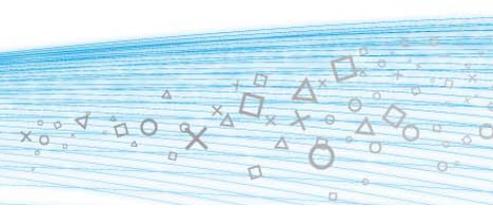


The Future of Gaming: Sustainability Challenges

Dr Kieren Mayers
Head of Environment & Technology Compliance
Sony Computer Entertainment Europe

11 November, 2015



The future of gaming: sustainability challenges

- **Key trends**
 - Technology
 - Market
 - Environmental policy
- History and background
- Product & service development

TREND 1: Exponential improvement with each generation

1995 PS ^{One}	2000 PlayStation ² , Xbox, Wii	2005 Xbox 360, PlayStation ³ , Wii U	2013 Xbox One, PlayStation ⁴
Performance has improved exponentially			
Pixelated graphics	SD gaming	HD photo realistic gaming	Ultra HD capable
A wider range of secondary functions are provided.			

Order of magnitude between performance between PS3 and Ps4

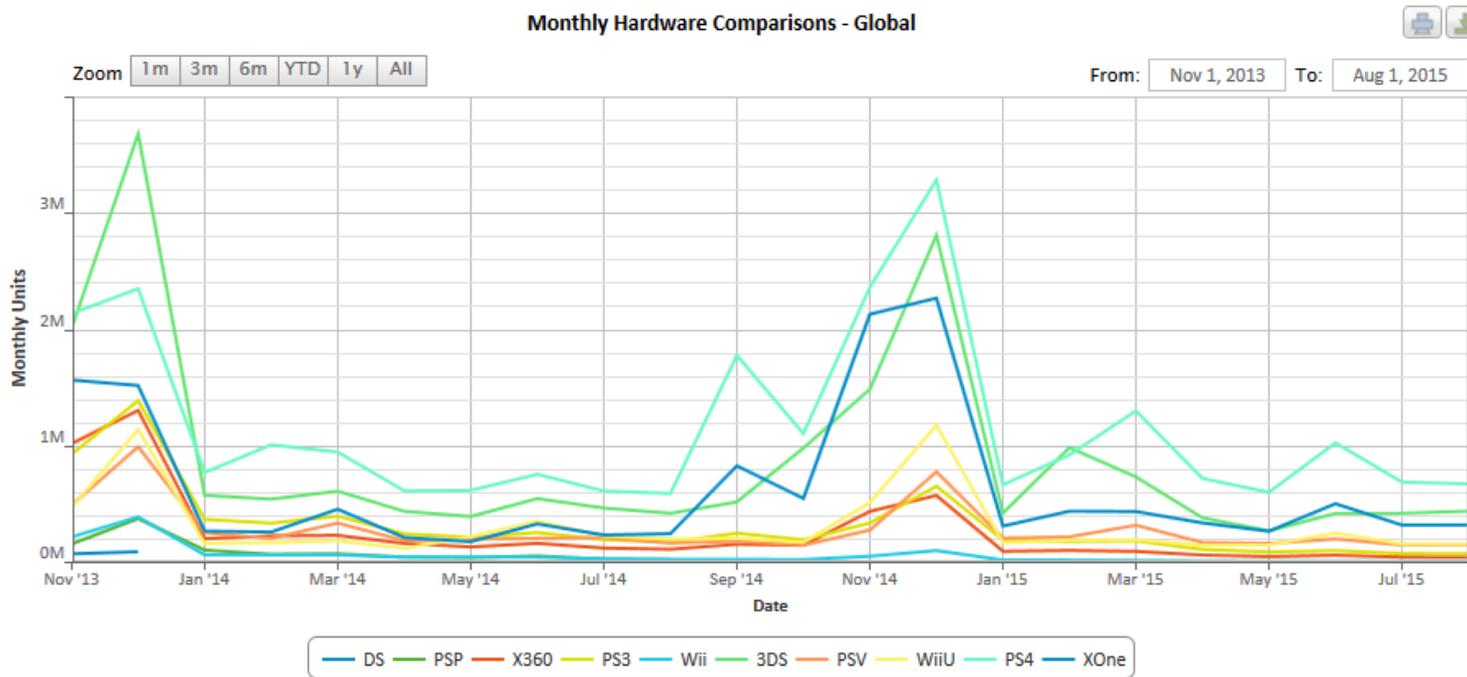
Around 40% usage of PlayStation⁴ is non-gaming

TREND 2: High market penetration of consoles

Two years since launch, 8 in 10 UK households now own a next generation games console, such as PlayStation®4



TREND 3: PS4 - the most successful console ever



SOURCE:
www.vgchartz.com
27/10/15

TREND 4: Environmental laws affect console life-cycle



General EMS	✓						
Energy use	✓	! Mandatory energy audits (EU - 2015)		✓	! Console efficiency agreement (EU - 2016+) ! Network efficiency requirements (EU & global - 2017+)		
Waste & recycling	✓	! Mandatory office recycling (EU - 2015)	✓		✓	! Controls on used products (global - 2017+) ! Up to 5% 'waste tax' (Russia - 2015) ! Use of Triman logo (France - 2015)	
Hazardous substances	✓		✓	! Substance testing for products & EAC logo (Russia - 2015) ! Phthalates' restrictions for products (EU - 2018) ! ~30% substances tax on electronics (Sweden, TBC)		✓	! Chemical imports registration (EU - 2018)
Resource use	✓		✓	! Product reparability, durability, and recyclability requirements (EU, 2017+)			
Social responsibility			✓				

✓ Existing requirements
 ! New / future requirements

The future of gaming: sustainability challenges

- Key trends

1. Consoles are increasingly popular
2. Environmental legislation targets product life-cycle

- History and background

- Stakeholder concerns
- Energy use of consoles
- Environmental requirements

- Product & service development

NGOs draw attention to energy use of consoles

Energy Facts

Lowering the Cost of Play: Improving the Energy Efficiency of Video Game Consoles

Today, more than 40 percent of all homes in the United States contain at least one video game console. And all that gaming is adding up to serious energy use.



After conducting the first ever comprehensive study on the energy use of video game consoles, NRDC and Ecos Consulting found that game consoles consume an estimated 16 billion kilowatt-hours per year—roughly equal to the annual electricity use of the city of San Diego.¹ Because this estimate is based on the assumption that half of all users leave their device on all the time, gamers can significantly reduce the energy consumed by their consoles through simple steps like turning off the console when not actively playing a game or watching a

movie and enabling power management features when available. But bigger changes in the industry are also needed, including the incorporation of more user-friendly power management features by console manufacturers and game designers.

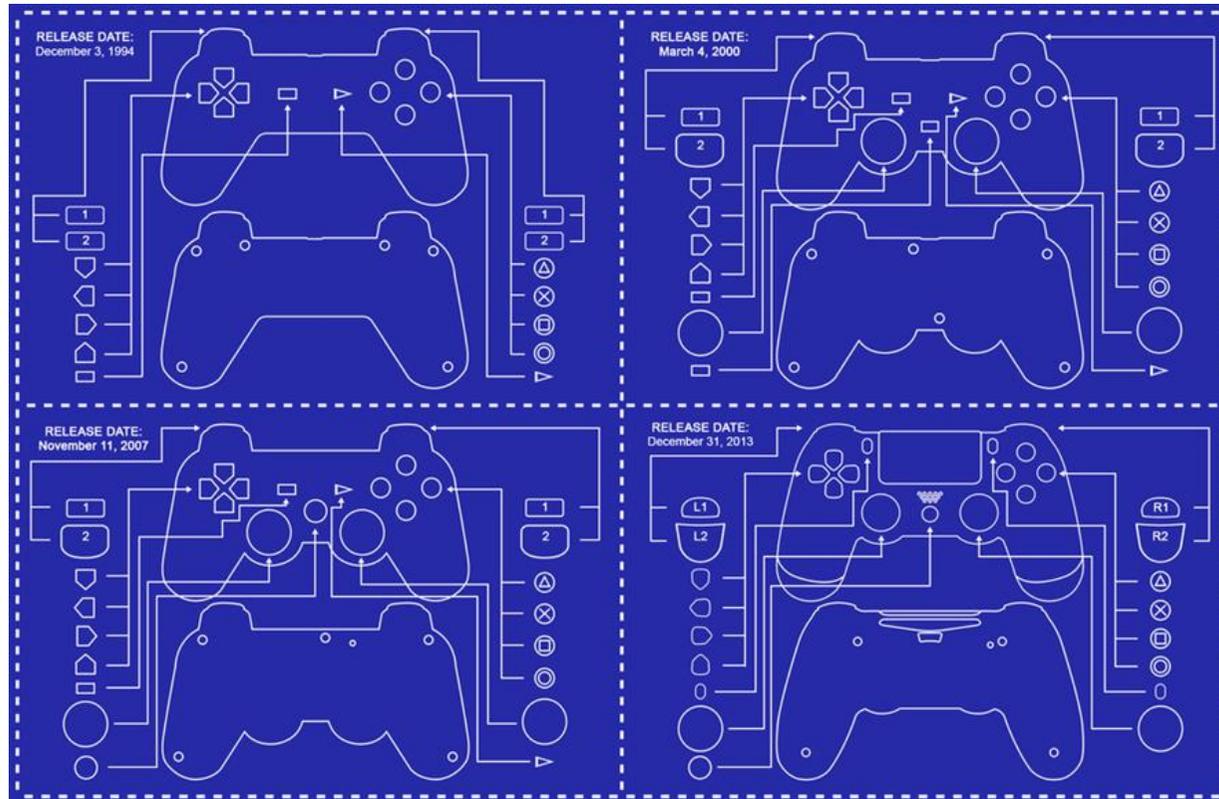


EU target consoles for efficiency measures



2009

Global project started to develop efficient next generation PlayStation®

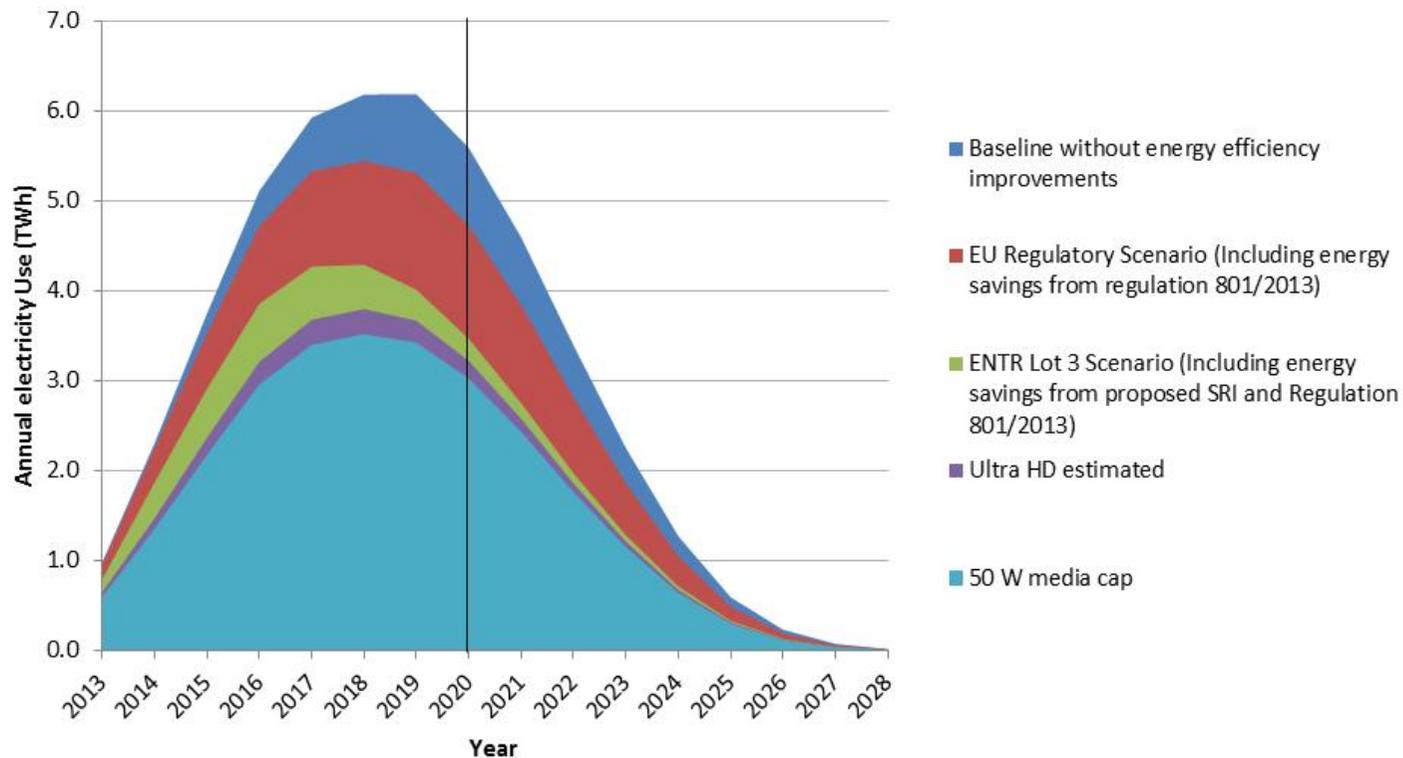


2010

Voluntary energy efficiency agreement drafted



Industry energy saving estimated: 1.0 TWh/yr 2020



2014

...equivalent to yearly electricity use of Lithuania



2014

Commissioners adopt console voluntary agreement



The Commission considers this voluntary scheme to be a valid alternative to an ecodesign implementing measure, so will abstain, for now, from establishing mandatory ecodesign requirements for games consoles placed on the EU market.

The Commission will continuously monitor the application of the voluntary scheme. Should this reveal that the objectives and general principles of the Ecodesign Directive are not being met, the Commission may establish ecodesign requirements for games consoles in a mandatory implementing measure.

Apr 22, 2015

2015

History: Requirements

14

A range of efficiency requirements now apply



Energy efficiency requirements:

- ✓ *Off / standby* 0.5 W
- ✓ *Networked standby* 6 W → 3 W → 2 W
- ✓ *Navigation/ home menu* 90 W → 70 W
- ✓ *Media play* 90 W → 70 W
- ✓ *Auto-power-down mandatory*



Consumer information (TBC)

- *Power consumption*
- *Power-down information*
- *Low power modes available*
- *End-of-life / repair services available*



Material efficiency:

- ✓ *Provide out-of-warranty repair service*
- ✓ *Maintenance possible by non-destructive disassembly*
- ✓ *Plastics marking for parts >25g*

Future policy development will continue to impact network gaming & consoles

ISSUES

2015 EU review of servers & storage devices
Measurement standards for networked standby
Global targets for networked equipment

2016 Durability, reparability, & recyclability standards

2017 Review of EU console efficiency agreement

2019 Review of networked standby limits for 2019+

POLICY MAKERS



DIGITALEUROPE





The future of gaming: sustainability challenges

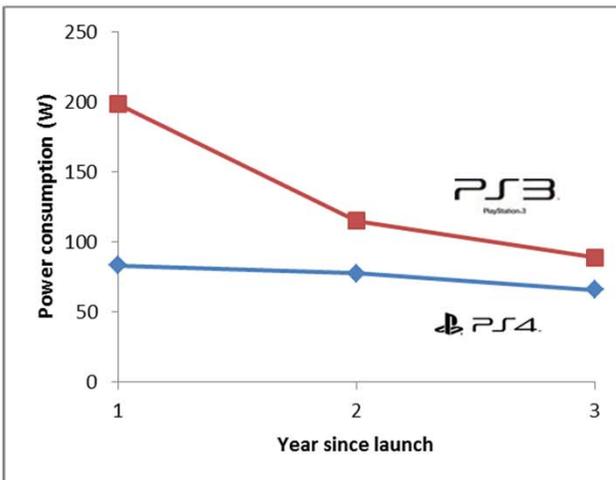
- Key trends
- History and background
 - Console producers have committed to a voluntary ecodesign agreement
- Product & service development
 - PlayStation®4 energy efficiency
 - Circular economy commitments
 - Consideration of future services

PlayStation®4: designed for energy efficiency

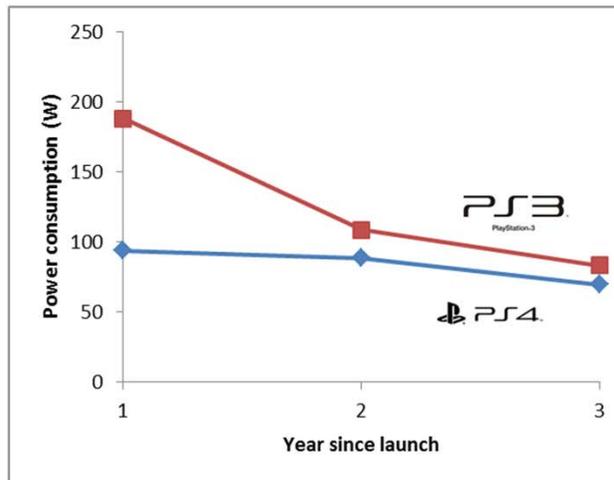
- APD: 20 min for gaming, 4 h for movies
- System on a Chip, with power gating & optimised scaling
- Efficient power supplies (92% conversion)
- Optimised and efficient GDDR5 memory
- Blu-ray and other electronics condensed and integrated onto the motherboard
- Low power 'rest' modes:
 - Background download
 - Suspend / resume function
 - Peripheral charging
 - Automatic updates
 - Network wake-up

Result: PS4 power reduction tracks below PS3

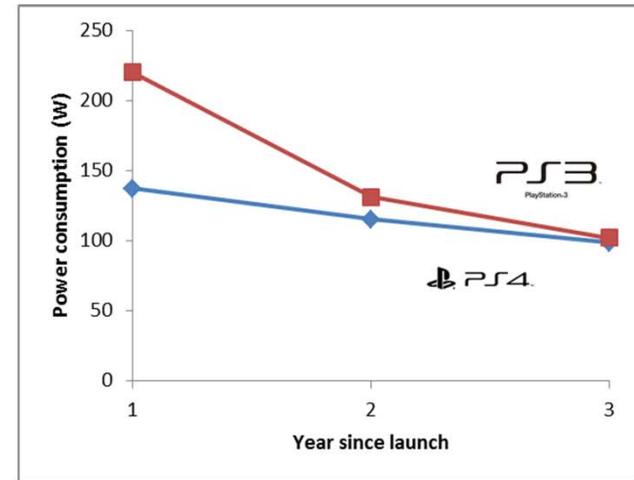
Navigation mode



Media mode

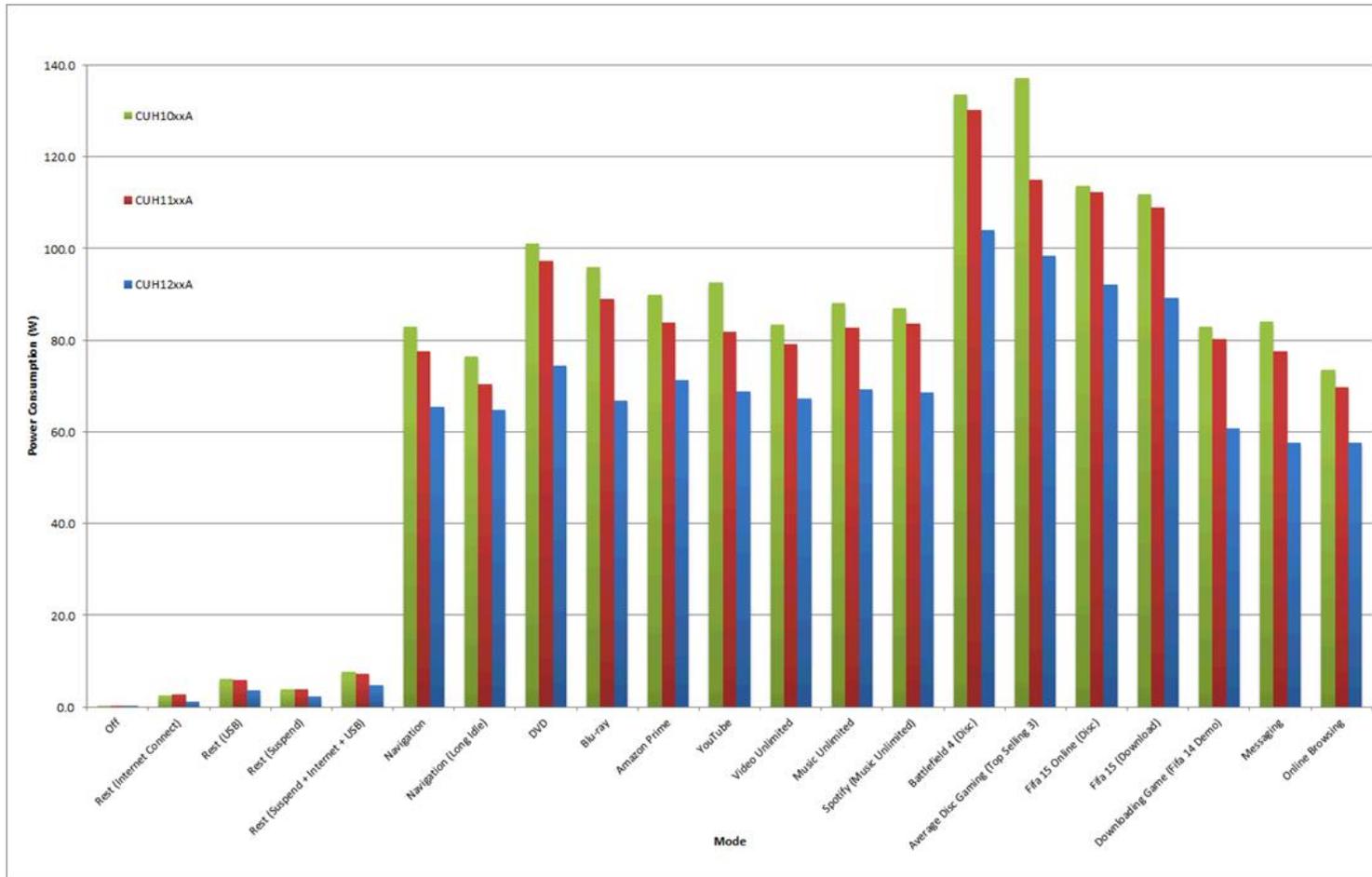


Gaming mode



Power reduction achieved despite PS4 having around an order of magnitude more processing power than PS3

Result: media power down ~26% since launch



- Testing UK models (average of 5 samples)

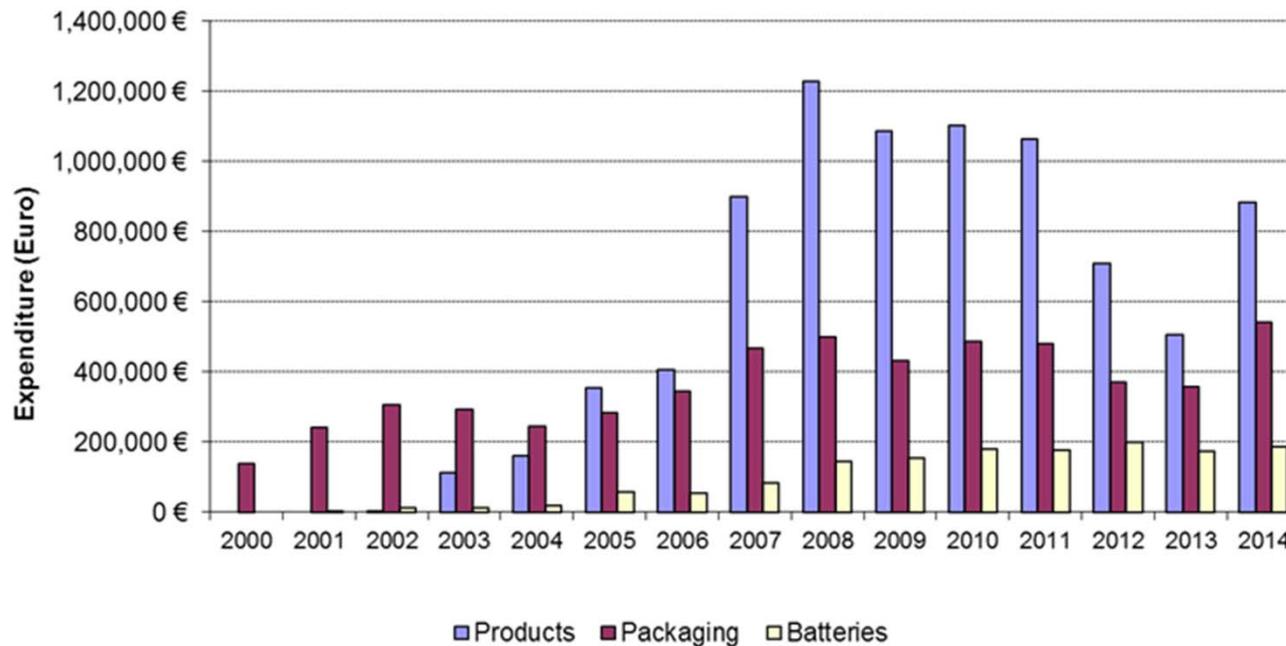


Circular economy, end-of-life, and reduction of hazardous substances are key considerations

- Plastic components labelled with polymer type wherever possible, so that they can be identified during recycling.
- Batteries and portable PlayStation®Vita display screens are mercury-free
- Only bromine and chlorine-free flame retardants are used in console casings.
- Customers provided out-of-warranty repair and refurbishment services to ensure their consoles can be fixed if broken at any time.

~£1.6m paid towards end-of-life PlayStation® take-back and recycling in EU in 2014

SCEE annual take-back compliance expenditure



PlayStation®VR & PS4 expected to consume less power than gaming PC & VR headset



©2014 Sony Computer Entertainment Inc. All rights reserved.
Design and specifications are subject to change without notice.

The transition to digital games has started: carbon impacts will depend on file size and usage



[Games streamed from 'the cloud' without the need for a games console]

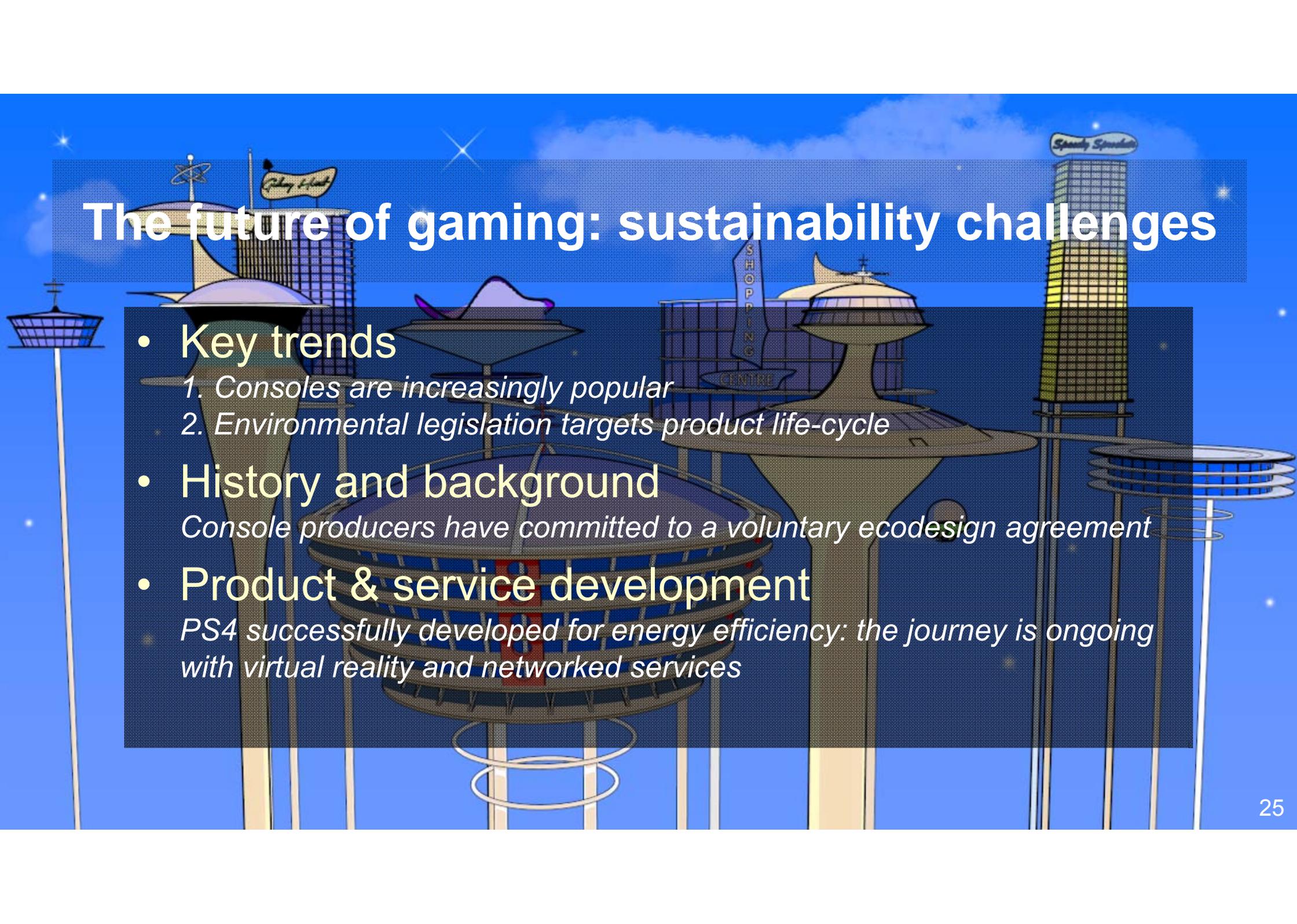


PlayStation®Store

[Games downloaded from the internet]



[Games played from physical Blu-Ray disc]



The future of gaming: sustainability challenges

- **Key trends**

1. *Consoles are increasingly popular*
2. *Environmental legislation targets product life-cycle*

- **History and background**

Console producers have committed to a voluntary ecodesign agreement

- **Product & service development**

PS4 successfully developed for energy efficiency: the journey is ongoing with virtual reality and networked services