



Set-top Box (STB)

How to Partner with ENERGY STAR to Promote Efficient Set-Top Boxes

Gregg Hardy, Ecova

November 10, 2010

ENERGY STAR Products Partner Meeting

Agenda

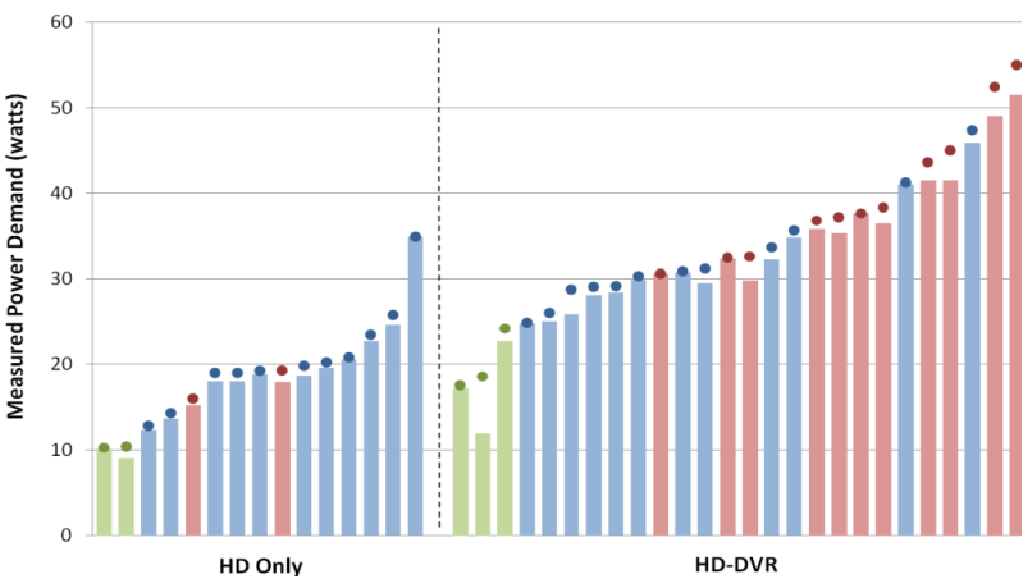


- Introductions 5 min
- Presentations 30 min
 - Noah Horowitz NRDC
 - Robert Turner Pace
 - Steve Dulac DirecTV
 - Elizabeth Crenshaw EPB
- Q&A 25 min

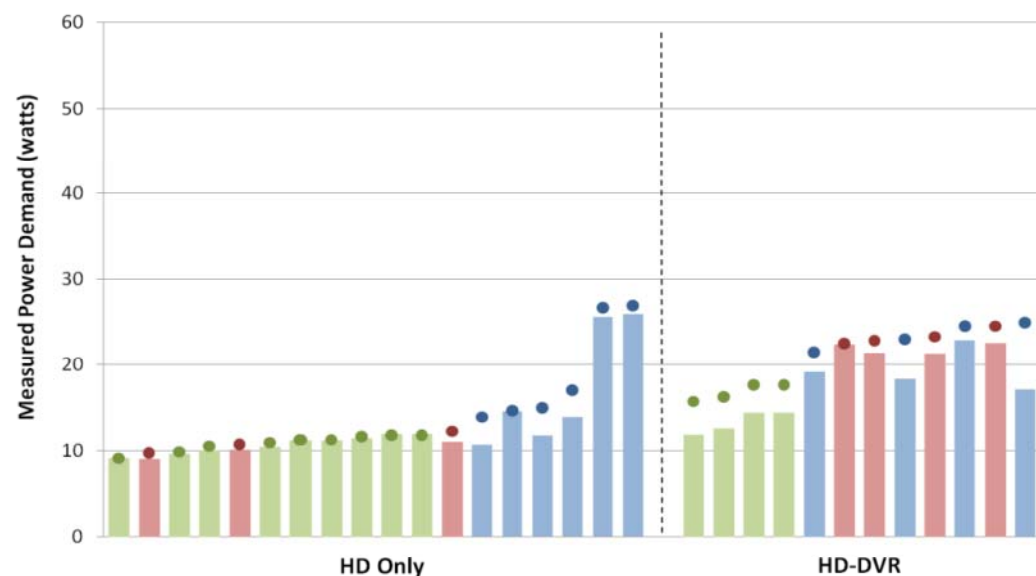
Comparison of 2010 NRDC Test Data and 2011 ENERGY STAR QPL



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



ENERGY STAR OCTOBER 2011 QPL



On Mode Power
Sleep Mode Power

Cable
Satellite
IPTV

	NRDC	QPL	% Difference
• Average TEC (kWh/yr) for HD	164	116	34%
• Average TEC (kWh/yr) for HD-DVR	294	175	51%

Overview of NRDC-Ecos 2010 STB Study:

*Lack of Sleep Costs Americans
\$2 Billion/yr*



Noah Horowitz
Senior Scientist
Natural Resources Defense Council
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November 2011

NRDC-Ecos STB Study Details

- NRDC hired Ecos Consulting to measure STB energy use and perform analysis
- Went into the field in 2010 and measured power use of roughly 50 STB in various operating modes
- Measured a cross section of basic and full featured boxes (e.g. HD-DVR)
- Range of service providers – cable, satellite and telco.

NRDC-Ecos STB Study Findings

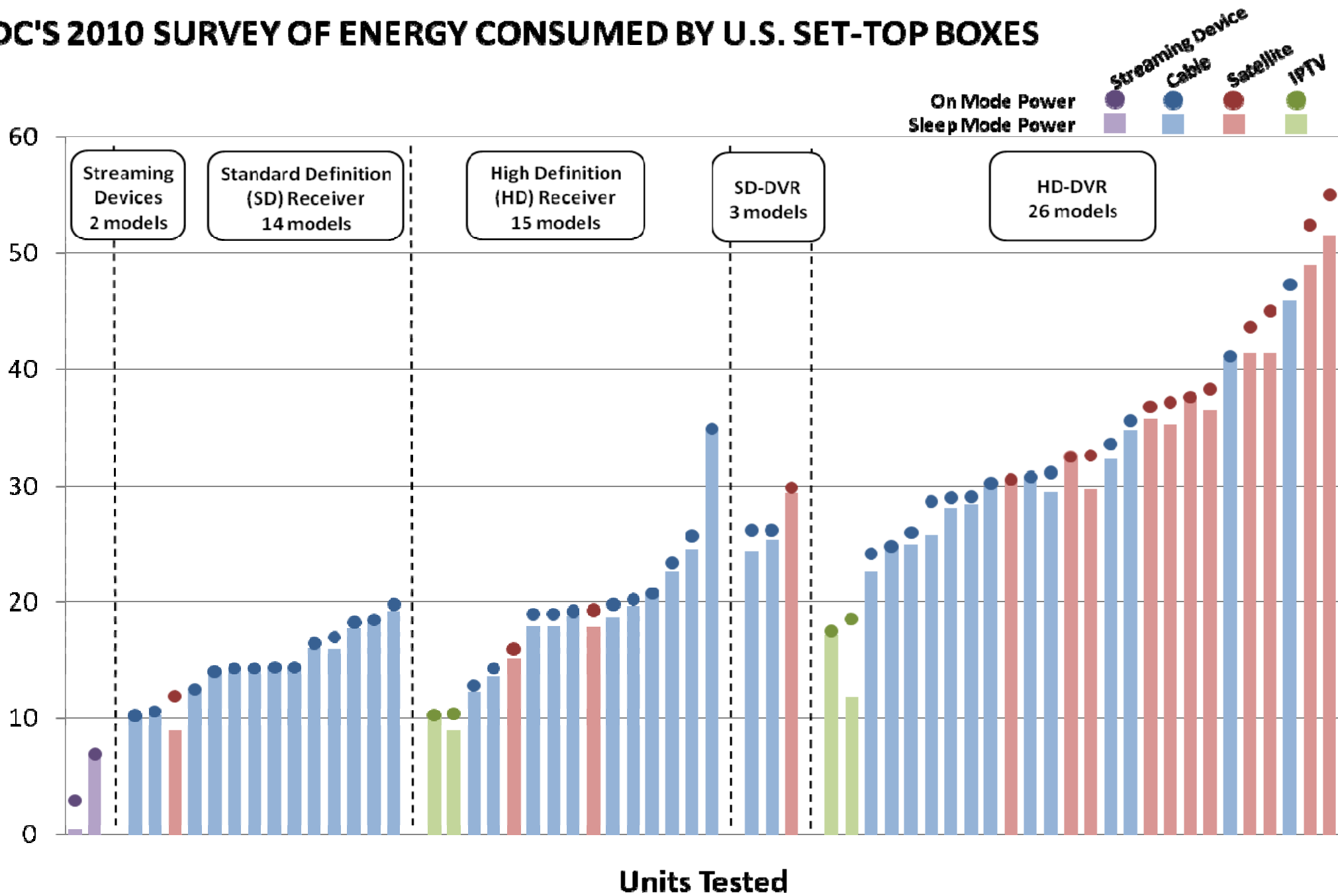
- > 80% of US households subscribe to pay TV
- Installed base - 160 million STBs
- Many homes have 2 or more STBs
- **Little to no difference in power use when “turned off”**
- Per home STB energy use increasing due to

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.**

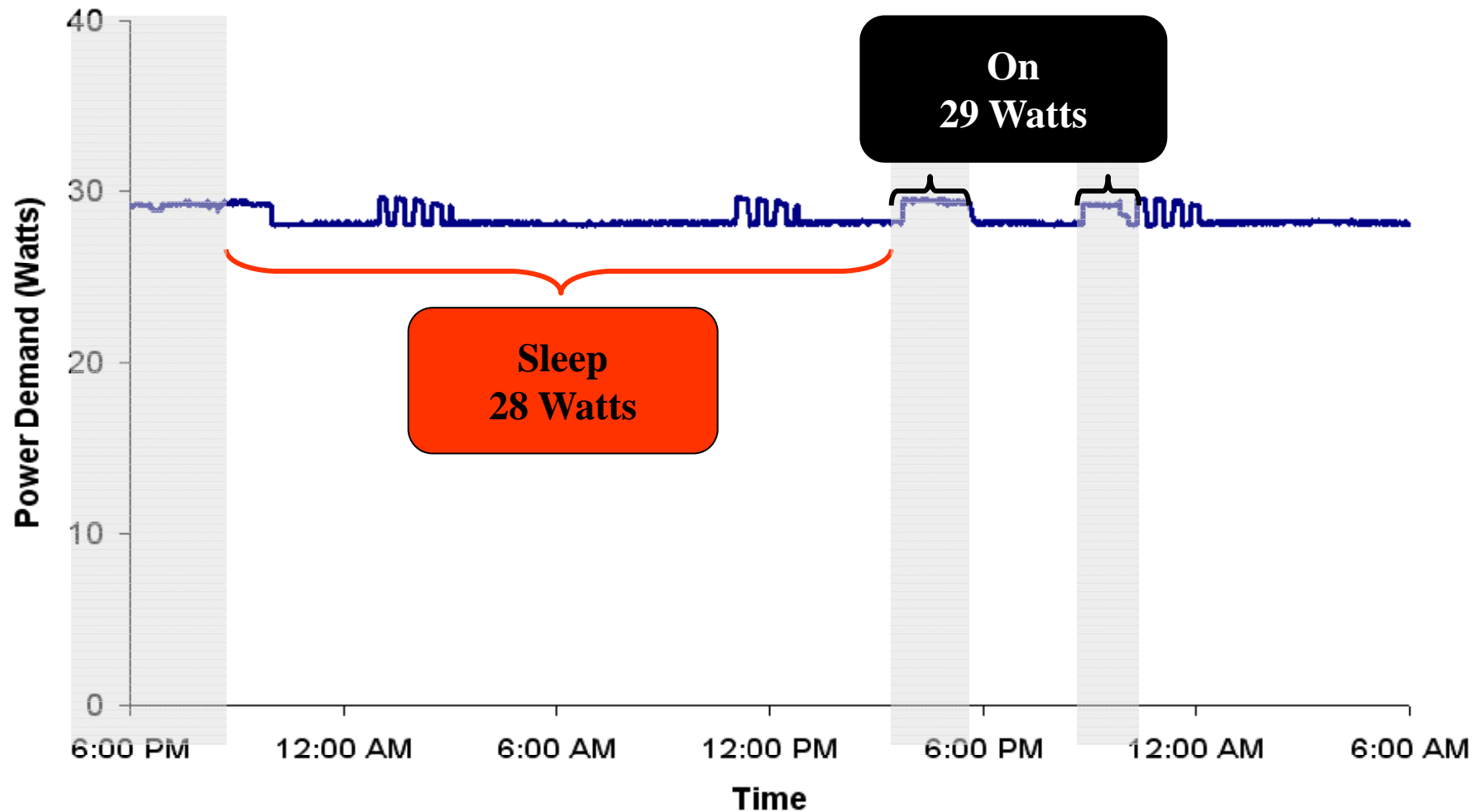
NRDC'S 2010 SURVEY OF ENERGY CONSUMED BY U.S. SET-TOP BOXES

Measured Power Demand (watts)



STB Data Logging Example

Motorola DCX3400 with Comcast Digital Cable

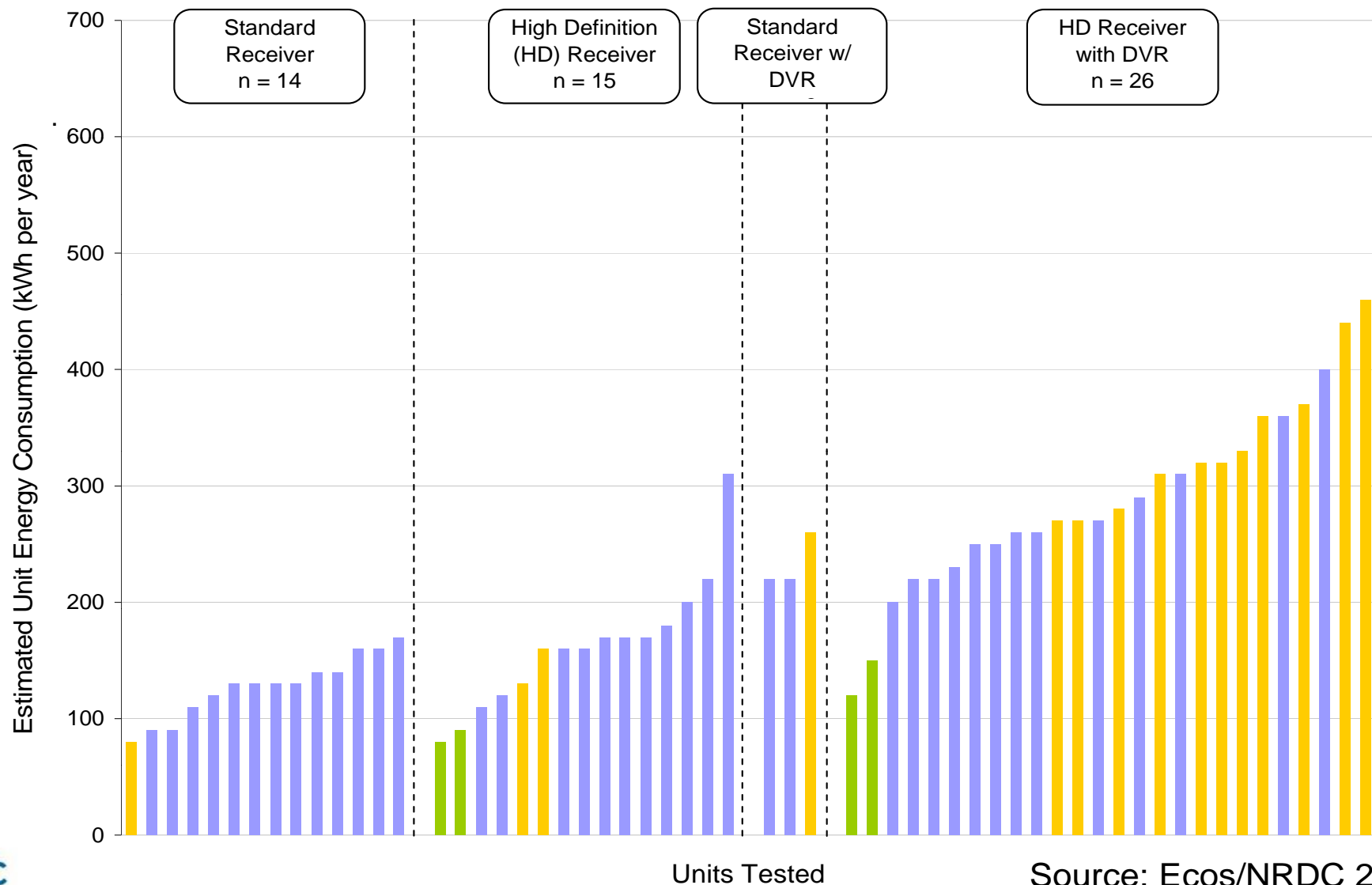


Source: Ecos/NRDC 2010

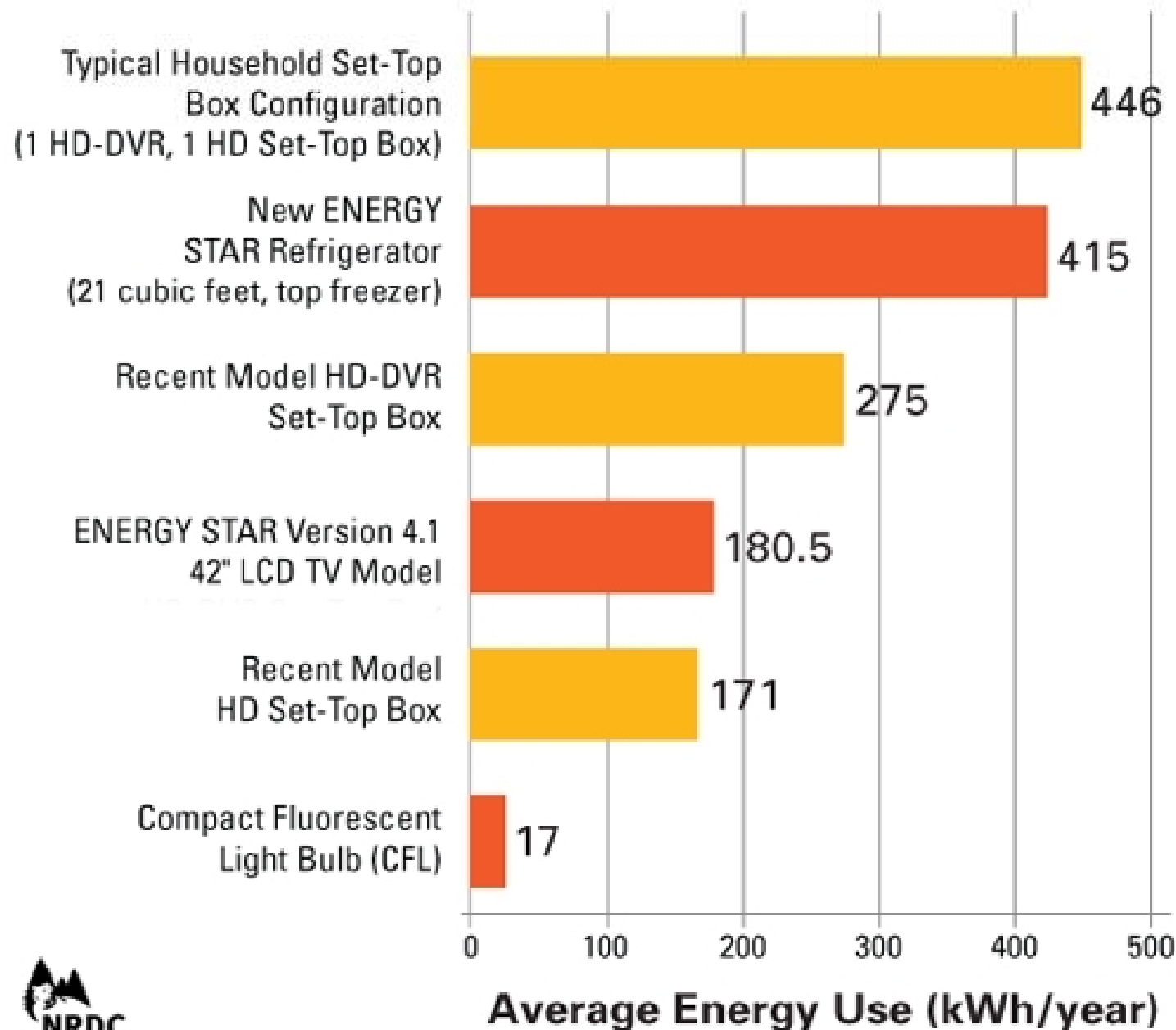
2010 Study Results for All Service Providers

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

Cable Satellite IPTV



Energy Use of Set-Top Boxes and Other Appliances



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 CO₂/year

Cost to Consumers:
\$1 Billion/year

RESULTS IN...

Electricity Consumption:
6 Power Plants (500 MW each)

Emissions:
11 Million Metric Tons CO₂/year

Cost to Consumers:
\$2 Billion/year

In Use = watching or recording a show

Not In Use = not watching or recording a show



The Ideal “New World”

1. *STBs only use low levels of power ($<5W$) when not in use and are able to reboot relatively quickly when user returns*
2. *Homes with multiple TVs switch to an efficient “multi-room” configuration – main box (“media server”) and thin clients on the 2nd and 3rd TVs*
3. *Explore software update for existing machines as way to reduce standby power levels (see Sky Broadcasting example in Europe)*
4. *All hands on deck to meet ESTAR 4.0 (the “bigger prize”). Utilities consider providing incentives to jump start/subsidize efforts*

Sky Broadcasting

Advanced Power Management

- Power levels
 - 22.5W On
 - 13.2W Light Sleep
 - 0.65W Deep Sleep
- Auto power down at 11pm to light sleep
- Deep sleep capability seldom picked by consumers (requires one to hold power button for 5 seconds and causes longer resume time)
- Sky installers program Sky remote to control both TV and STB



For More Info

NRDC Report :

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

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



Service Provider	Service Provider			Product	MultiRoom	Additional	Active	Standby
Type	Name	Make	Model Name	Class	Capability	Tuners	Power Use (W)	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	StarOne5FT2	SD	No	No	19	19
Cable	Charter	Motorola	StarOne5FT2	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	MCS72LL/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





Pace plc

Energy Star – 2011

Robert Turner – Consultant Approval Engineer

Pace Energy Efficiency History / Pedigree

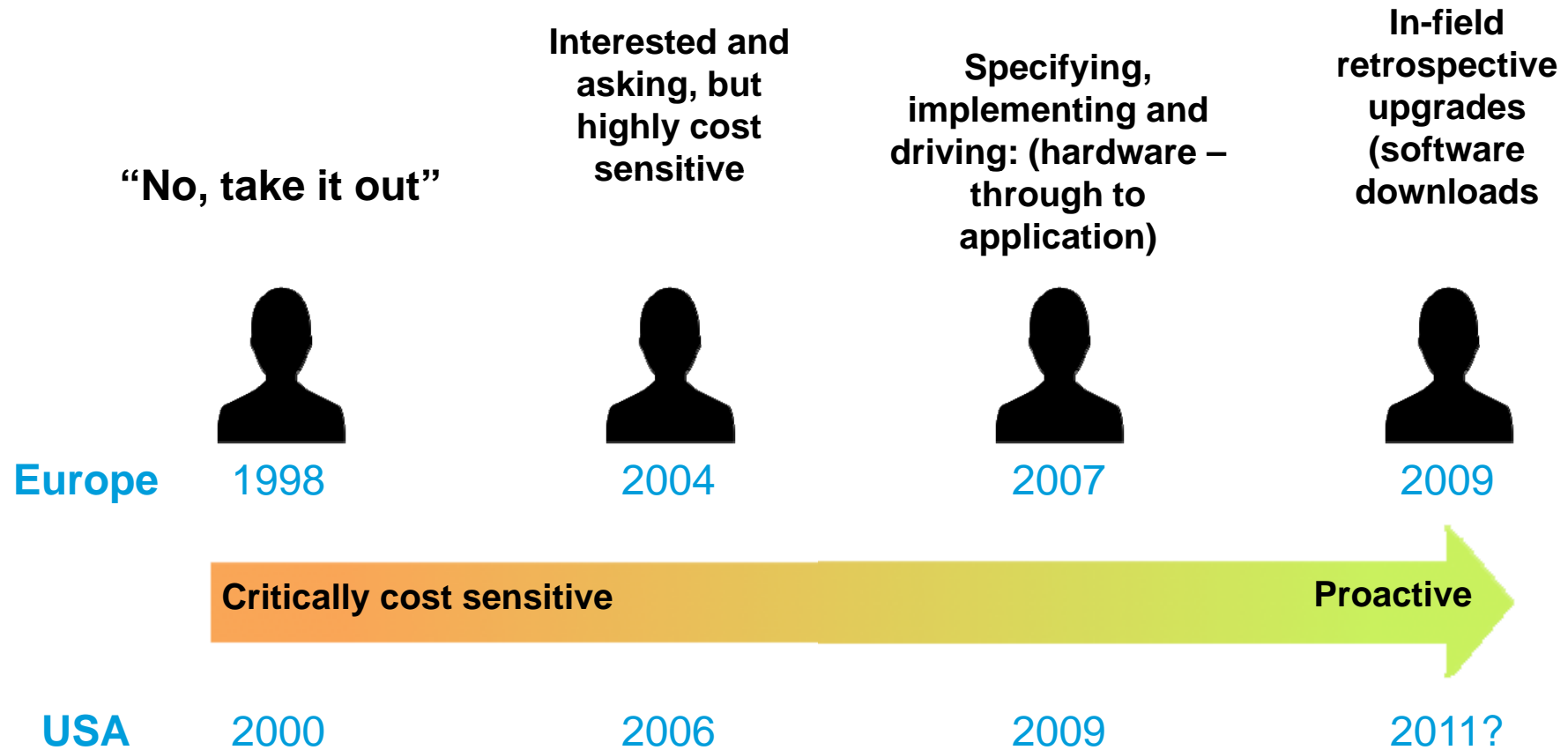
- 1998: EU Code of Conduct – Pace one of founders
- 2001: Energy Star V1 – Pace launch partner
- 2009: Energy Star V2 – Pace first to launch
- 2010: EU Voluntary Agreement – Pace Key Driver
- Present: EU code of conduct > 80% of products compliant (target 25%)
Energy Star V3 > 80% of products compliant (target 25%)
EU Voluntary Agreement => 100% compliant (target 90%)
Australian MEPs etc. => 100% compliant

Energy Efficiency is in our DNA

European Energy Efficiency history

- 1998: EU Code of Conduct
- 2008: 1W Standby Regulation
- 2009: Simple STB Regulation
- 2010: Proposed CSTB Legislation replaced with Voluntary Agreement
- 2013: ½W Standby Regulation + auto-standby
- 2013?: Network Standby (12W Hi) (4W Lo)
- 2016?: Network Standby Tier 2 (8W Hi) (2W Lo)

Customer Evolution



Home Entertainment - History

Ten years ago



Modem
40kWh



VCR
100kWh

Total =
540kWh/yr.



SD STB
150kWh



PC
250kWh

Home Entertainment - History

Now



Integrated
< 200kWh

- + Place shifting
- + Time shifting
- + VOD

Efficiency choices?



EU Industry Voluntary Agreement

Legislation

- Fixed – not flexible
- Doesn't react to technology changes
- Becomes irrelevant

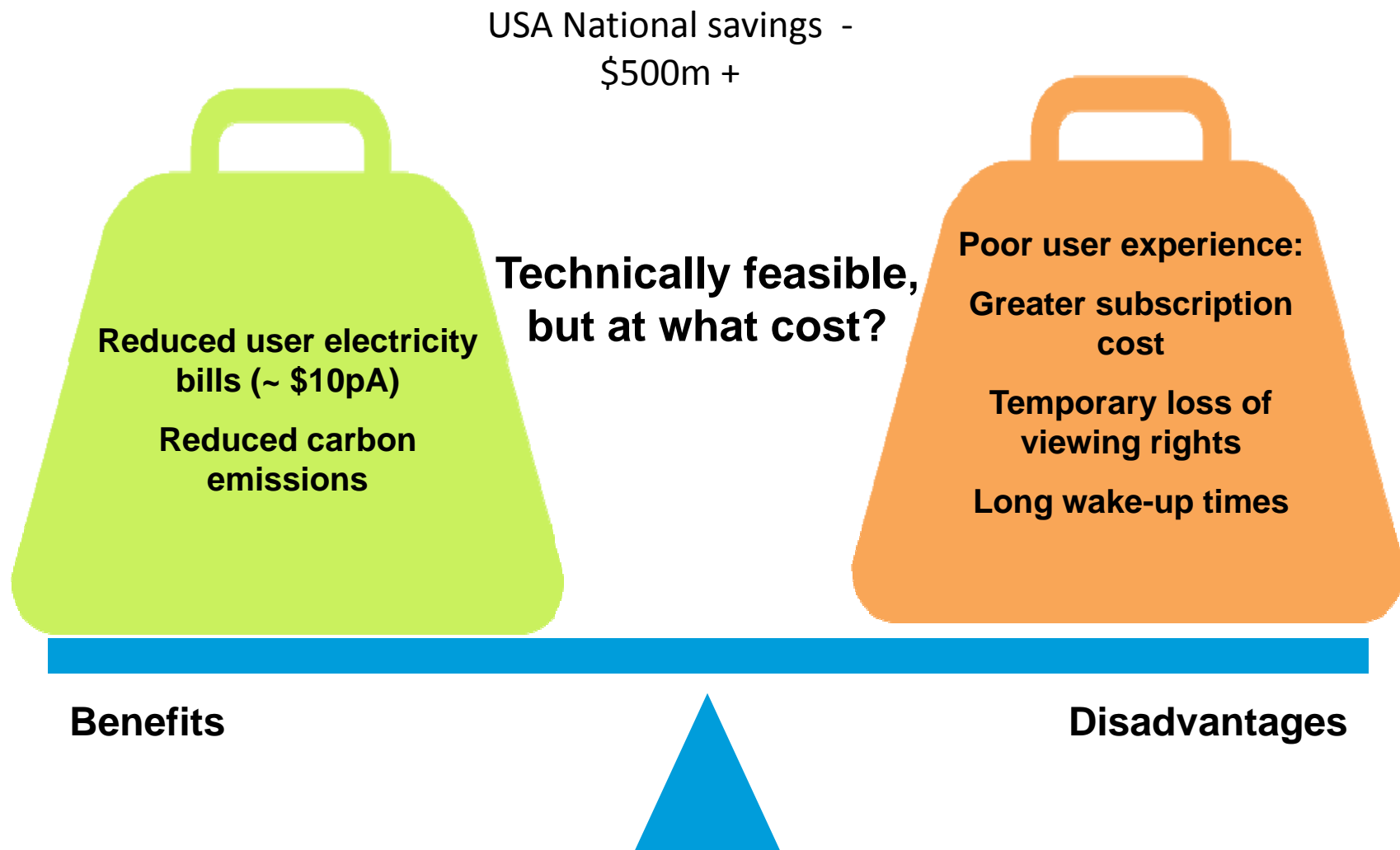
V.A. Delivers

- Better than business as usual power savings
- Flexibility
- Relevancy

Key Aspects

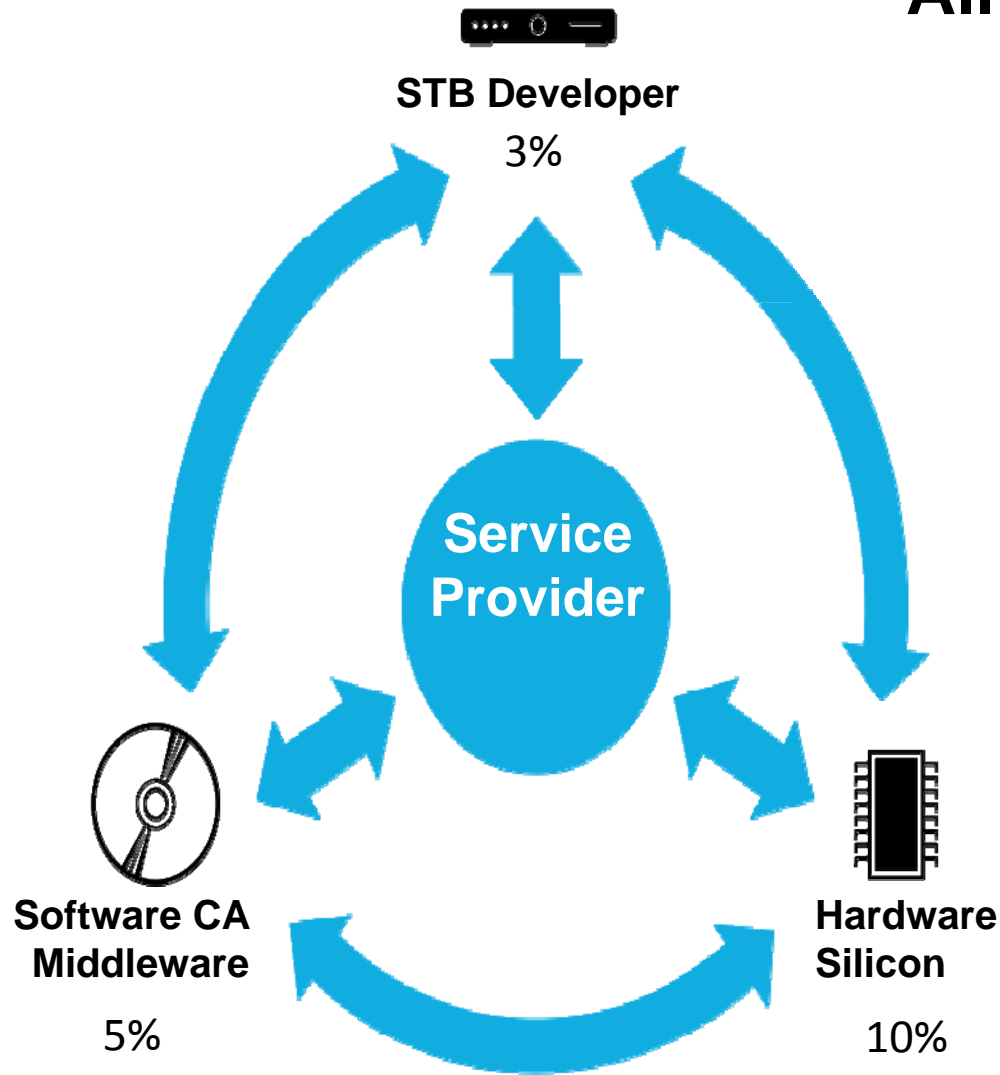
- Coverage – 80% of EU by sales/installations
- Commitment – 90% of product shipped/installed will meet limit, BUT...
- New technologies excluded, then added in at the next revision
- Revised annually by stakeholders
 - Manufacturers
 - Service providers
 - NGOs
 - European Commission
- Audited – Independent auditors report summary of compliance

Less than 1W standby?



Industry relationships

All together = 50%+





www.pace.com



ENERGY STAR Partner Meeting

Set-top Box Discussion

Steve Dulac
Director, Engineering

10 November 2011



Big Picture. Small Footprint.

DIRECTV's energy efficient receivers save customers money while protecting the environment. For the second straight year, we stand alone among TV providers recognized by ENERGY STAR®



1.800.DIRECTV | directv.com

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ENERGY STAR

- Service Provider Partner since 2009
- Set-top Box Manufacturer Partner since 2009
- 2010 & 2011 Awards for Excellence in Energy Efficient Product Design

DIRECTV joined the ENERGY STAR Set-Top Box program upon its inception, and by the end of 2011 will have delivered more than 30 million ENERGY STAR qualified receivers to customers.

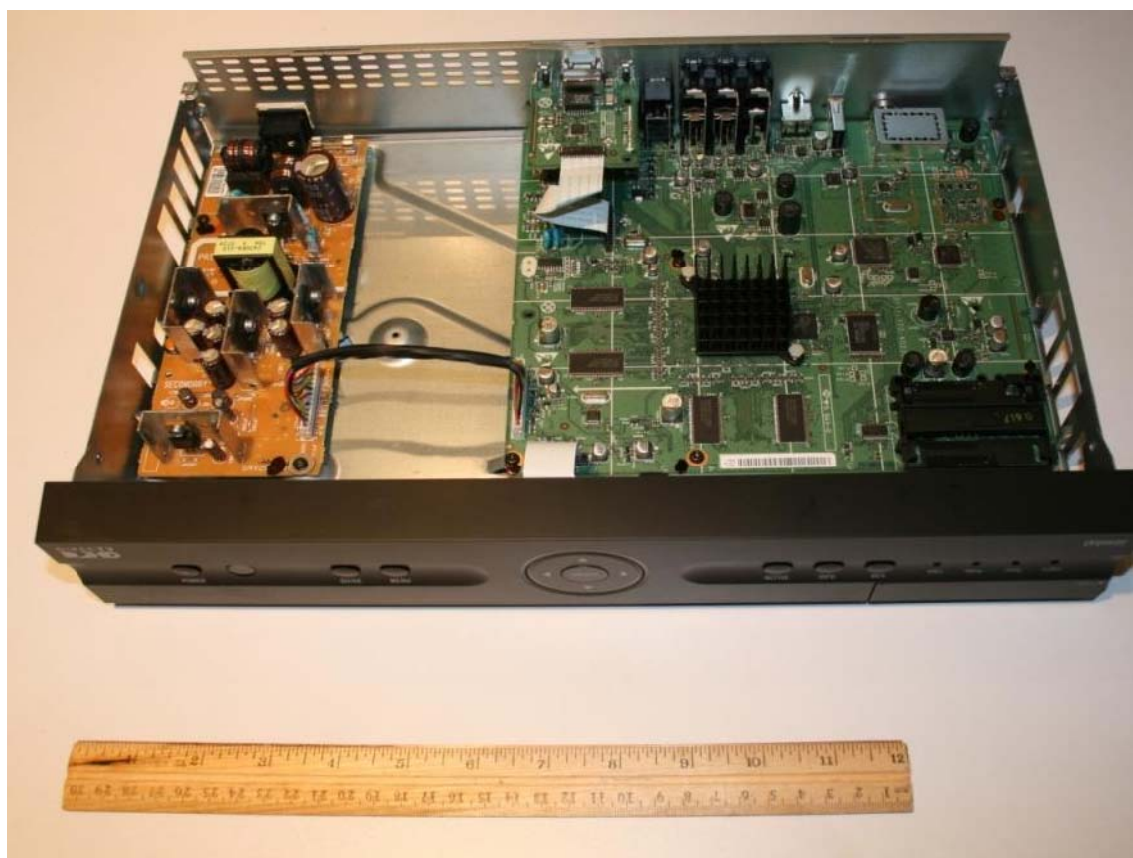
Prior to ENERGY STAR STB Program



- 2005: DIRECTV H20 High Definition STBs
 - Loaded with new technology (e.g. H.264 MPEG4)
 - Enabled DIRECTV to launch 100 HD channels: an advance that reshaped the Pay-TV industry
- Average:
 - ON power = 27W
 - TEC = 230 kWhr/yr
- W x D x H (inches)
15" x 11.5" x 3"

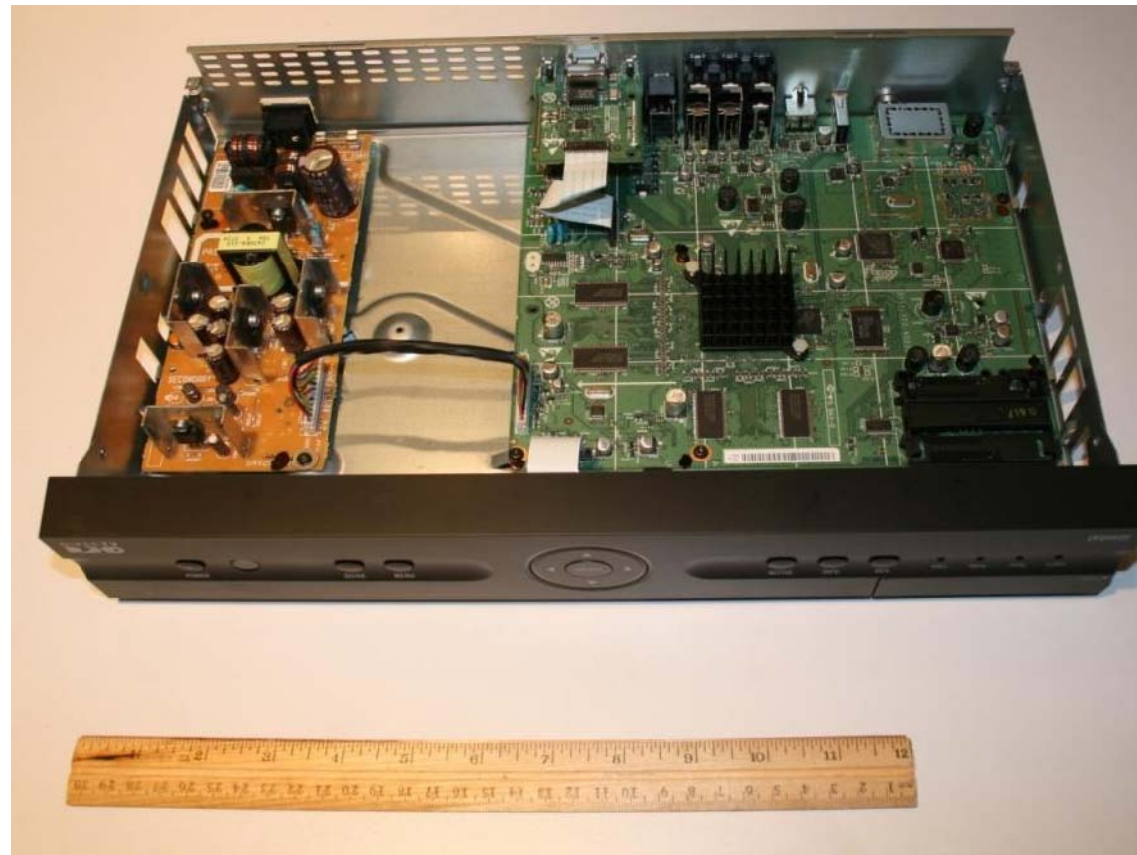


- 2007: DIRECTV H21 & H23 High Definition STBs
 - Higher integration of functionality
 - Reduced cost and greater reliability
- Average
 - ON power = 14.5W
 - TEC = 125 kWhr/yr
- W x D x H (inches)
15" x 9.75" x 2.75"



- 2007: DIRECTV H21 & H23 High Definition STBs
 - Higher integration of functionality
 - Reduced cost and greater reliability

46%
less power
22%
smaller



- 2010: DIRECTV H24 High Definition STBs
 - Addition of MoCA Advanced Home Networking
 - Did not sacrifice energy efficiency
- Average
 - ON power = 14.5W
 - TEC = 122 kWhr/yr
- W x D x H (inches)
12" x 9" x 1.75"

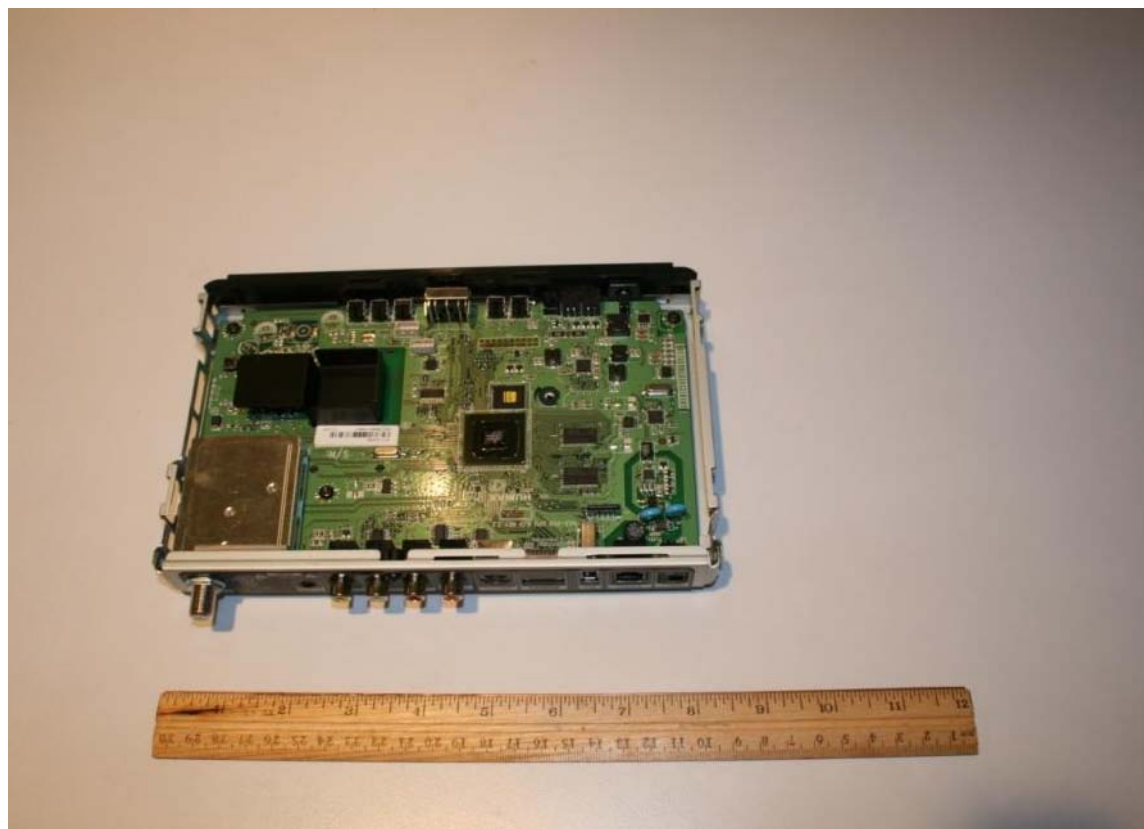


- 2010: DIRECTV H24 High Definition STBs
 - Addition of MoCA Advanced Home Networking
 - Did not sacrifice energy efficiency

47%
less power
63%
smaller

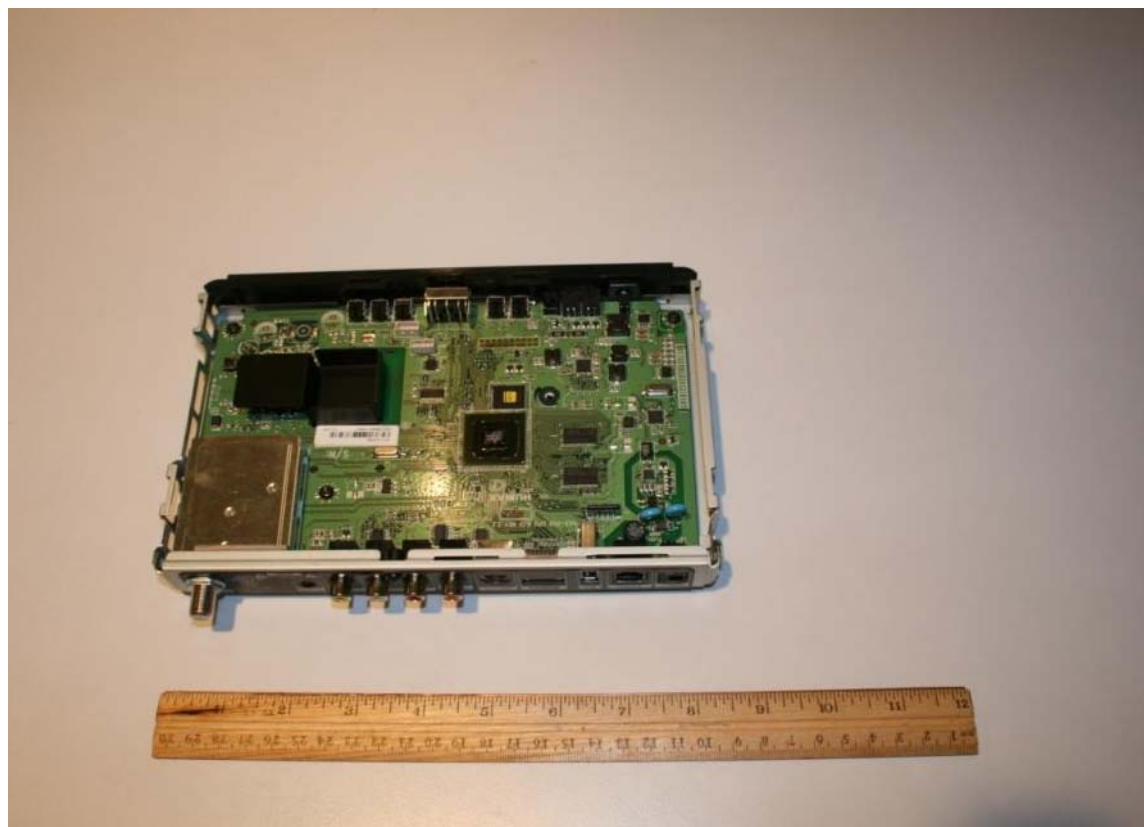


- 2011: DIRECTV H25 High Definition STBs
 - Higher integration of functionality (again)
 - Reduced cost and greater reliability (again)
- Average:
 - ON power = 11.2W
 - TEC = 92 kWhr/yr
- W x D x H (inches)
8.5" x 6.5" x 1.25"



- 2011: DIRECTV H25 High Definition STBs
 - Higher integration of functionality (again)
 - Reduced cost and greater reliability (again)

60%
less power
87%
smaller

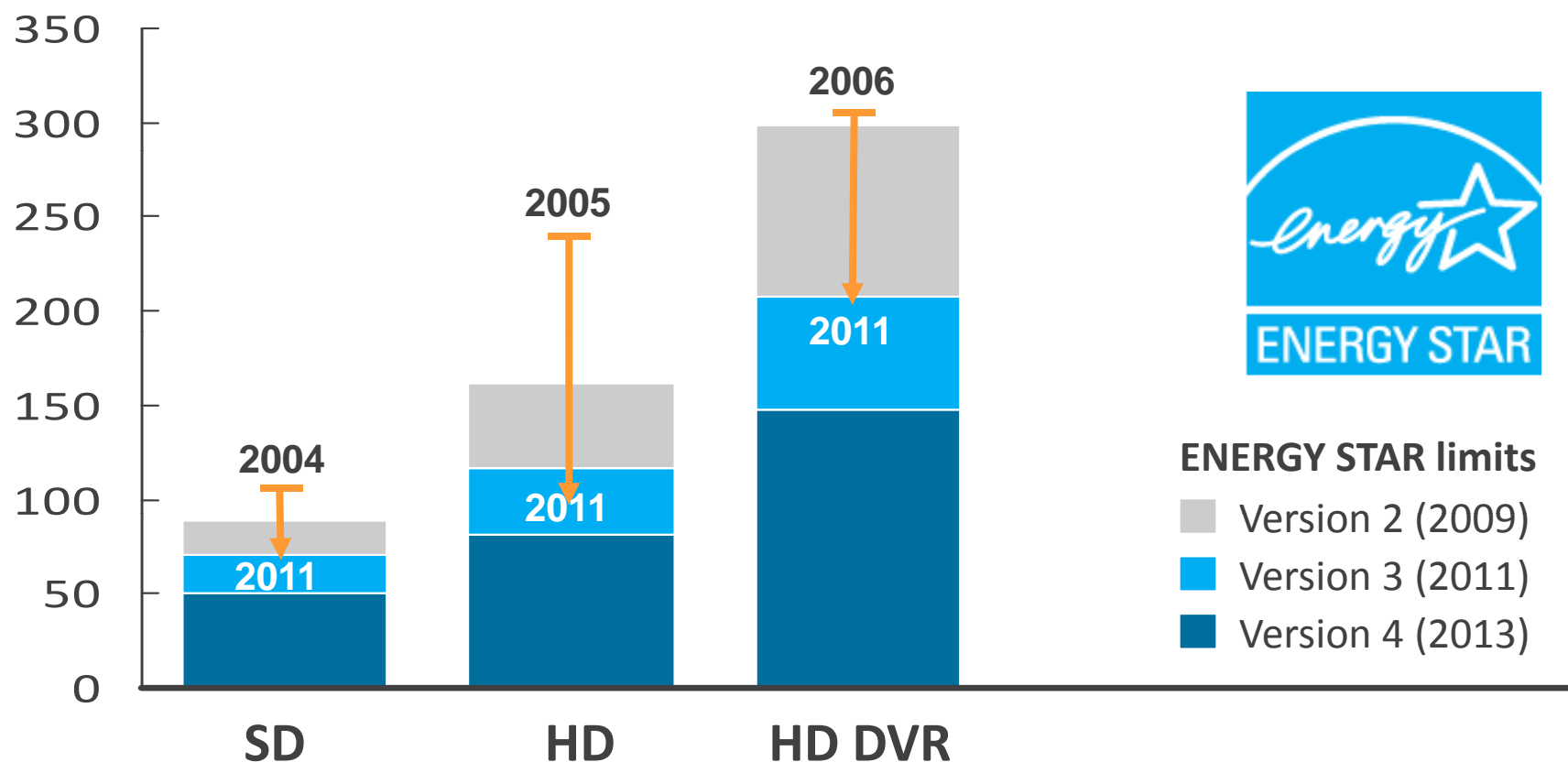


Energy Consumption Trend



Typical Energy Consumption (TEC) kWH/year

Change in energy consumption from
1st generation to current

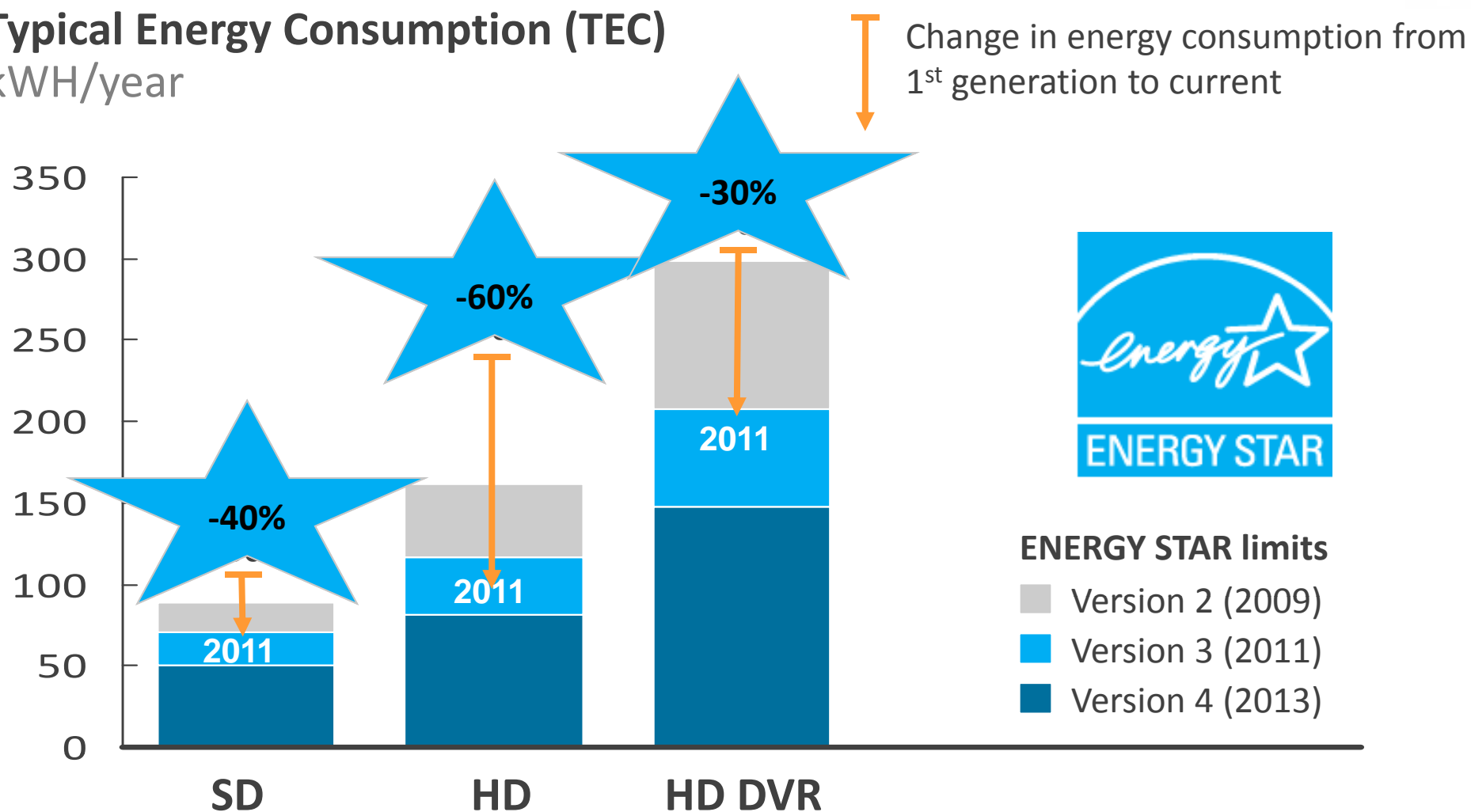


ENERGY STAR limits

- Version 2 (2009)
- Version 3 (2011)
- Version 4 (2013)

Current DIRECTV models have substantially better energy consumption than 1st generation DIRECTV models, while adding more functionality and processing power

Typical Energy Consumption (TEC) kWH/year



Current DIRECTV models have substantially better energy consumption than 1st generation DIRECTV models, while adding more functionality and processing power

Multi-Room

- The new DIRECTV HR34 “Smart Box” works directly with TVs capable of supporting the new RVU industry standard (e.g. Samsung 32” TV model UN32D6000).
- DIRECTV’s Smart Box will roll out nationwide in October 2011.

The new DIRECTV HR34 “Smart Box” multi-room architecture allows a service provider to deploy only one set-top box in the home while still being able to serve TVs throughout the home. In other words, a family with four television sets would need only one set-top box for the entire house. That means three fewer boxes and significant energy savings.



**Samsung RVU Capable TV
(32” model UN32D6000)**

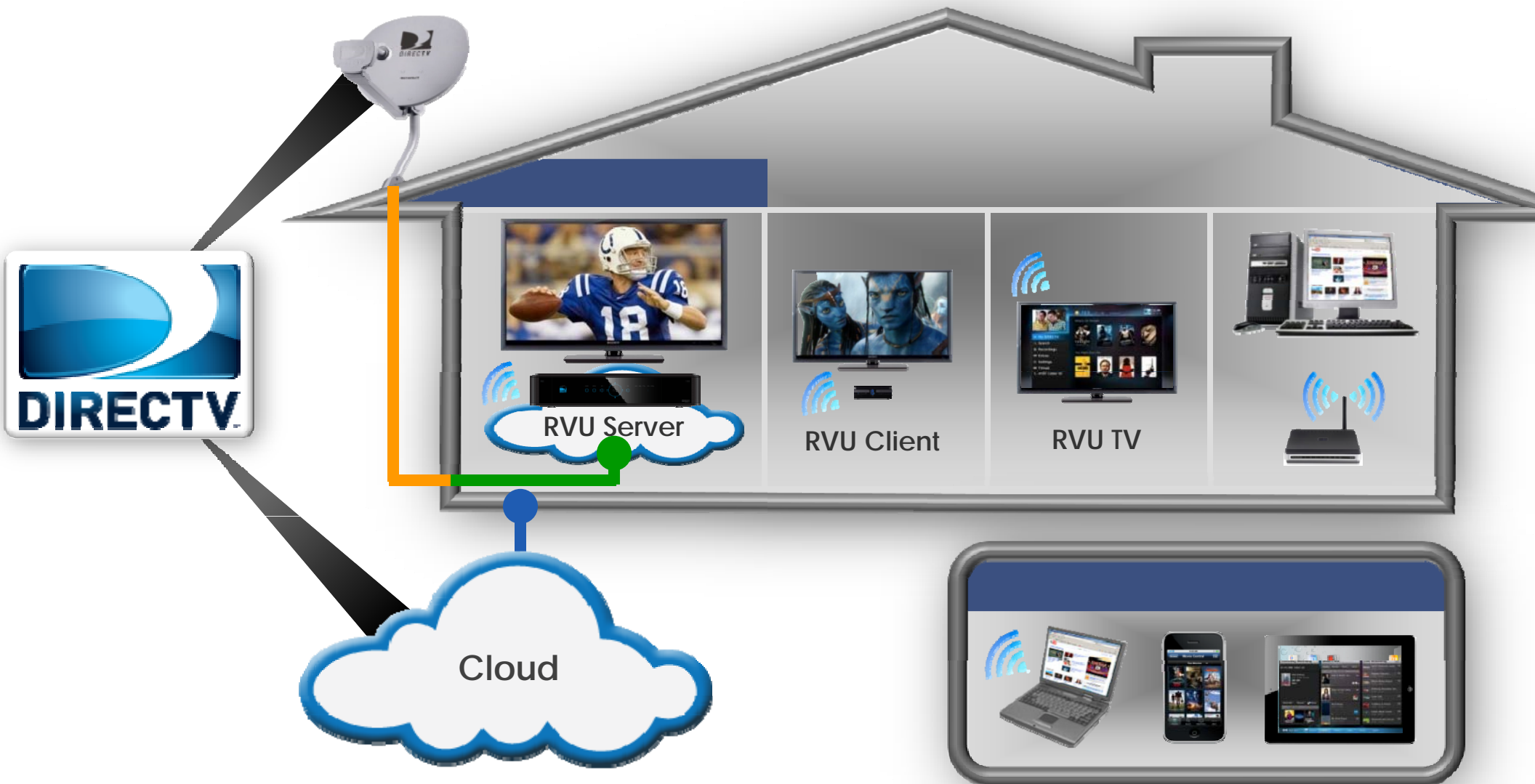


**DIRECTV HR34 “Smart Box” (RVU
Server)**



www.rvualliance.org

Energy Efficient Multi-room Architecture



- **2012: DIRECTV C31 High Definition Client**
 - **New RVU based server-client architecture**
 - **Reduced cost and greater reliability (again)**
- **Prototype:**
 - **ON power = 5.7W**
 - **TEC = 47 kWhr/yr**
- **W x D x H (inches)**
8.5" x 6.5" x 1.25"



www.rvualliance.org

- **2012: DIRECTV C31 High Definition Client**
 - **New RVU based server-client architecture**
 - **Reduced cost and greater reliability (again)**

80%
less power

94%
smaller



www.rvualliance.org

- **STB manufacturers are delivering ENERGY STAR capable hardware platforms**
 - **Service Providers increasingly requiring this capability**
- **Typical Energy Consumption (TEC) concept works**
 - **Allows ENERGY STAR Partners freedom to innovate**
 - **Adopted by European Commission for its voluntary “Digital TV Service Systems Code Of Conduct”**
- **ENERGY STAR is driving energy savings in both Qualified STBs and non-ENERGY STAR STBs**
 - **True impact is much greater than the energy savings of ENERGY STAR vs. non-ENERGY STAR products**

Don't just watch TV. **DIRECTV.**





Partnering with ENERGY STAR

EPB & ENERGY STAR

About EPB



- Non-profit agency of the City of Chattanooga
- Provides electricity + broadband communications
- Launched Fiber Optics business in 2009
- Automated Smart Grid to reduce outage time by an est. 40%, creates efficiencies
- 1st residential Gig offering in the US; available to 170k homes & businesses
- Serves 30,000+ Fiber Optics customers



Partnership Expectations



- Minimal administrative responsibility
- Qualified products procurement easy
- Flexible training options
- No barriers for small providers

Promotion

FiTVSM DVR

**Record 4 shows at once
and watch them in any room!**

Never miss another show
The Fi TV DVR is the only one that lets you record four shows at once -- including two in HD! So no one in your house will have to miss their favorite programs and movies again.

Watch what you want, where you want
When you're ready to watch your recordings, you can do it in any room you choose. Simply add a Fi TV set top box to any TV in any room, and your Fi TV DVR sends your recorded shows to that TV, ready for watching. So you need only one DVR, and get lots of rooms to watch it in!



- Press Releases
- Website
- Social Media
- Expos/ Events

Community Benefits



- **Nearly \$1M in energy savings total by year-end 2011**
 - 10,606,155 kWh saved
 - 7,314 tons of carbon dioxide equivalent avoided
 - Equivalent to nearly 40 rail road cars of coal
- **\$90 saved by each EPB Fiber Optics household over STB's lifetime**
 - 921 kWh saved
 - .635 tons of carbon dioxide equivalent avoided
 - Equivalent to each EPB Fi household planting 16 trees

EPB Benefits



- Brand Value
- Community Contribution
- Company Culture
- Small Provider influence in ENERGY STAR program

4.0 Requirements



Photo courtesy of Cisco

- Vendor readiness
- Balancing functionality with customer expectations
- Deep Sleep?
- EPB already offers:
 - Light sleep
 - Remote Control power-down
 - Whole-home DVR

Looking Ahead



- Customer engagement & input
- Customer experience focus
- Streaming Network DVR Model potential
- ENERGY STAR education support



Q&A





Contact Information



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