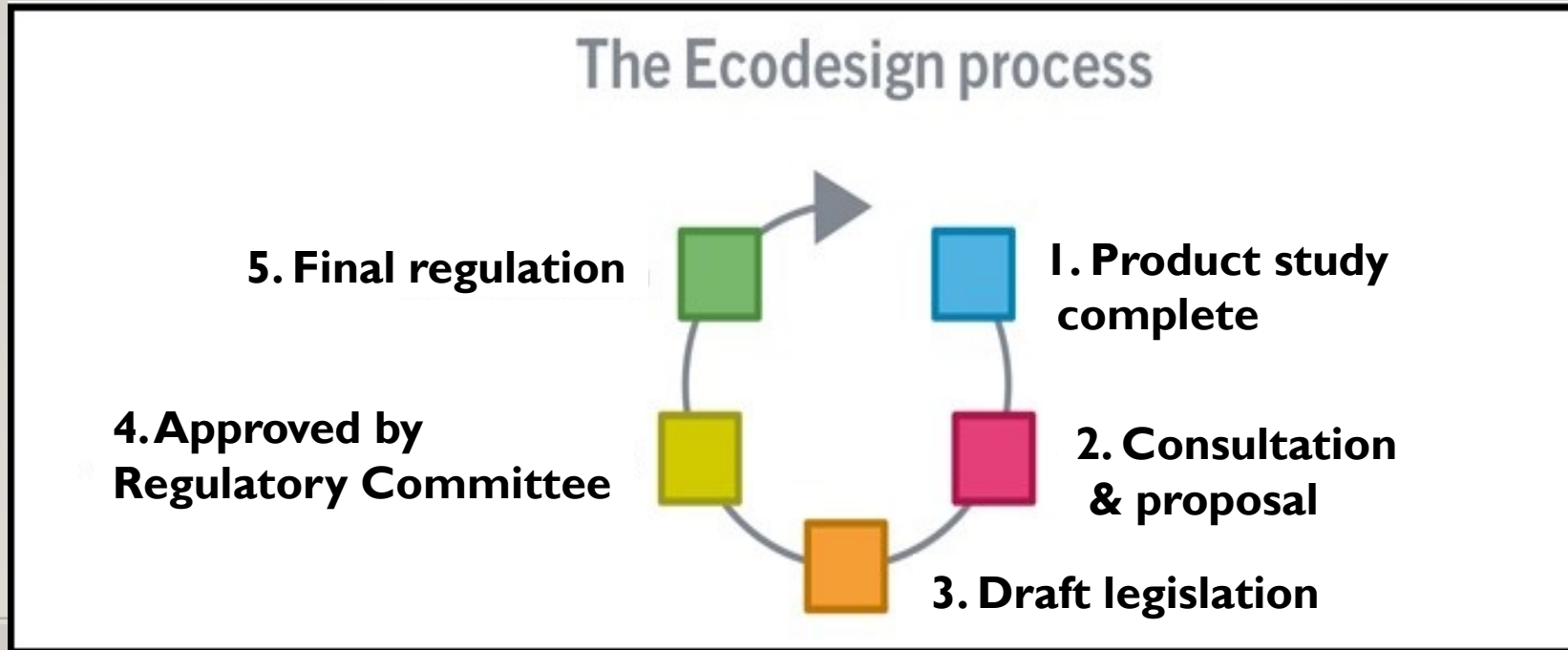
Appliance Test (or Efficiency) Standard



Ecodesign Start
Directive 2005/32/EC

Ecodesign NLand
AAE for external
EC No 278/2009

- Product study – target total energy consumption reduction share for specific appliance
- Convert result to required efficiency
- Set efficiency improvement specification for appliance
- Confirm energy consumption reduction after a number of years after effectivity

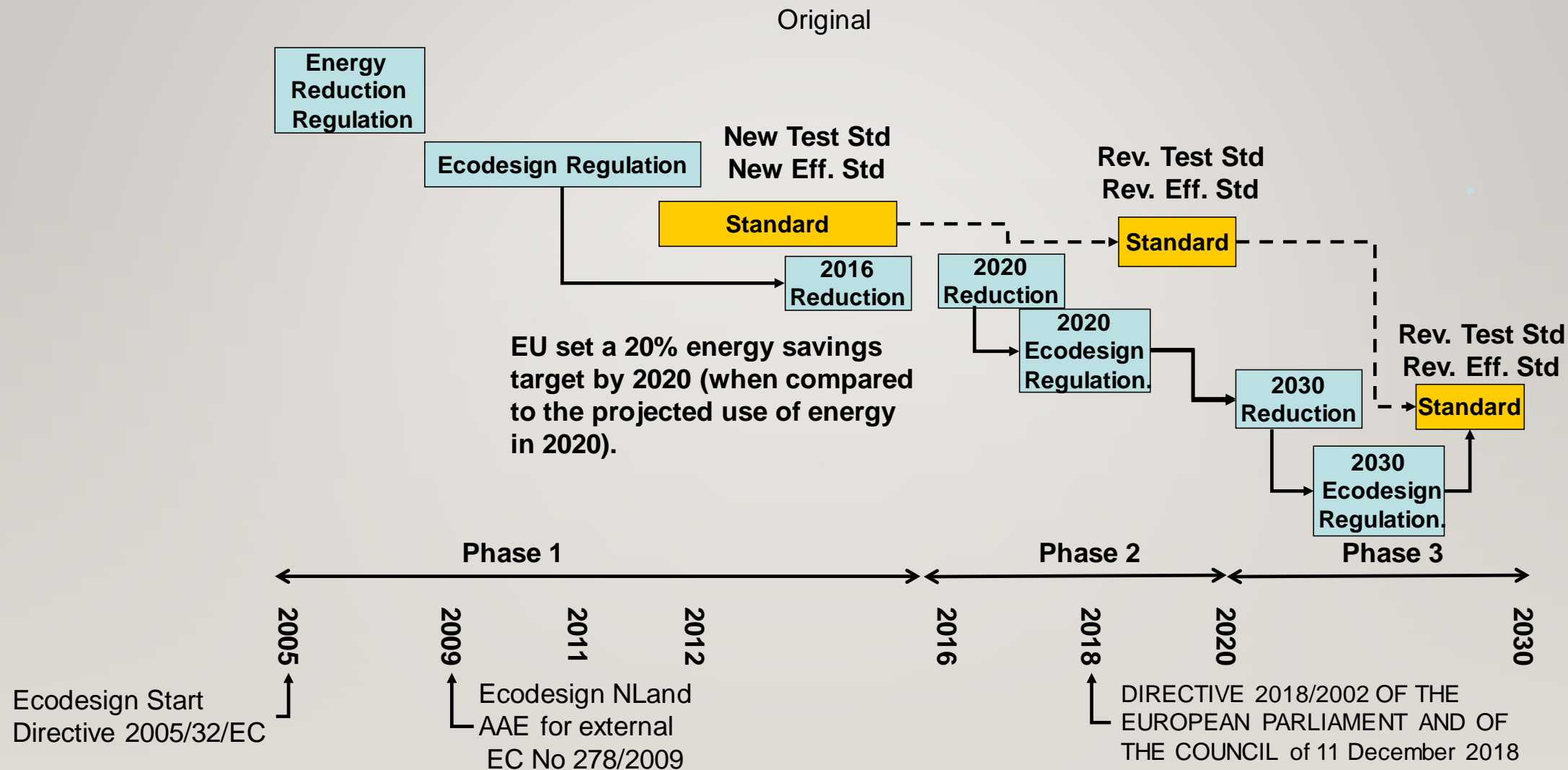


THE EFFICIENCY BAR IS CONTINUALLY RAISING

- Your product could be blocked from the market unless you comply with increased efficiency levels specified based on 2016 consumption levels as power consumption is reduced.
- In general targets are
 - 2020 – 20% consumption reduction based on 2016 projected consumption
 - 50% of EU appliance consumption reduction already achieved
 - 2030 – ~30% (i.e. 30.7% for EU with possible upward revision in 2023)
 - 2050 - ~50%
- So expect a sally of higher-efficiency regulations for appliances



REGULATIONS & STANDARDS



SUMMARY

- Energy efficiency is impacting your market
- Monitoring regulations provides 2 years advance notice of efficiency standards
- Look for the efficiency bar will be raised for 2020, 2030, and 2050
- It is to your advantage to participate in regulation & standard process
- The PSMA EEDB and SCDB simplifies your searches and provide continuous updates