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

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

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<th>Category</th>
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Measured Power Demand (watts)

Units Tested

- Streaming Device
- Cable
- Satellite
- IPTV

On Mode Power
Sleep Mode Power

NRDC
STB Data Logging Example

Motorola DCX3400 with Comcast Digital Cable

- **On**: 29 Watts
- **Sleep**: 28 Watts

Source: Ecos/NRDC 2010
2010 Study Results for All Service Providers

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

- **Standard Receiver** (n = 14)
- **High Definition (HD) Receiver** (n = 15)
- **Standard Receiver w/ DVR**
- **HD Receiver with DVR** (n = 26)

Estimated Unit Energy Consumption (kWh per year)

Units Tested

Source: Ecos/NRDC 2010
Energy Use of Set-Top Boxes and Other Appliances

- Typical Household Set-Top Box Configuration (1 HD-DVR, 1 HD Set-Top Box): 446 kWh/year
- New ENERGY STAR Refrigerator (21 cubic feet, top freezer): 415 kWh/year
- Recent Model HD-DVR Set-Top Box: 275 kWh/year
- ENERGY STAR Version 4.1 42” LCD TV Model: 180.5 kWh/year
- Recent Model HD Set-Top Box: 171 kWh/year
- Compact Fluorescent Light Bulb (CFL): 17 kWh/year

Average Energy Use (kWh/year)
Nearly Two-Thirds of Annual U.S. Set-Top Box Energy Use Occurs When Viewers are Not Watching or Recording Content

**In Use**

1/3 of Energy Use

**Not In Use**

2/3 of Energy Use

**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

NRDC
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 2\textsuperscript{nd} and 3\textsuperscript{rd} 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

Source: Intertek, Results of 2010 NRDC Study Performed by Ecova: formerly Ecos Consulting
For More Info

NRDC Report :

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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 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

Europe
- 1998: “No, take it out”
- 2004: Interested and asking, but highly cost sensitive
- 2007: Specifying, implementing and driving: (hardware – through to application)
- 2009: In-field retrospective upgrades (software downloads)

USA
- 2000: Critically cost sensitive
- 2006: Proactive
- 2009: 2011?
Home Entertainment - History

Ten years ago

- Modem: 40kWh
- VCR: 100kWh
- SD STB: 150kWh
- PC: 250kWh

Total = 540kWh/yr.
Home Entertainment - History

Now

Integrated < 200kWh

+ Place shifting
+ Time shifting
+ VOD
Efficiency choices?

Energy Consumption

- Passive Standby: Slow response, High savings, Poor user experience
- Instant: Quick response, Minimum savings, Good user experience

Efficiency choices?
EU Industry Voluntary Agreement

Legislation

• Fixed – not flexible
• Doesn’t react to technology changes
• Becomes irrelevant

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

V.A. Delivers

• Better than business as usual power savings
• Flexibility
• Relevancy
Less than 1W standby?

USA National savings - $500m +

Benefits
- Reduced user electricity bills (~ $10pA)
- Reduced carbon emissions

Technically feasible, but at what cost?

Disadvantages
- Poor user experience: Greater subscription cost
- Temporary loss of viewing rights
- Long wake-up times
Industry relationships

All together = 50%+

STB Developer
3%

Service Provider

Software CA Middleware
5%

Hardware Silicon
10%
ENERGY STAR Partner Meeting
Set-top Box Discussion

Steve Dulac
Director, Engineering

10 November 2011
Set-Top Box Energy Efficiency

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 kWh/yr

W x D x H (inches)
15” x 11.5” x 3”
ENERGY STAR STB Version 2 Program

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

- Average
  - ON power = 14.5W
  - TEC = 125 kWh/yr

- W x D x H (inches)
  15” x 9.75” x 2.75”
ENERGY STAR STB Version 2 Program

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

46% less power
22% smaller
ENERGY STAR STB Version 2 Program

2010: DIRECTV H24 High Definition STBs

- Addition of MoCA Advanced Home Networking
- Did not sacrifice energy efficiency

Average
- ON power = 14.5W
- TEC = 122 kWh/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
ENERGY STAR STB Version 3 Program

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

- Average:
  - ON power = 11.2W
  - TEC = 92 kWh/yr

- W x D x H (inches)
  - 8.5” x 6.5” x 1.25”
ENERGY STAR STB Version 3 Program

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

60% less power
87% smaller
Current DIRECTV models have substantially better energy consumption than 1st generation DIRECTV models, while adding more functionality and processing power.
Current DIRECTV models have substantially better energy consumption than 1st generation DIRECTV models, while adding more functionality and processing power.
Energy Efficient Multi-room Architecture

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.
Energy Efficient Multi-room Architecture

DIRECTV

RVU Server

RVU Client

RVU TV

Cloud
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 kWh/yr

W x D x H (inches)
8.5” x 6.5” x 1.25”
Energy Efficient Multi-room Architecture

- 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
ENERGY STAR STB Program is a Success

- 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

Fi TV™ 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 EPBFi household planting 16 trees
EPB Benefits

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

- 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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