“*Lack of Sleep Costs Americans $2 Billion/yr*”

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March 2013

Today's Plan

- Present findings from 2011 NRDC/Ecova study on STB in the US
- Discuss recent trends and improvements
- Discuss additional opportunities

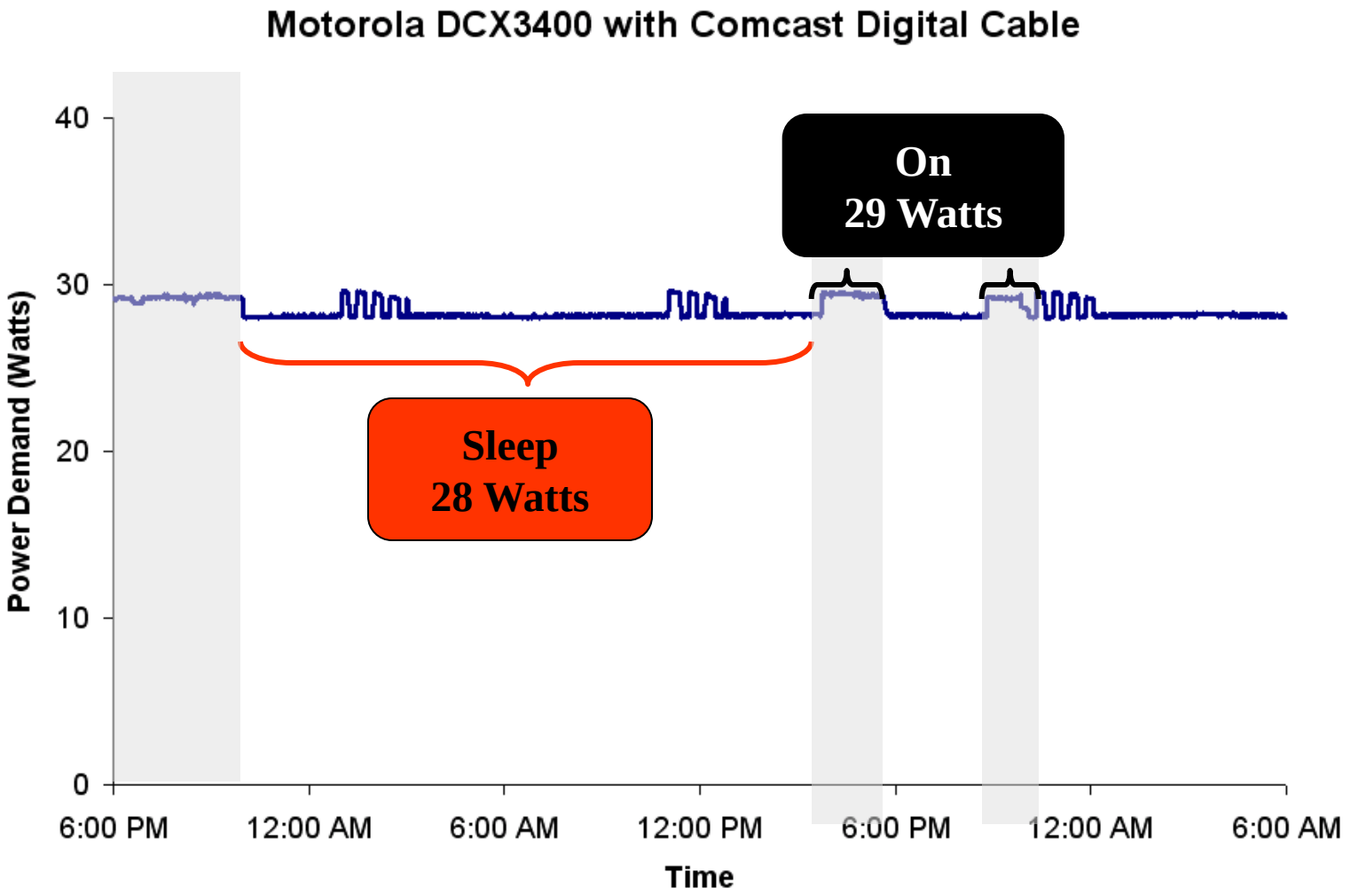
NRDC-Ecova 2011 STB Study Details

- NRDC hired Ecova to measure and analyze STB energy use
- Went into the field in 2010 and measured power use of roughly 50 STB models in various operating modes
- Cross-section of:
  - SD/HD
  - Regular/DVR
  - Cable/satellite/telco

NRDC-Ecova STB Study Findings

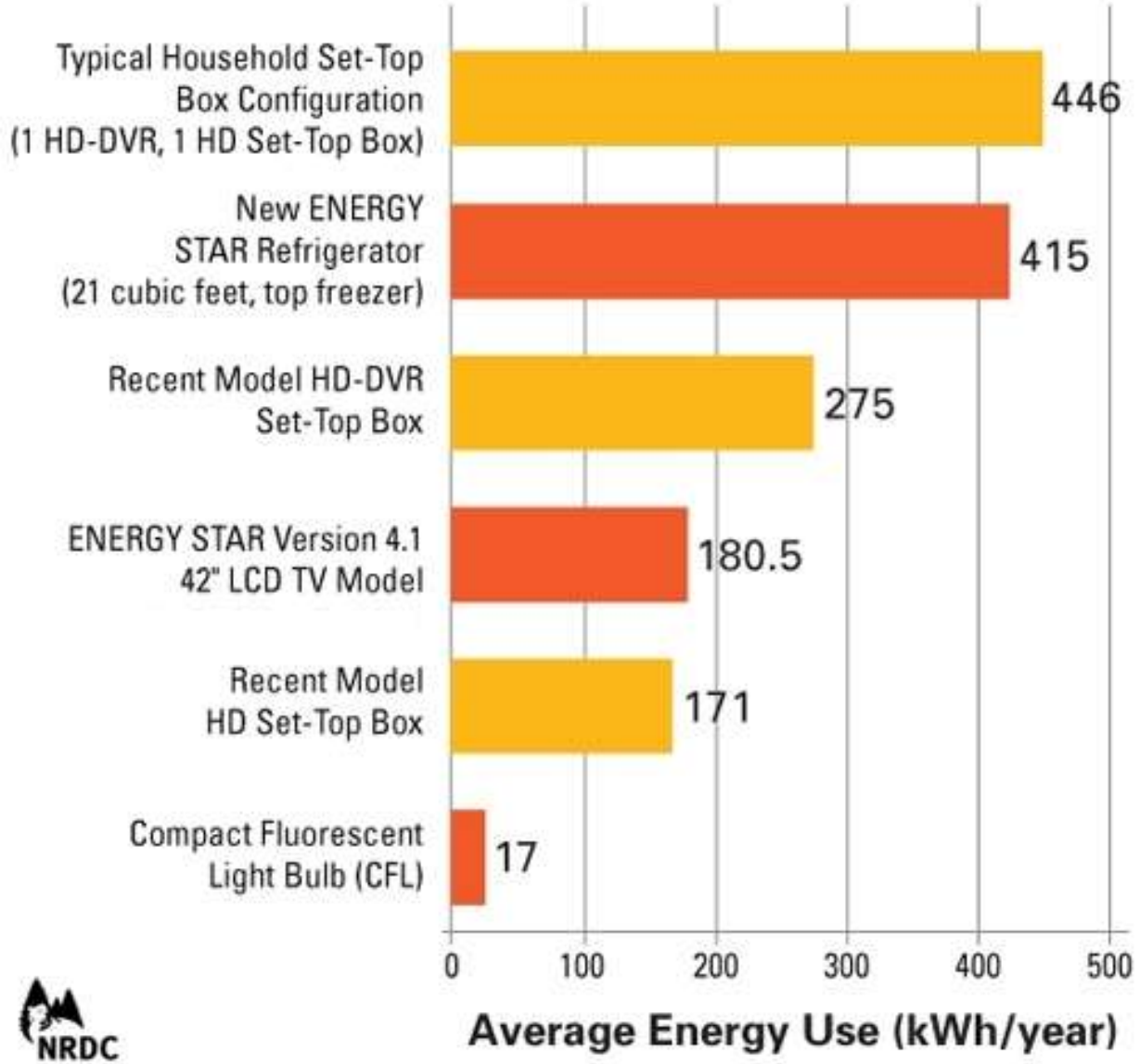
- > 80% of US households subscribe to pay-TV
- Installed base - 160 million STBs
- Many homes have 2 or more STBs
- Little to no difference in power use when "turned off"
- Hitting "power button" merely dims the clock and the box continues to use near full power 24/7
- Americans spend $2 billion/yr to power their STBs when they are NOT in use.

STB Data Logging Example



Source: Ecos/NRDC 2010

Energy Use of Set-Top Boxes and Other Appliances



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Nearly Two-Thirds of Annual U.S. Set-Top Box Energy Use Occurs When Viewers are Not Watching or Recording Content

RESULTS IN...

Electricity Consumption:
3 Power Plants (500 MW each)

Emissions:
5 Million Metric Tons CO_2/year

Cost to Consumers:
$1 Billion/year

RESULTS IN...

Electricity Consumption:
6 Power Plants (500 MW each)

Emissions:
11 Million Metric Tons CO_2/year

Cost to Consumers:
$2 Billion/year

In Use = watching or recording a show

Not In Use = not watching or recording a show

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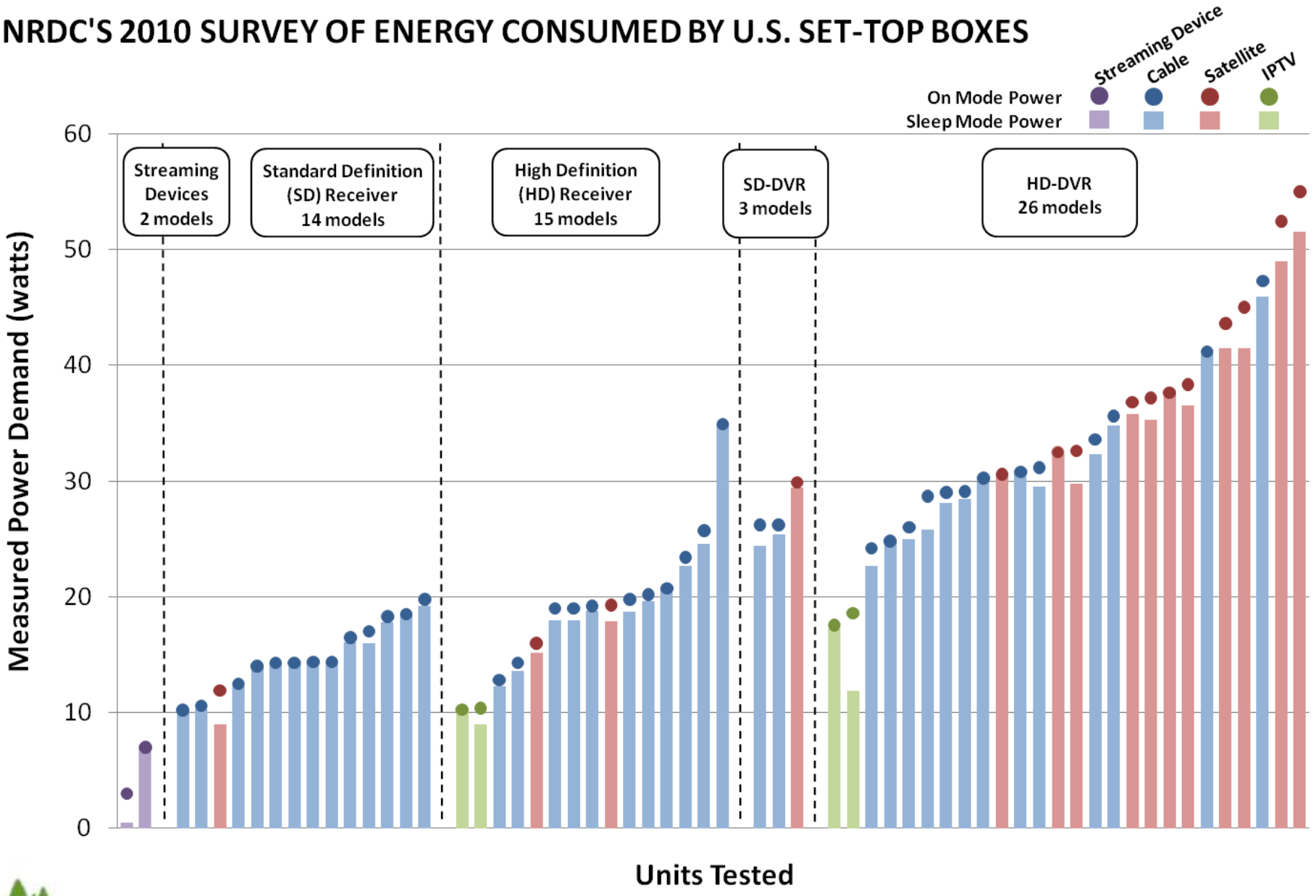
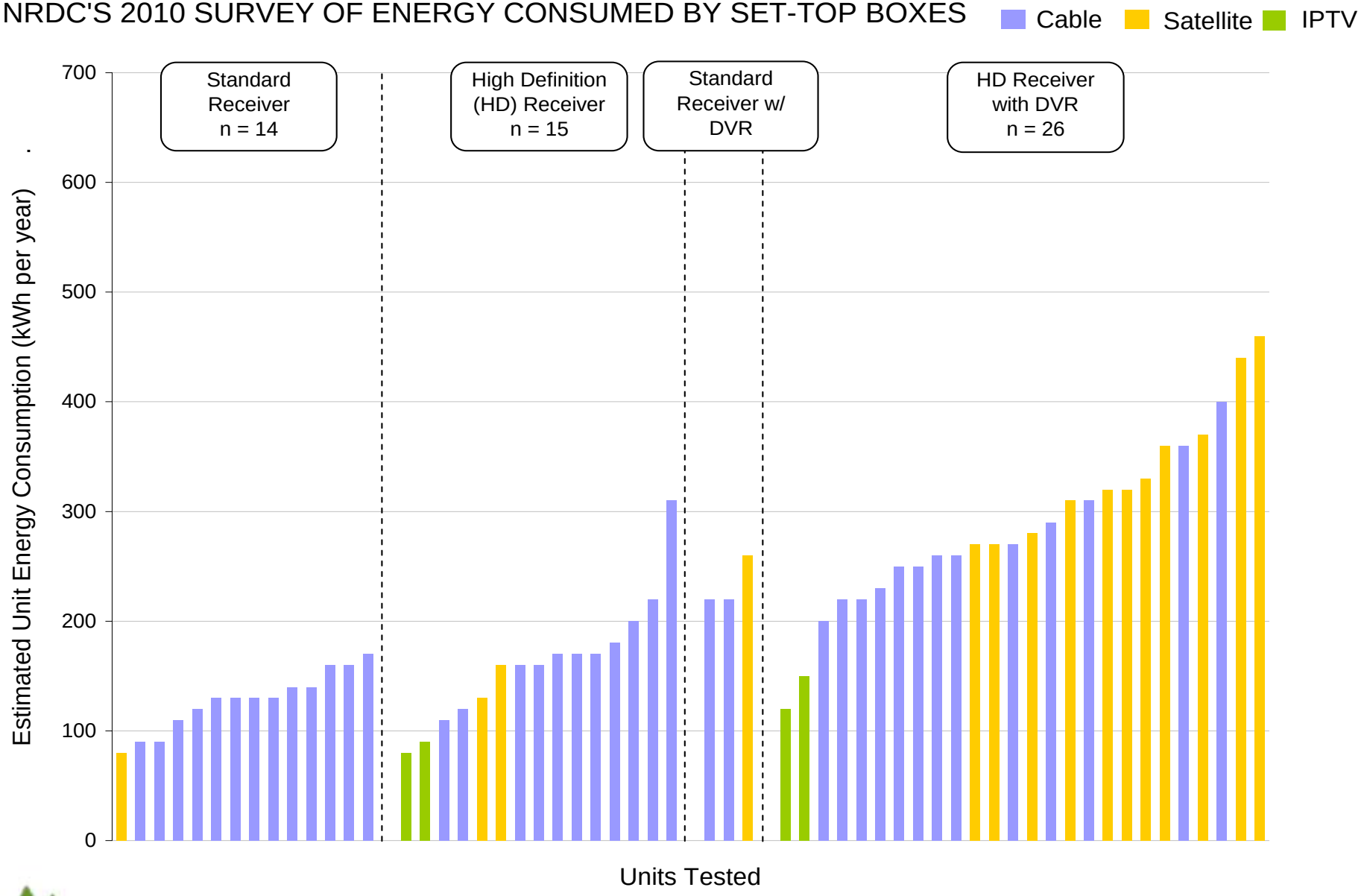
NRDC'S 2010 SURVEY OF ENERGY CONSUMED BY U.S. SET-TOP BOXES



NRDC'S 2010 SURVEY OF ENERGY CONSUMED BY SET-TOP BOXES



Source: Ecos/NRDC 2010

Recent Developments

- US Environmental Protection Agency issued two new versions of ENERGY STAR (V3 and V4) which cut annual energy use by approx. 25% (V3) and an additional 30% (V4) from 2010 levels. V3 in effect now, updated V4 due out in late Q2
- Industry moving away from installing one DVR per TV. Whole home solutions growing in popularity (whole home DVR on main TV, thin client on 2nd and 3rd TV)

Additional Developments

- Cable DVRs now have “light sleep” feature that sheds 5 to 7 W when box is turned off (spins down hard drive and turns off tuners). Also software update pushed to newer boxes in the field.
- Many new cable and satellite boxes use around 30% less energy than prior models.
- Thin clients are around 7W on, 6W standby today.

Where Do We Want Things to Go?

- All boxes have much lower sleep power use with fast recovery/wake times
  - No user sacrifices: can still wake to record shows, receive software and program guide updates, etc.
- Thin clients:
  - Get closer to 3W on, <1W sleep as they're not connected to the head-end
- Auto-power down (APD):
  - All boxes installed with APD enabled so they automatically go to low power sleep state if left on for extended period of inactivity

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Other Trends/Issues

- **Convergence** – new “gateway” boxes due to come to market that may include hi-speed internet service, IP telephony, and router, along with whole home DVR. Will this save energy overall/prevent innovative low power sleep?
- **Testing** - Power use of box is a function of BOTH the box itself, how its deployed and the head end its connected to. Testing must be done with live signals on service provider’s network.
- **Deep Sleep** - Some scheduled “deep sleep” initiatives whereby box uses very little power between 1 and 5 am.

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In Closing

- Consumer cannot choose a more efficient box, but must pay the electricity bill
- Standby power in perspective:
  - Current EStar 3.0-qualified boxes use 9-12W in Sleep, average new box in US may be 12-20W (2-3x EU Lot 26 Tier 1)
  - Not a 0.5W vs. 1W issue: 15W 24/7 = 130 kWh, just for Sleep!
- Not just a technical issue:
  - Regulatory (CableCARD), split incentives…
- Need all stakeholders to work together to solve this challenge and capture energy savings

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NRDC Report: http://www.nrdc.org/energy/files/settopboxes.pdf

ENERGY FACTS

Better Viewing, Lower Energy Bills, and Less Pollution: Improving the Efficiency of Television Set-Top Boxes

More than 80 percent of U.S. homes subscribe to some form of pay television service. Transforming those signals into shows, movies, and sports on the screen currently depends on approximately 160 million set-top boxes, nearly all of which are owned and installed by the cable, satellite, phone, or other service provider. NRDC and Ecos partnered to better understand how much energy these devices use and what energy savings opportunities exist. What we found was startling: In 2010, set-top boxes in the United States consumed approximately 27 billion kilowatt-hours of electricity, which is equivalent to the annual output of nine average (500 MW) coal-fired power plants. The electricity required to operate all U.S. boxes is equal to the annual household electricity consumption of the entire state of Maryland, results in 16 million metric tons of carbon dioxide (CO_2) emissions, and costs households more than $3 billion each year. Fortunately, there is great potential for improving the efficiency and reducing the cost of operating these electronics relied upon by so many viewers.

Key Findings

- There are approximately 160 million set-top boxes installed in U.S. homes. Almost all of these boxes are owned and installed by the service provider (e.g. Comcast, Time Warner, Cox Communications, DISH Network, DirecTV, Verizon and AT&T, etc).
- Today's set-top boxes operate at near full power even when the consumer is neither watching nor recording a show. As a nation, we spend $2 billion each year to power these boxes when they are not being actively used.
- Digital Video Recorders (DVRs) are growing in popularity and frequently replace set-top boxes without recording capability. DVRs typically use around 40 percent more energy per year than their non-DVR counterparts.
- Better designed pay-TV set-top boxes could reduce the energy use of the installed base of boxes by 30 percent to 50 percent by 2020. The big opportunities include: a) shifting to whole-home solutions that include a main box connected to the primary TV with either TVs specially-designed to access the video content stored on the main box or low-power thin client boxes that serve the same function, and b) having the boxes automatically power down to much lower power levels when not in use (e.g. in the middle of the night, or while users are at work).

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Power Measurements of Cable, Satellite and IPTV Set-Top Boxes

NRDC ecos

Service Provider Type	Service Provider Name	Make	Model Name	Product Class	MultiRoom Capability	Additional Tuners	Active Power Use (W)	Standby Power Use (W)
Cable	Comcast	Motorola	DCH70	SD	No	No	11	10
Cable	Comcast	Motorola	DCH70	SD	No	No	10	10
Cable	Verizon FiOS	Motorola	QIP2500	SD	No	No	13	12
Cable	Time Warner	Motorola	DCT2224	SD	No	No	14	14
Cable	Verizon FiOS	Motorola	QIP2500	SD	No	No	14	14
Cable	Verizon FiOS	Motorola	QIP2500	SD	No	No	14	14
Cable	Verizon FiOS	Motorola	QIP2500	SD	No	No	14	14
Cable	Verizon FiOS	Motorola	QIP2500	SD	No	No	14	14
Cable	Time Warner	Scientific Atlanta	Explorer 2100	SD	No	No	17	16
Cable	Comcast	Motorola	DCT2000	SD	No	No	17	16
Cable	Comcast	Motorola	DCT2000	SD	No	No	18	18
Cable	Comcast	Motorola	Starfone5FT2	SD	No	No	19	19
Cable	Charter	Motorola	Starfone5FT2	SD	No	No	20	19
Cable	Comcast	Pace	RNG110	HD	No	No	13	12
Cable	Bresnan	Pace	DC700X	HD	No	Yes	14	14
Cable	Time Warner	Cisco	Explorer 4250HDC	HD	No	No	19	18
Cable	Time Warner	Cisco	Explorer 4250HDC	HD	No	No	19	18
Cable	Comcast	Motorola	DCX3200	HD	No	No	20	20
Cable	Time Warner	Scientific Atlanta	Explorer 3250HD	HD	No	No	20	19
Cable	Cox	Scientific Atlanta	Explorer 3250HD	HD	No	No	19	19
Cable	Verizon FiOS	Motorola	QIP7100	HD	Yes	Yes	21	21
Cable	Time Warner	Cisco	Explorer 8300HD	HD	No	No	23	23
Cable	Comcast	Motorola	DCH3200	HD	No	No	26	25
Cable	Bresnan	Motorola	DCH6200	HD	No	No	35	35
Cable	Comcast	Pace	TDC577X	SD/DVR	No	Yes	26	24
Cable	Comcast	Pace	TDC575D	SD/DVR	No	Yes	26	25
Cable	Time Warner	Cisco	Explorer 8300HDC	HD/DVR	No	Yes	26	25
Cable	Cox	Cisco	Explorer 8240HDC	HD/DVR	No	Yes	25	25
Cable	Time Warner	Cisco	Explorer 8300HDC	HD/DVR	No	Yes	29	26
Cable	Verizon FiOS	Motorola	QIP7216	HD/DVR	Yes	Yes	29	28
Cable	Comcast	Motorola	DCX3400	HD/DVR	No	Yes	29	28
Cable	Comcast	Motorola	DCT3416	HD/DVR	No	Yes	30	30
Cable	Comcast	Motorola	DCT3412	HD/DVR	No	Yes	31	30
Cable	Verizon FiOS	Motorola	QIP6416	HD/DVR	No	Yes	31	31
Cable	Comcast	Motorola	DCH3416	HD/DVR	No	Yes	34	32
Cable	Verizon FiOS	Motorola	QIP6416	HD/DVR	No	Yes	36	35
Cable	Bresnan	Pace	TDC779X	HD/DVR	No	Yes	41	41
Cable	Bresnan	Motorola	DCH6416	HD/DVR	No	Yes	47	46
Satellite	DirecTV	DirecTV	D11	SD	No	No	12	9
Satellite	DirecTV	DirecTV	H24	HD	No	No	16	15
Satellite	DirecTV	DirecTV	H23-600	HD	No	No	19	18
Satellite	Dish Network	Dish Network	625	SD/DVR	Yes	Yes	30	29
Satellite	DirecTV	DirecTV	HR24	HD/DVR	Yes	Yes	31	31
Satellite	DirecTV	DirecTV	HR22-100	HD/DVR	Yes	Yes	33	30
Satellite	DirecTV	DirecTV	HR21-100	HD/DVR	Yes	Yes	33	32
Satellite	DirecTV	DirecTV	HR22-100	HD/DVR	Yes	Yes	37	35
Satellite	DirecTV	DirecTV	HR22-100	HD/DVR	Yes	Yes	37	36
Satellite	DirecTV	DirecTV	HR20-700	HD/DVR	Yes	Yes	38	37
Satellite	DirecTV	DirecTV	HR20-700	HD/DVR	Yes	Yes	38	38
Satellite	Dish Network	Dish Network	VIP922	HD/DVR	Yes	Yes	43	40
Satellite	Dish Network	Dish Network	VIP612	HD/DVR	Yes	Yes	44	42
Satellite	Dish Network	Dish Network	VIP622	HD/DVR	Yes	Yes	52	49
Satellite	Dish Network	Dish Network	VIP722	HD/DVR	Yes	Yes	55	52
IPTV	AT&T U-Verse	Motorola	VIP1200	HD	No	No	10	9
IPTV	AT&T U-Verse	Motorola	VIP1200	HD	No	No	10	10
IPTV	AT&T U-Verse	Motorola	VIP1225	HD/DVR	Yes	Yes	19	12
IPTV	AT&T U-Verse	Motorola	VIP1216	HD/DVR	Yes	Yes	18	17
Streaming Device	N/A	Apple	MC572LL/A	Internet	No	No	3	0.5
Streaming Device	N/A	Roku	XR-HD	Internet	No	No	7	7

Ecos took these measurements in the field in the summer of 2010, using a Watts up? PRO ES power meter, from set-top boxes connected to service from a cable, satellite or IPTV service provider.

59 total set-top boxes measured
44 unique set-top box models