Appliance and Equipment Labeling and Efficiency Standards

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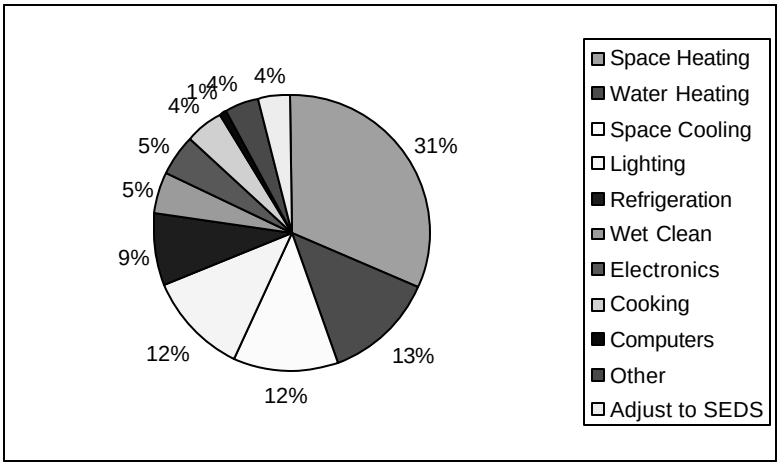
Outline

- Appliance energy use
- Opportunities for savings
- Barriers to appliance efficiency
- Labeling
- Standards
- Steps in establishing a program
- Conclusion

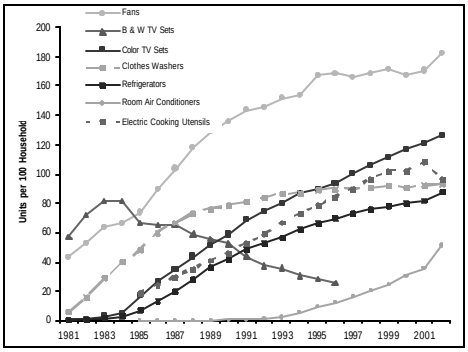
U.S. Residential Energy Use



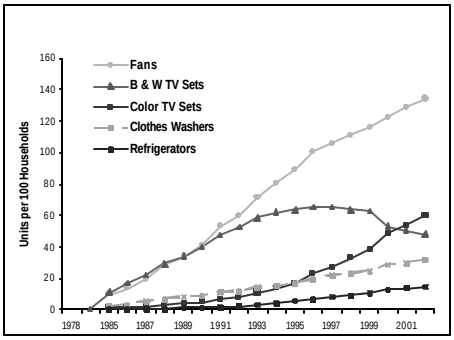
Source: EIA, 2002 RECS

Appliance Ownership in China

Urban



Rural



Source: LBL, China Energy Databook, 2004 edition

Energy, Economic and Emissions Savings from U.S. Standards

Enact Year	Standards	Electricity savings (TWh/yr)			Primary energy savings (Quads/yr)			Peak load reductions (GW)			Carbon Reductions (MMT)			Net Benefit ($Billion)
		2000	2010	2020	2000	2010	2020	2000	2010	2020	2000	2010	2020	Thru 2030
1987	NAECA	8.0	40.9	45.2	0.21	0.55	0.61	1.4	14.9	16.5	3.7	10.0	10.1	46.3
1988	Ballasts	18.0	22.8	25.2	0.21	0.27	0.29	5.7	7.1	7.9	4.4	5.0	5.0	8.9
1989&91	NAECA updates	20.0	37.1	41.0	0.23	0.43	0.47	3.6	6.9	7.7	4.8	8.1	8.1	15.2
1992	EPAct (lamps, motors, etc)	42.0	110.3	121.9	0.59	1.51	1.67	10.1	26.2	28.9	11.8	27.5	27.9	84.2
1997	Refrigerator/freezer update	0.0	13.3	28.0	0.00	0.13	0.28	0.0	1.7	3.6	0.0	2.9	5.5	5.9
1997	Room Air Conditioner update	0.0	1.3	2.1	0.00	0.01	0.02	0.0	1.0	1.6	0.0	0.3	0.4	0.6
2000	Ballasts update	0.0	6.2	13.7	0.00	0.06	0.13	0.0	1.8	3.0	0.0	1.3	2.7	2.6
2001	Clothes Washer Update	0.0	8.0	22.6	0.00	0.11	0.28	0.0	1.3	6.1	0.0	2.2	5.4	15.3
2001	Water heater update	0.0	2.5	4.9	0.00	0.08	0.13	0.0	1.5	3.6	0.0	1.4	2.2	2.0
2001	Central AC&HP update	0.0	10.7	36.4	0.00	0.11	0.35	0.0	3.5	41.5	0.0	2.3	7.2	5.0
2005	EPAct 2005	0.0	14.7	53.0	0.00	0.21	0.65	0.0	5.8	23.9	0.0	3.7	11.5	47.5
	TOTAL	**88**	**268**	**394**	**1.2**	**3.5**	**4.9**	**21**	**72**	**144**	**25**	**65**	**86**	**234**
	% of projected U.S. use	**2.5%**	**6.9%**	**9.1%**	**1.3%**	**3.1%**	**4.0%**	**2.8%**	**8.3%**	**15.1%**	**1.7%**	**3.6%**	**4.4%**	

Source: ACEEE, "Leading the Way", 2006

Recommended Standards in Thailand

- Refrigerators
  - Tier 1: 11% savings 1-door, 19% 2-door
  - Tier 2: 17% savings 1-door, 30% 2-door
- Split Air Conditioners
  - 9.6 EER (~10% avg. savings)
- Fluorescent ballasts
  - Restrict losses to require low-loss ballasts (saves ~40%)
- Electric motors
  - Tier 1at worldwide "standard" efficiency level (saves ~ 2%)
  - Long-term goal of worldwide "high efficiency level (saves ~5% more)
- Fluorescent lamps
  - Maximum wattage limits for fluorescent tubes (saves ~10%)
  - Quality standards for CFLs (eliminate junk that leads to unhappy customers)

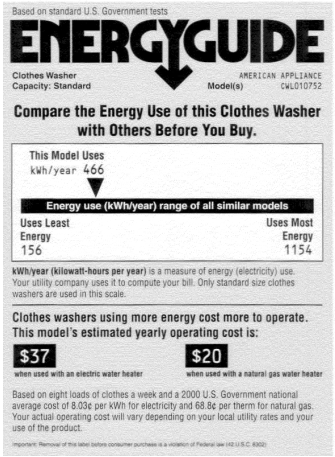
Barriers to Appliance Efficiency

- Lack of information -- consumers (and often salespersons) don't realize variations in efficiency and which are most efficient products
- Third party decision-makers – landlords, builders
- Efficient products may not be readily available at time of purchase (e.g. panic purchases)
- High prices
  - Bells and whistles
  - Niche products

Appliance Labeling

- Provides consumers comparative information between products
- Best labels:
  - Encourage consumers to purchase most efficient products
  - Encourage manufacturers to upgrade products
    - Compete for best products
    - Avoid worst products

Informational Label



Categorical Labels

Figure 1. European Appliance Label

Figure 2. Australian Appliance Label

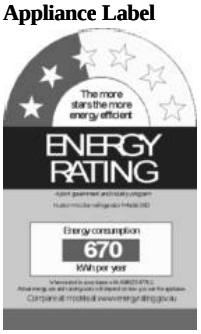


Figure 3. Thai Appliance Label

Endorsement Labels

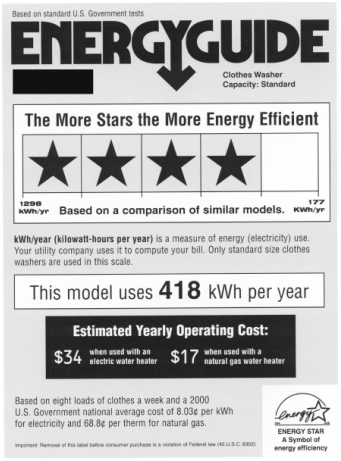
U.S.

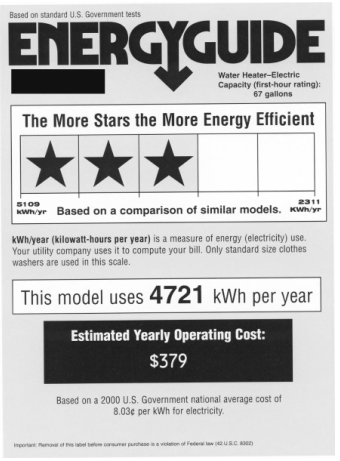
Brazil

Experience with Categorical Labels

- EU: refrigerator efficiency increased by 27% from 1990 to 1999 after labeling program started
- Australia: efficiency improvements of 1% to 16% for labeled product categories from 1986 to 1992
- Thailand:
  - Market share of efficient ACs grew from 19% in 1996 to 38% in 1998
  - Efficient refrigerators up from 10% market share before the label to 92% in 1998.

Proposed Combined Label





Equipment Efficiency Standards

- Surmount barriers
- Remove inefficient products from market
- Leave wide range of products and product attributes to choose from
- Based on levels of efficiency that are cost-effective to most consumers

Initial Products Subject to U.S. Federal Standards

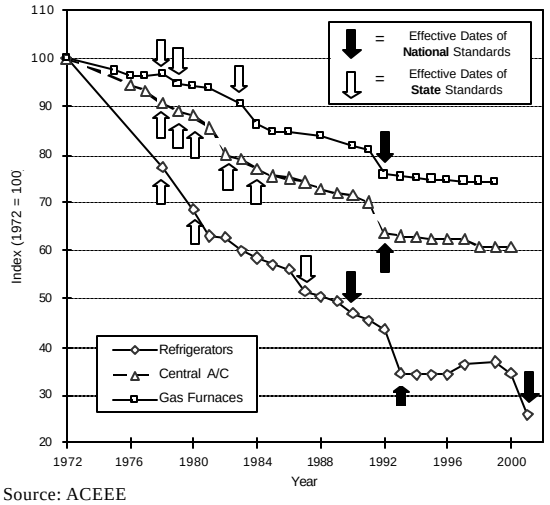
Products Included in the National Appliance Energy Conservation Act	
Refrigerator-freezers	Clothes washers
Freezers	Clothes dryers
Room air conditioners	Dishwashers
Central air conditioners & heat pumps	Ranges & ovens
Furnaces & boilers	Pool heaters
Water heaters	Fluorescent lamp ballasts
Direct-fired space heaters	Televisions*
Products Added in the Energy Policy Act of 1992	
Fluorescent lamps	Showerheads
Incandescent reflector lamps	Faucets & aerators
Electric motors (1–200 hp)	Toilets
Commercial packaged air conditioners & heat pumps	Distribution transformers*
Commercial furnaces & boilers	Small electric motors (<1 hp)*
Commercial water heaters	High-intensity discharge lamps*

* DOE to determine if standards justified and appropriate level

Standards Added in the Energy Policy Act of 2005

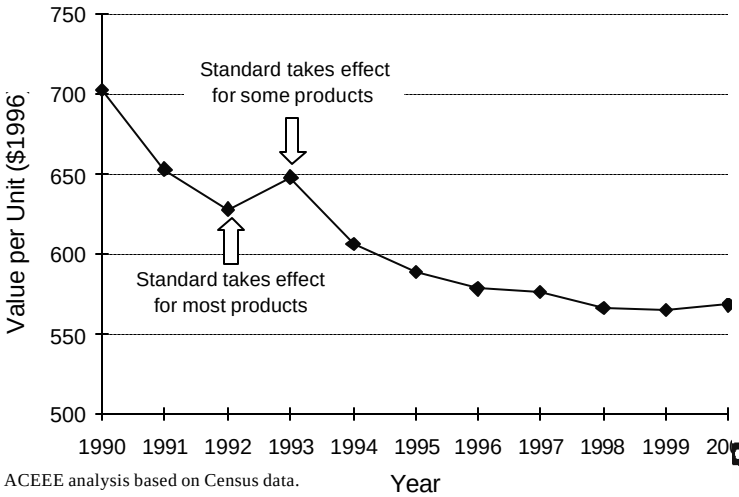
Residential
Ceiling fan light kits
Dehumidifiers
Compact fluorescent lamps
Torchiere lighting fixtures
Commercial and Industrial
Air-conditioners and heat pumps (unitary equipment 240–760k Btu/hr)
Clothes washers
Distribution transformers (low voltage)
Exit signs
Fluorescent lamp ballasts (F34 and F96ES types)
Ice-makers (cube type, 50-2,500 lbs/day)
Mercury vapor lamp ballasts
Pedestrian traffic signals
Pre-rinse spray valves
Refrigerators and freezers (packaged)
Traffic signals
Unit heaters

Impact of U.S. Standards on Product Efficiency



Source: ACEEE

Impact on Product Prices
(central air conditioners)



Source: ACEEE analysis based on Census data.

Countries with Mandatory Standards (# products)

- U.S. (32)
- Canada (20)
- Taipai (12)
- Russia (9)
- Brazil (1)
- Israel (11)
- Australia (9)
- New Zealand (8)
- China (16)
- Malaysia (1)
- Norway (4)
- EU (4)
- Korea (12)
- Jamaica (3)
- Czech Republic (4)
- Philippines (3)
- Thailand (1)
- Mexico (10)
- Poland(4)
- Costa Rica (8)
- Columbia (8)
- Hungary (2)
- Iran (8)
- Venezuela (2)
- Saudi Arabia (1)
- Ghana (1)
- Egypt (4)
- Tunisia 1)

Source: CLASP with ACEEE revisions for U.S. and China

Products Covered by Standards (# of countries)

- Refrigerators (22)
- Freezers (20)
- Room AC (20)
- Fluorescent ballasts (13)
- Lamps (12)
- Electric motors (12)
- Water heaters (11)
- Boilers (9)
- Clothes washers (7)
- Ranges/ovens (6)
- Dishwashers (4)
- Space heaters (4)
- Chillers (3)
- Fans (3)
- Furnaces (3)
- Many at (2) or (1)

Products Covered by Chinese Standards

- Refrigerators
- Room air conditioners
- Clothes washers
- Fans
- Rice cookers
- Televisions
- Single-package AC
- Chillers
- Ventilation fans
- Fluorescent lamps (tubes & CFLs)
- Fluorescent ballasts
- HPS lamps & ballasts
- Electric motors
- Industrial pumps
- Air compressors
- Water heaters, external power supplies and distribution transformers close

Steps to Develop Labels and Standards

- Law/authority
- Test standards
- Test lab
- Data compilation
- Analysis and market research
- Labels
- Initial standards
- Revisions to standards
- “Reach” standards

Conclusions

- Large opportunity to save energy and money with more efficient appliances and equipment
- Standards probably the most effective policy to capture these savings
  - Adopted in ~30 countries
- Labels (particularly categorical) are a useful complement
- Developing standards and labels first requires equipment test procedures, testing, and compilation of a database of equipment performance.