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NATURAL RESOURCES DEFENSE COUNCIL

January 19, 2012

Ms. Brenda Edwards
U.S. Department of Energy
Building Technologies Program
Mailstop EE-2J
1000 Independence Avenue, SW
Washington, DC 20585-0121

Re: Preliminary NRDC Comments – RFI Covering Test Procedure and Energy Conservation Standard for Set-Top Boxes and Network Equipment

Docket Number: **EERE-2011-BT-NOA-0067**

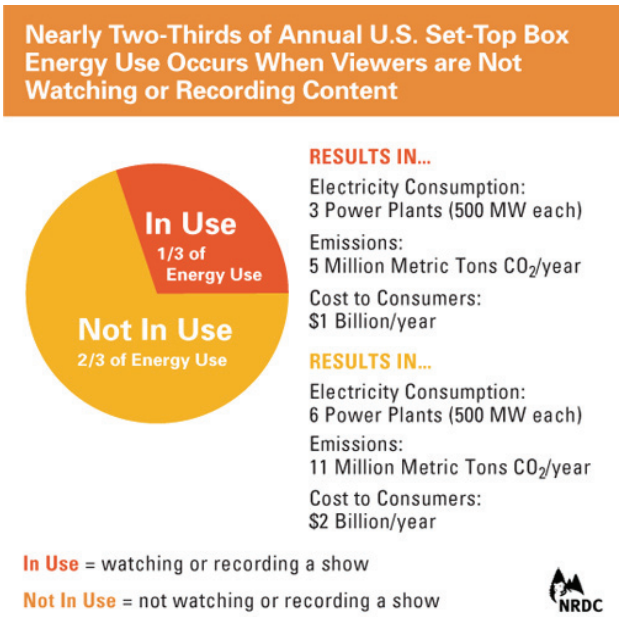
RIN: **1904-AC52**

On behalf of NRDC and its more than 1.3 million members and electronic activists we respectfully submit these preliminary comments in advance of the January 26, 2012 DOE meeting on the test procedure and energy efficiency standards for set-top boxes (STBs) and networking equipment. These comments are meant to inform the proceeding DOE is initiating and builds off of the written comments NRDC previously submitted on September 29, 2011. Our comments cover the following topics: background, product classes, test procedures, and efficiency targets for the rulemaking.

Background: Per field measurements and analysis previously performed by NRDC and its consultant Ecos, there are approximately 160 million pay TV set top boxes installed in the US. Nationally, as of 2010, STBs[1] consume an estimated 27 billion kWh/yr and cost consumers more than $3 billion per year in electric bills. The bulk of this energy consumption occurs while the user is neither is watching or recording a show. This is because STBs as currently designed consume near full power levels even when they are "turned off". Figure 1 below provides a graphical summary of the national impacts of set top box use.

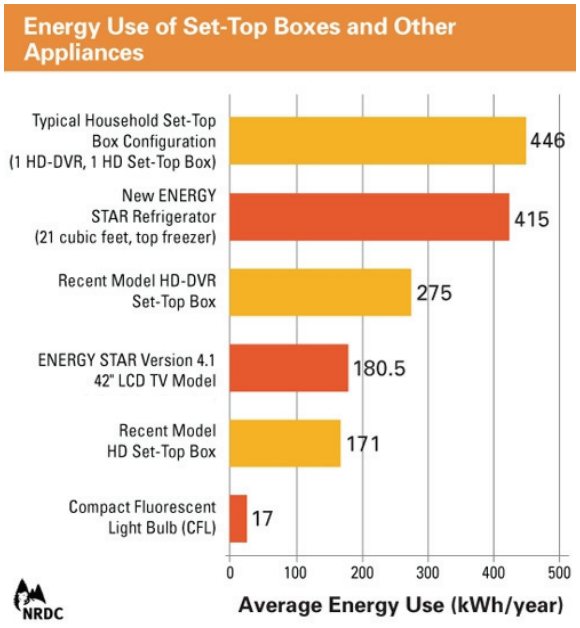
[1] A copy of NRDC's report can be downloaded at: http://www.nrdc.org/energy/files/settopboxes.pdf. Note, our analysis only focused on set top boxes provided by cable, satellite and telco service providers and does NOT include the power consumed by networking equipment such as cable/DSL modems or routers.

Figure 1– National Energy Use and Operating Costs of STBs



It should also be noted that in many cases a high definition DVR may use more electricity per year to operate than the new big screen TV it's connected to. Also the STBs in homes that have a DVR and additional basic boxes hooked up to their other TV(s) will consume more electricity per year than a new refrigerator. (See Figure 2 below.)

Figure 2 – Annual Energy Use of STBs and Other Appliances (Note: The top entry is for a common set-up found in the market – an HD-DVR STB on the main TV and a basic STB on the second TV.)



Since we completed our study, an updated version of ENERGY STAR (Version 3) went into effect and new boxes are entering the market that meet these requirements and use roughly 30% less energy. While there are approximately 30 or so qualified models on the market, it is often difficult for a consumer to access one of these new models for their home. Over time, availability of these new more efficient boxes will increase and national STB energy use will begin to decline. (Note as a typical STB lasts 6 years or so, it will take many years for the installed base of less efficient legacy boxes to be replaced). We also want to point out that the leading cable companies have made the following public commitment[2] in a letter to Senator Feinstein: 90% of new STBs they purchase and deploy will meet or exceed ENERGY STAR 3.0 standards by the end of 2013.

Based on informal conversations we have had with service providers from the satellite and Telco companies, the vast majority of new STBs deployed in the near future will meet ENERGY STAR Version 3.

Product Classes/Scope – There are currently three major providers of service – cable, satellite and telephone company (Telco for short). Each provides consumers with access to pay TV and video content. In almost all cases, the service provider either loans the box to the customer without charge or leases it to them for a monthly fee. The boxes that are deployed differ somewhat between service providers.

We do not yet have an opinion whether DOE should simply set one set of standards for STBs that offer similar functionality (e.g., one size fits all) or should create separate product classes for cable, satellite and Telco STBs. In either case, DOE can consider establishing power use adders, where appropriate, to provide additional power allowances due to additional features/functionality (e.g., a STB with a DVR would warrant additional on mode power compared to a basic box).

Other points tied to the issue of product class/scope that we wish to bring to DOE's attention include:

- LNBs – satellite systems deploy one or more LNBs (low noise block). Their power use is typically 2 to 4 Watts each, often 24/7, and their power use should be included in power measurements made under the final DOE test procedure.

- Auxiliary Boxes – Many of the systems deployed by the Telco providers include a gateway or optical network terminal (ONT) box that is placed in the garage, basement or exterior of the home. Incoming data, video and phone service may be routed through this box. Little is publicly known about these boxes but they are believed to consume around 16 or more Watts continuously. That translates to 140 kWh/yr and some portion of this power should be assigned to the STB. This energy use needs to be accounted for in DOE policies or little attention will be paid to this sizable energy use and telco providers will be provided with an

[2] http://energy.gov/sites/prod/files/120511_DOE%20Ltr.pdf

unfair advantage. We also understand that when a consumer switches service providers, typically after the favorable initial rate expires after the first year, that the ONT may remain at the customer's home and continue to consume power even when the user is no longer receiving service from it.

- Network Equipment – We encourage DOE to continue to include cable and DSL modems, and routers as part of this rulemaking and to develop one or more product classes to cover these products.

- TiVo Boxes – TiVo produces a standalone DVR that consumers purchase at retail. To receive pay TV content, the user signs up with a service provider and inserts a cable card into the back of the box. We recommend these types of boxes be covered by the test procedure and standard.

Test Procedures – ENERGY STAR and CEA test procedures provide two excellent starting points for measuring the energy use of STBs. The main area where additional improvement is needed is on the topic of "deep sleep". The CEA document has only one sleep state in its document and essentially measures how much power a connected box uses when it is turned "off". It does not provide the ability to distinguish between a light or deep sleep state. While ENERGY STAR does include deep sleep in Version 4 of its specification, their definition and test method lack sufficient clarity on what is an acceptable implementation. For example, one could conceivably design a box that requires the user to hold down the power button for 10 seconds or more for it to enter a deep sleep state, instead of light sleep. As few consumers would know about this option or remember to do this, the box would most likely not enter deep sleep and would consume significantly higher amounts of power when not in use.

Other high level input on test procedures include:

- Test on live system – Set top power use is highly dependent upon the service provider the box is connected to. For example, the same box may produce very different daily energy use levels when connected to Comcast vs Time Warner. This is because STB power use is tied to the hardware and software used by the service provider, and how the service provider deploys the box. We recommend STB testing for each box is done with live network testing. This can be done by actually connecting the box to the service provider or via an equivalent simulation.

- Set up conditions – DOE needs to include sufficient clarity on how to set up the STB prior to testing. For example, are the LNBs hooked up during the test, if the box has an auto power down feature as an option should it be on during testing, and how to handle a box that has speculative recording?

- DVRs – we concur with DOE that these devices should be tested in each of their major operating modes (recording, playback, sleep, etc).

- 24 Hour Testing – In addition to testing a STB's power use in the key operating modes, the testing should also consider the STB's behavior and power consumption throughout the day. For example while a box might have a low power deep sleep state, it is less useful if the STB is constantly being awakened by the head end or other STBs in the home network and spending most of its time in a much higher power state.

- Networking Equipment – Separate test methods from STBs will be needed for this product class.

Stringency – As stated in our earlier comments, the big savings opportunity for STBs is to reduce the power consumption when the box is not in use. None of the boxes on the market today meet this target. A meaningful DOE standard would include this requirement as the foundation of its requirements. Although today's STB are not able to meet a low power deep sleep requirement (approx 3 to 5 W) and quickly wake when the consumer returns, there are numerous examples of products on the market today that offer exactly this functionality. These include smart phones and IPads, both of which have similar user security and billing needs, use very low levels of power when not in use and wake almost instantly to receive or make a call, or return to view a video. While each product has its unique requirements, the general principles of power scaling are universally applicable and there are multiple chip vendors that can develop/provide the needed technology for STBs.

As the DOE standard will not likely take effect for 5 years or so, it's critical for the efficiency standard DOE issues to be forward looking and embrace the energy saving opportunities that exist. It is not sufficient to merely establish a standard at the same levels as ENERGY STAR Version 3, which the industry is likely to move to by the end of 2013 on its own. While it reflects an improvement over the installed base, it does not achieve the 75% or so level of savings that are achievable via incorporation of low power deep sleep and incremental improvements in on mode power.

For networking equipment we encourage DOE to review the work that has been done recently on energy efficient Ethernet standards which essentially require the equipment to scale power use to the amount of data being transmitted. Thus a router or modem at 2 am which is not actively receiving data would automatically throttle down to a lower power state.

Respectfully Submitted,

Noah D. Horowitz
Senior Scientist
Natural Resources Defense Council
nhorowitz@nrdc.org

Initial NRDC Comments on Set Top Boxes and Network Equipment

Docket: EERE-2011-BT-NOA-0067/ RIN: 1904-AC52

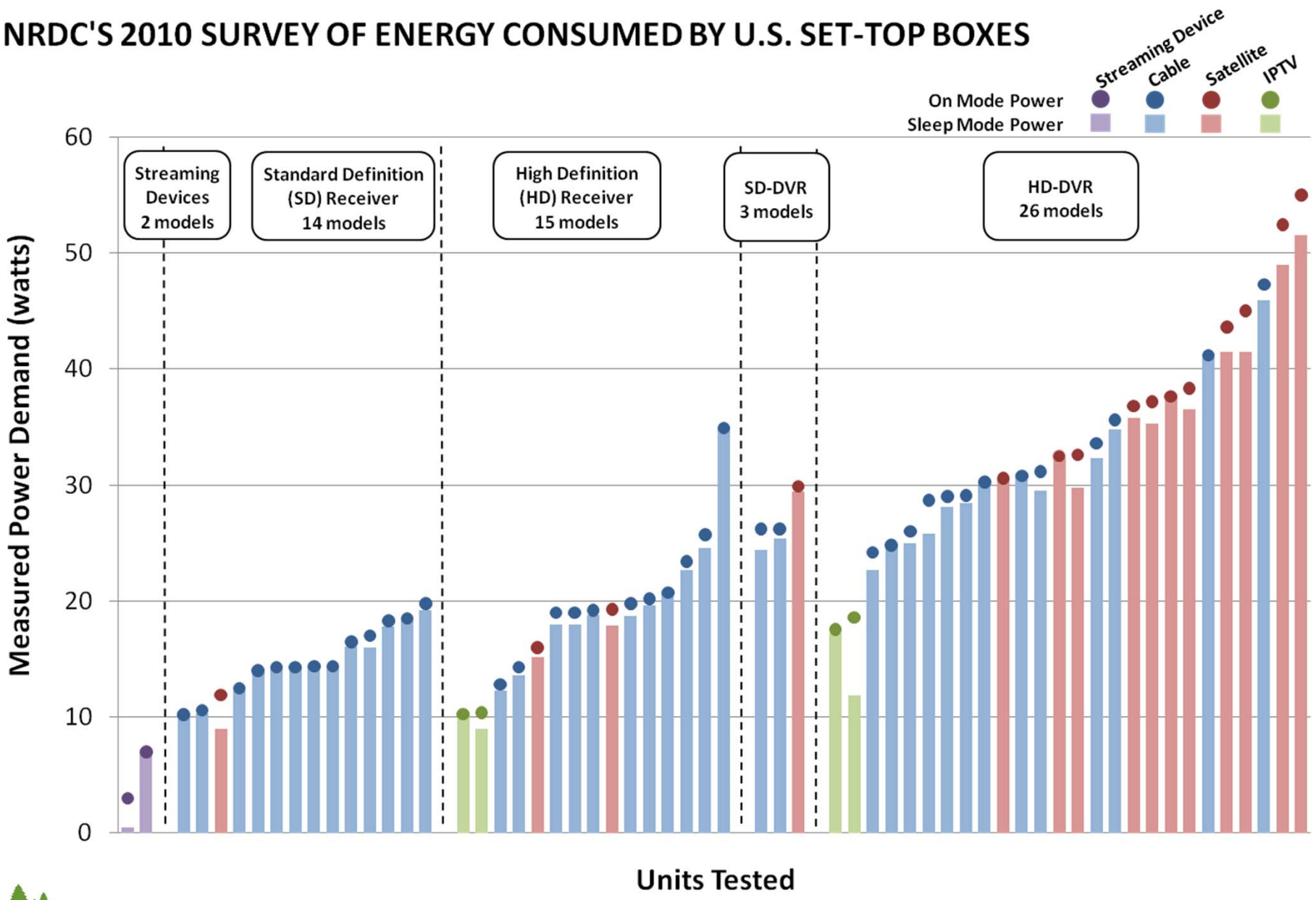
Noah Horowitz – Senior Scientist
Natural Resources Defense Council (NRDC)
nhorowitz@nrdc.org

January 26, 2011

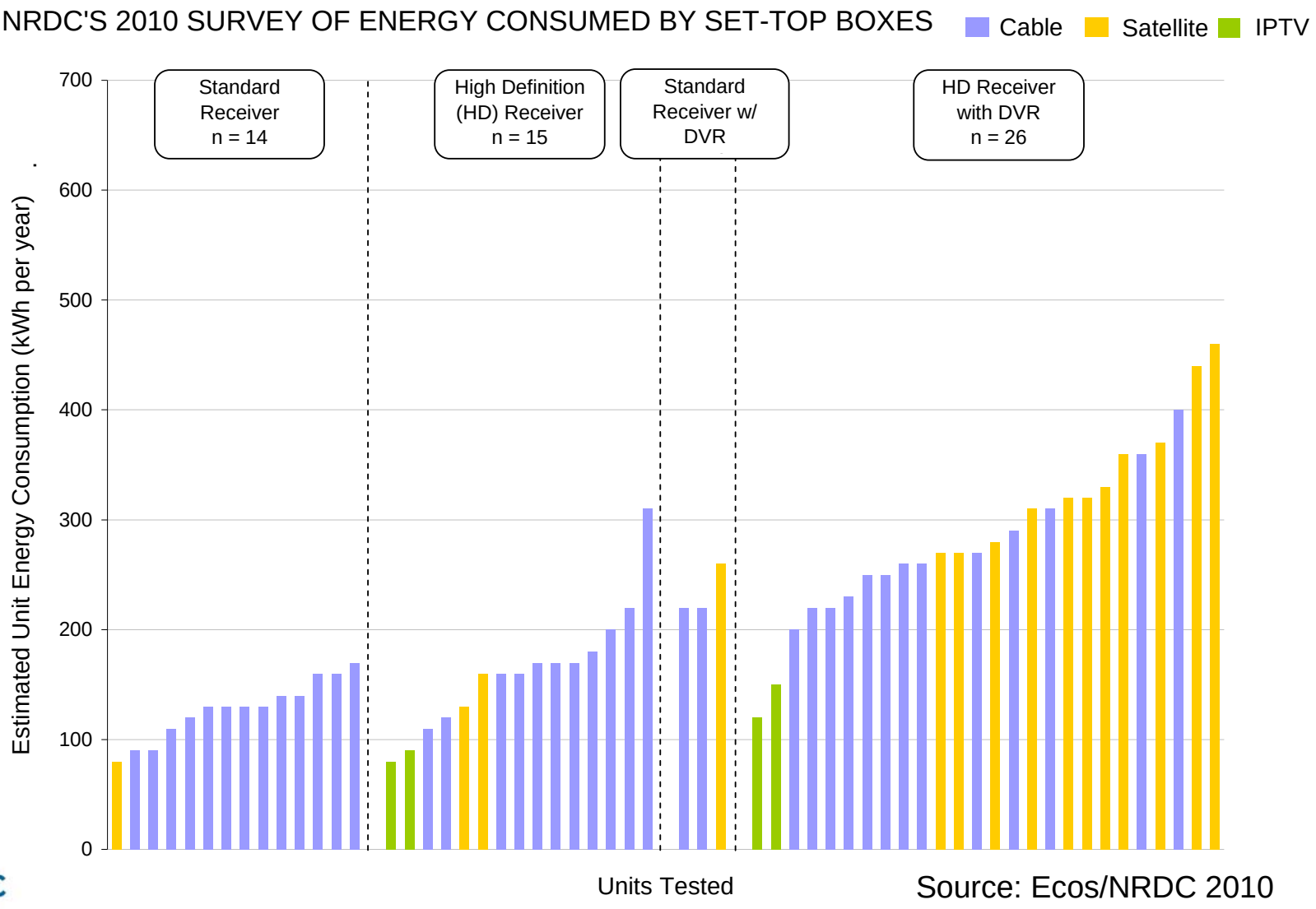
NRDC-Ecos STB 2010 Study Findings

- > 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"**
- Per home STB energy use increasing due to growth of DVRs

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



2010 Study Results for All Service Providers



Source: Ecos/NRDC 2010

NRDC-Ecos STB Study Findings II

- **DVR STB may use more electricity/yr than the big screen TV its connected to**
- **DVR STB + regular STB = Annual electricity use of new refrigerator**
- **Americans spend $2 billion/yr to power their STBs when they are NOT in use.**

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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Recent STB Developments

- EPA updated ENERGY STAR specification for set top boxes (STBs)
- E-Star 3.0 specification is live and with ~40 qualified models. Two positive developments:
  - On mode power reduction ~30%
  - 3→7 watt savings between on and sleep modes
- Major service providers shifting to E-Star 3.0 in next 12-24 months. Good first step but does NOT address need for deep sleep.

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Desired STB Outcomes

- Low power consumption (<5W for main box) when STB is not actively used
- Ability to wake quickly when user returns to record pre-programmed show, or receive updates

Learn from excellent power management already in place for IPads, smart phones, etc.

Desired STB Outcomes (II)

- Significantly reduce STB energy used for 2nd, 3rd TVs
- Encourage “thin client”, multi-room approach. Eliminate need to maintain connection to “head end”

Other Input

- Standard not likely to go into effect for 6+ years from today
- Changes may be required at both STB and service provider (head end) level
- Standard should establish power targets for next generation STBs– new silica, software, better power scaling, etc

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Test Method Issues

- Critical for testing to be done on live network. Results may vary by service provider
- How to address frequent wake events
- What else to include:
  - Satellite – LNBs
  - Telco – Optical Network Terminal (ONT) (~15 W, 24/7 → 131 kWh/yr)

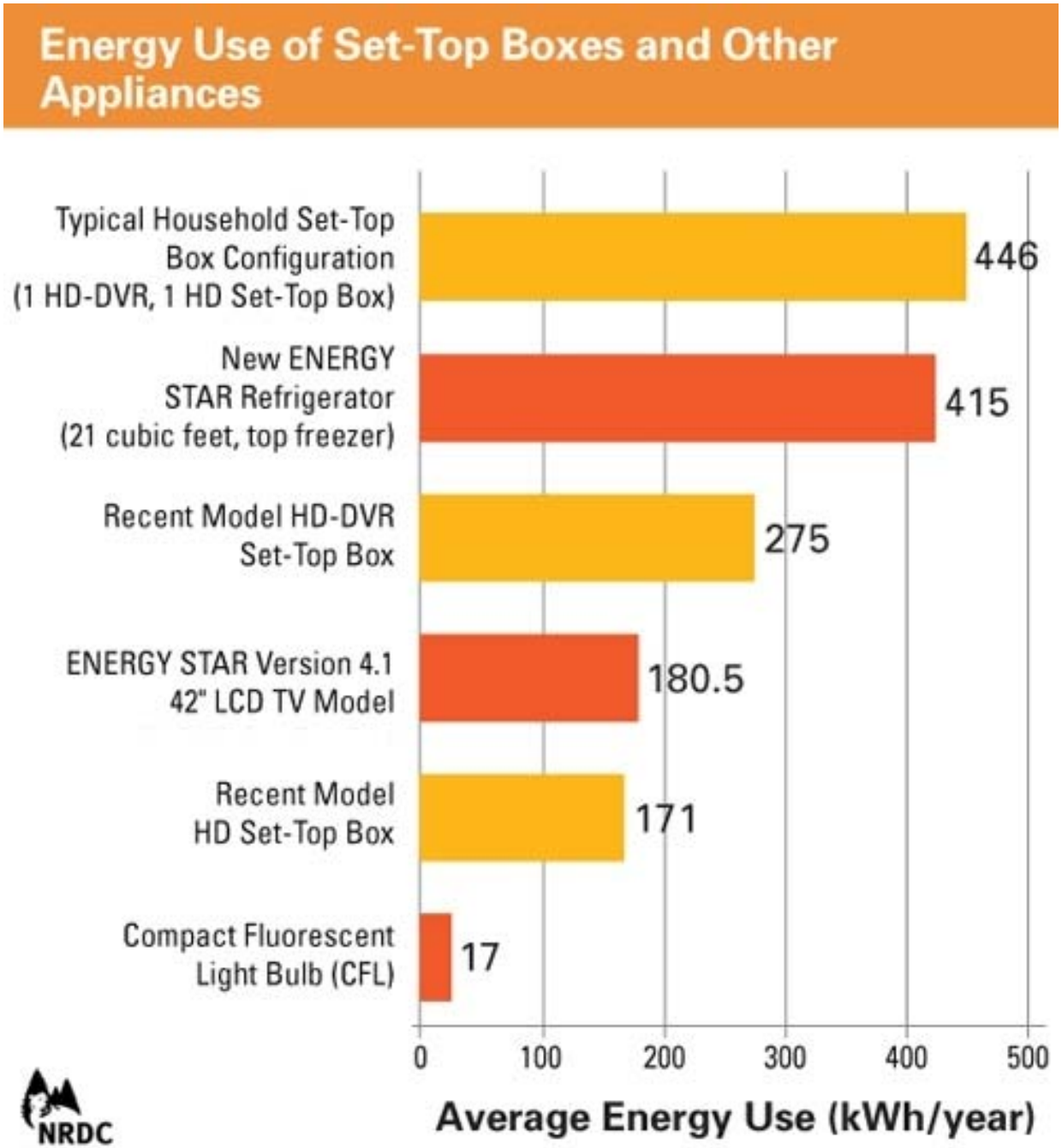
Networking Equipment

- Many homes have:
  A. High-speed internet – cable/DSL modem
  B. Wireless network – router
- It adds up – **6 W x 2 x 24/7 = 105 kWh/yr**
- Need good definition, data, test method
- Have energy use scale to amount of data being transferred

For More Info

NRDC Report :

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


Energy Use of Set-Top Boxes and Other Appliances
Typical Household Set-Top Box Configuration (1 HD-DVR, 1 HD Set-Top Box)
446
New ENERGY STAR Refrigerator (21 cubic feet, top freezer)
415
Recent Model HD-DVR Set-Top Box
275
ENERGY STAR Version 4.1 42" LCD TV Model
180.5
Recent Model HD Set-Top Box
171
Compact Fluorescent Light Bulb (CFL)
17
0
100
200
300
400
500
Average Energy Use (kWh/year)
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Power Measurements of Cable, Satellite and IPTV Set-Top Boxes

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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	StarfoneSFT2	SD	No	No	19	19
Cable	Charter	Motorola	StarfoneSFT2	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