

# Energy implications of the move from TV broadcast to streaming

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# CONTENT OVERVIEW

- What are we doing and why?
- Footprinting BBC Distribution.
- Results
- Comparison with YouTube
- (Design for Environment of Digital Services)
- Back to the Big Picture

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- *What are we doing and why?*
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FROM THIS.....



.... TO THIS

Living with environmental  
uncertainty



BIG PROBLEM...?

Living with environmental  
uncertainty

# CONTENT OVERVIEW

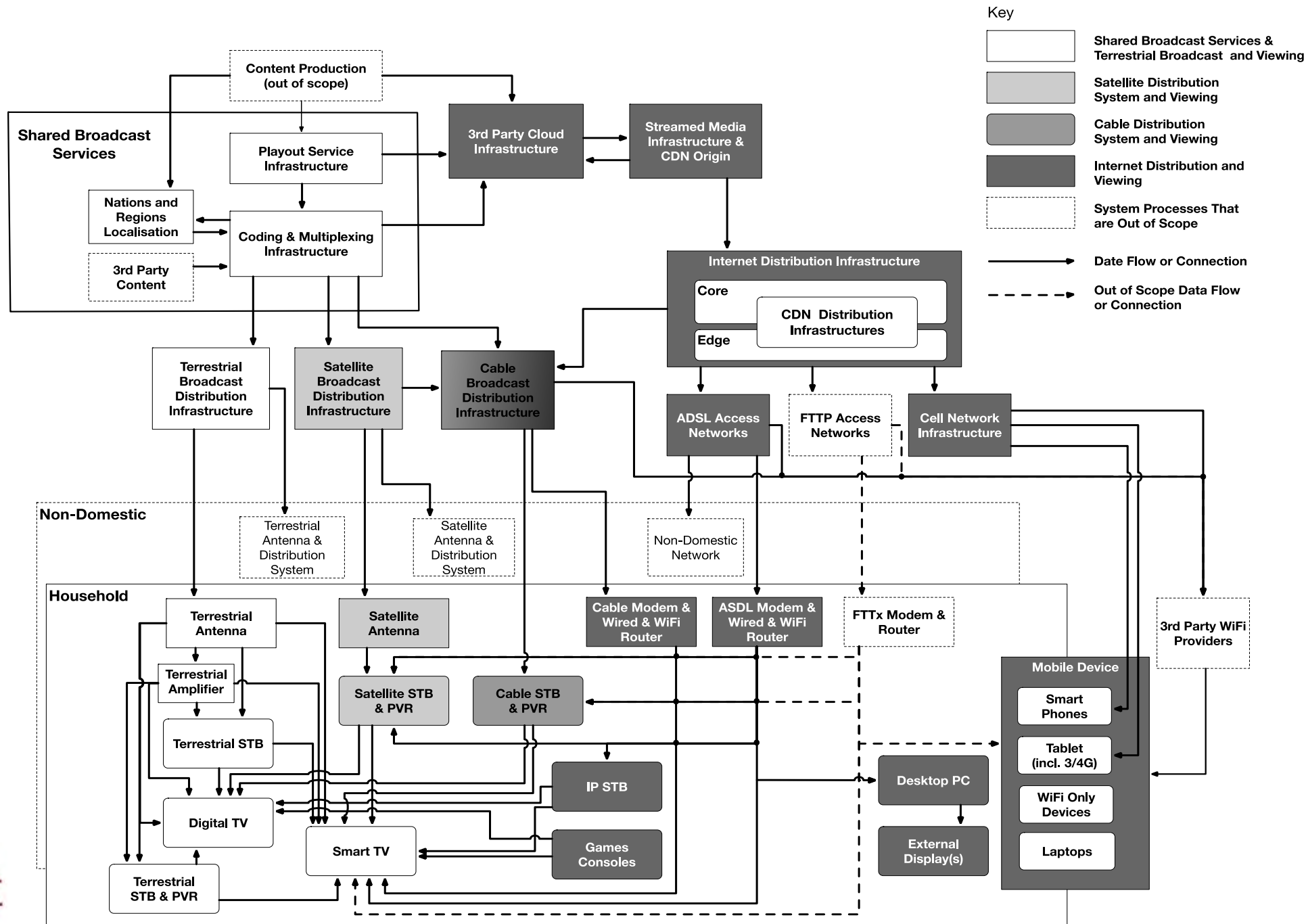
- What are we doing and why?
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# Footprinting TV distribution – Method (i)

- Process-based LCA (Unlike Koomey, SHIFT project)
- Parameterisable based on user behaviour patterns
- Online user behaviour: From User Analytics
- TV viewing behaviour: From BARB audience survey
- Other data: Primary, from BBC; secondary, from literature



# TV Distrib<sup>n</sup> Process Model



# Footprinting TV distribution – Method (ii)

- Cluster user data (Total viewing hours) according to ‘viewing configuration’
  - Eg: - Viewing Satellite broadcast on Main household TV
  - Viewing iPlayer on smartphone over mobile network
  - Viewing Terrestrial broadcast on secondary household TV
- Use process model to calculate electricity use for each configuration. Monte Carlo simulation with 10,000 runs.
- Sum. Shared parts of process can be calculated separately for efficiency.

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# Estimate of Carbon Emissions of BBC Distribution and Viewing 2016

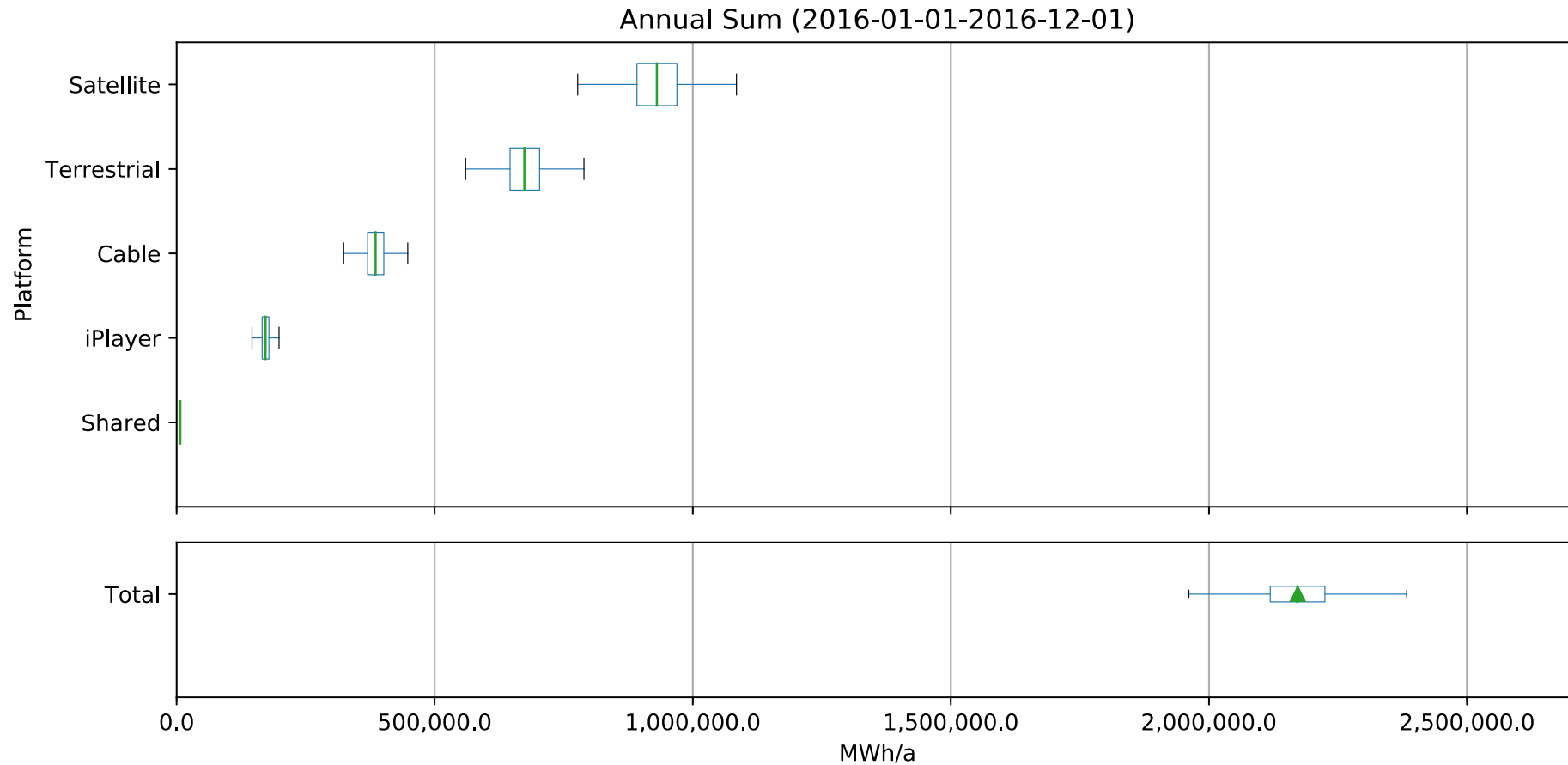
Electricity:

2,171 GWh (0.6% UK total)

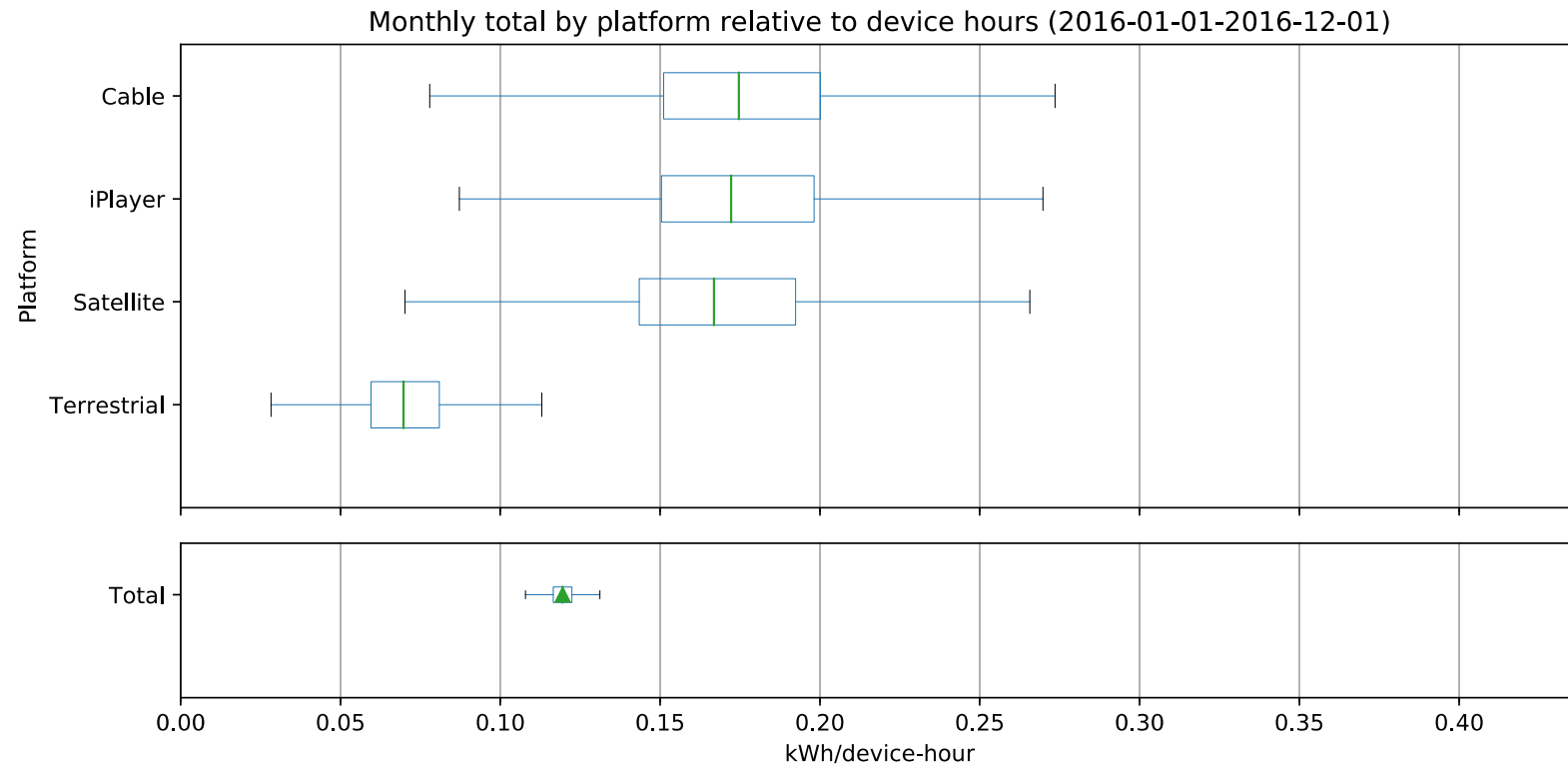
Carbon emissions:

1.12MtCO<sub>2</sub>e (0.24% UK total)

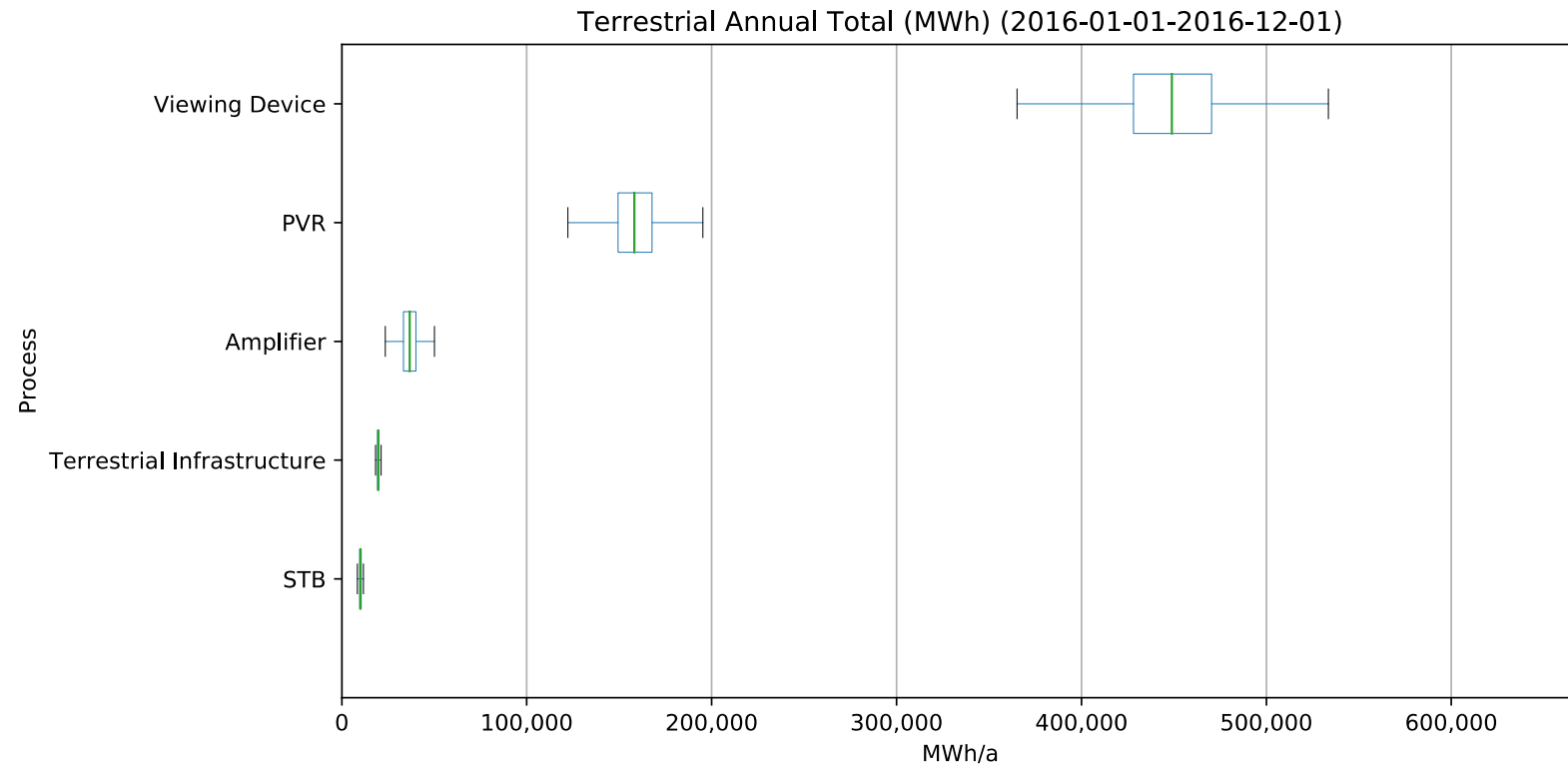
# BBC Total Electricity Use by Platform



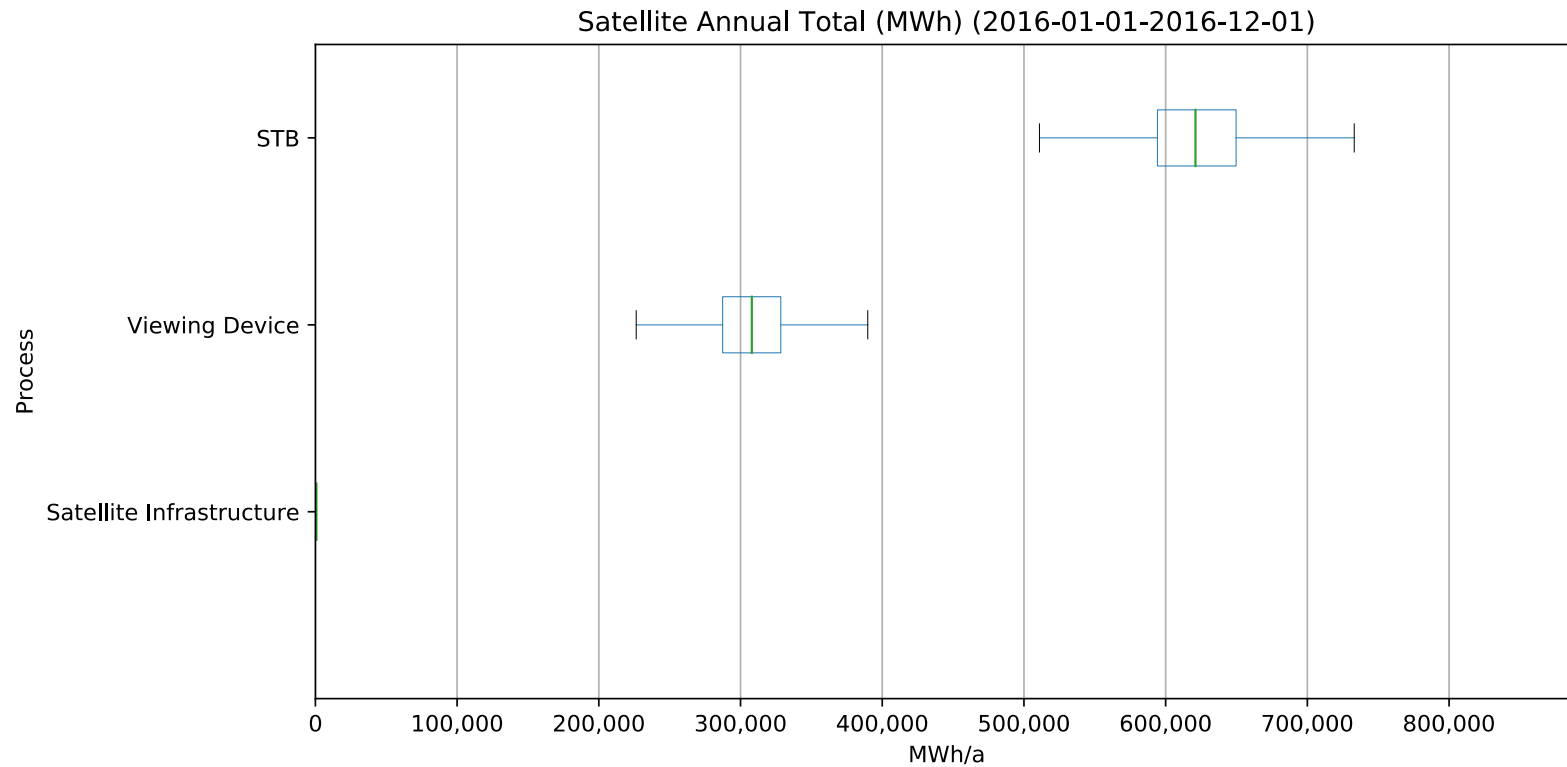
# BBC Electricity use per device-hour



# BBC Terrestrial Total

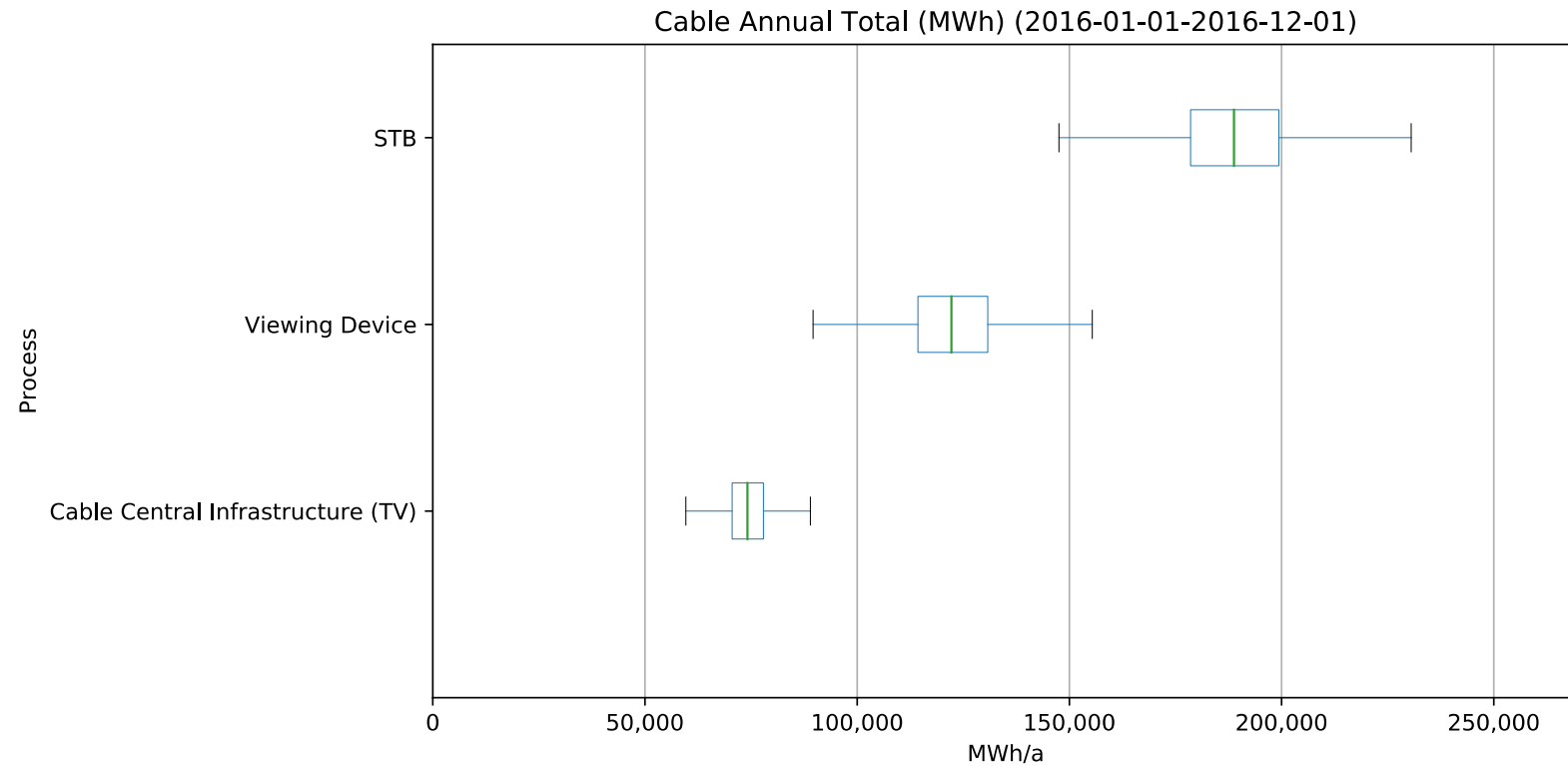


# BBC Satellite Total

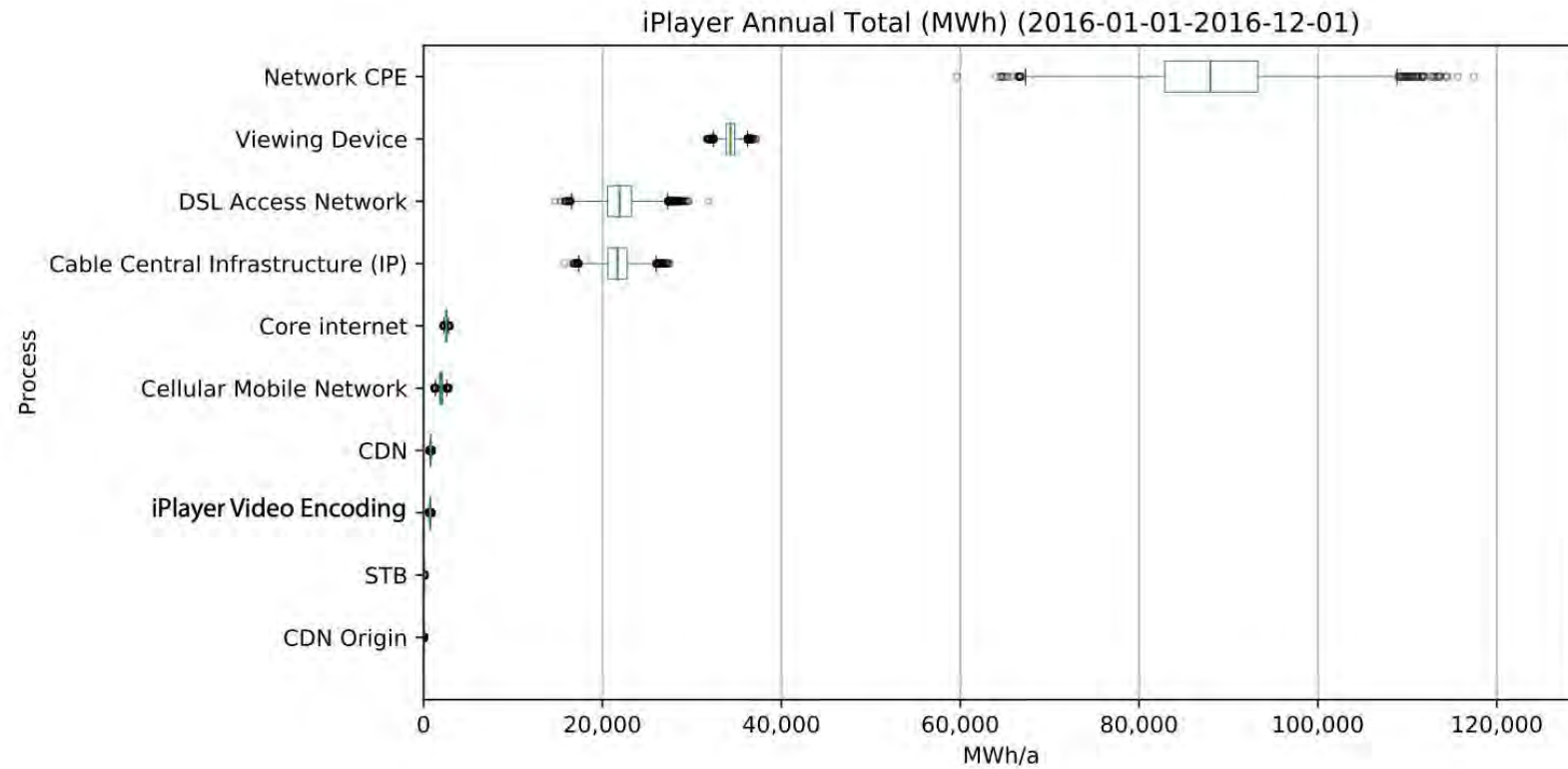




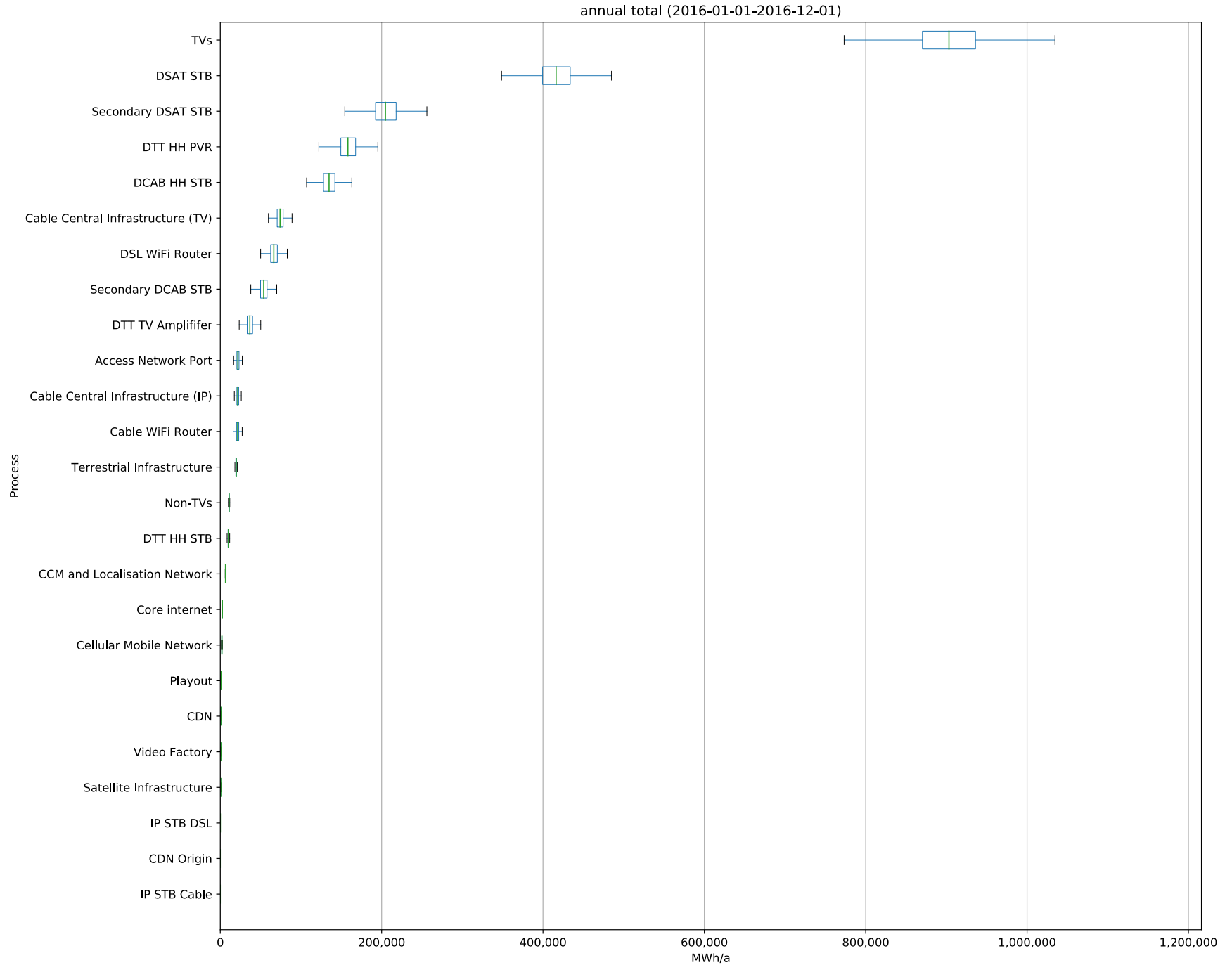
# BBC Cable Total



# BBC iPlayer Total



# BBC All Processes



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# Now Consider YouTube....

- Technical
- Behavioural
  
- Publicly available
- Substitute data from other services
  
- Conservative estimates

# Conservative Estimate of Carbon Emissions of YouTube distribution 2016

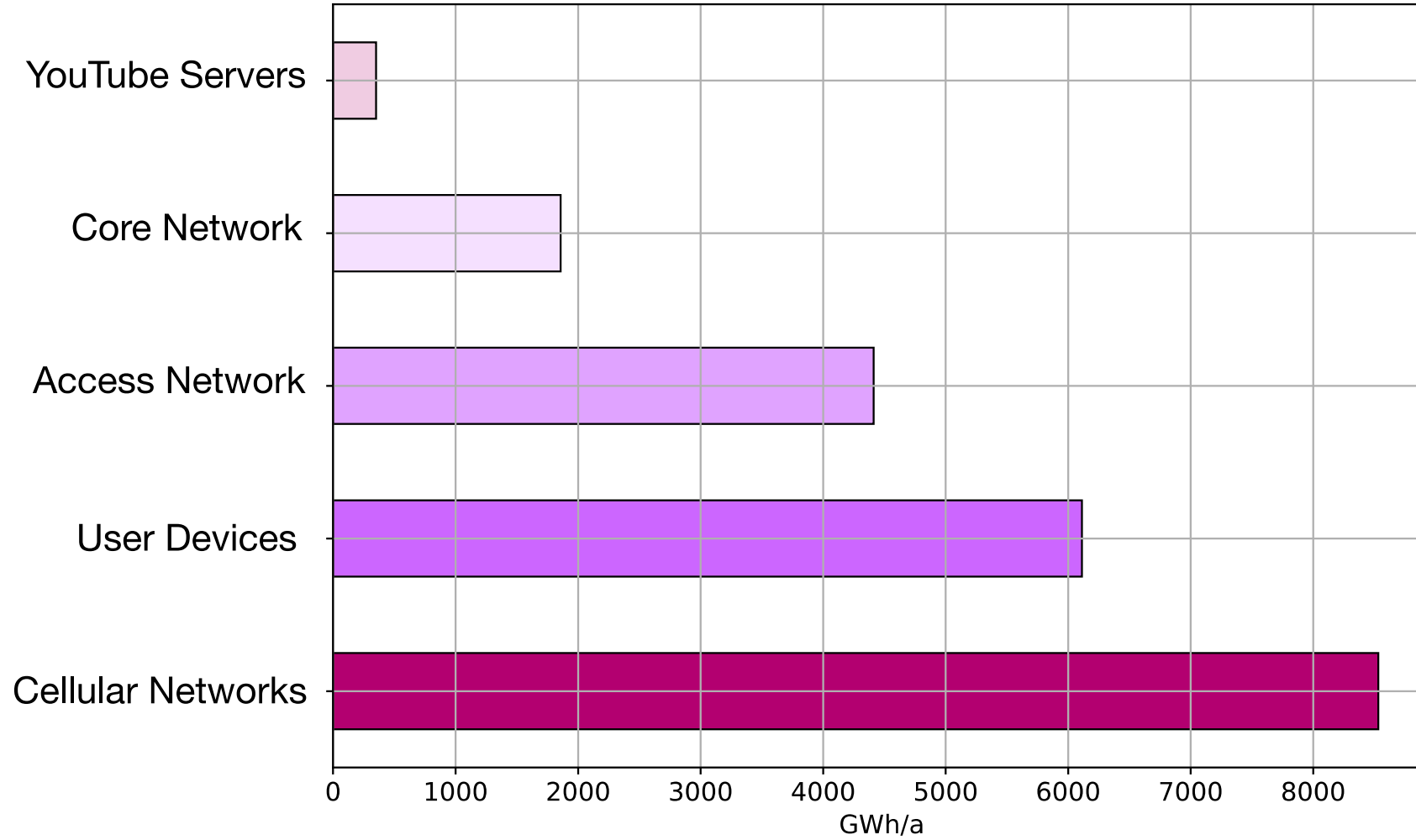
Electricity: 19.5 TWh

Carbon emissions: 10.0 MtCO<sub>2</sub>e

(In other words, about 10x that of BBC distribution)

(We assume all Google Data Centres and Global Cache use renewable energy.)

Annual Total Energy Consumption (2016)



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# Design for Environment



# Environmental Digital Service Design

- Model the Internet and how services use it.
- Study and Model User Behaviour (Ethnographic and/or Analytics)
- Use Environmental Life Cycle Assessment methods and data.
  
- Assessment of environmental impact of different design decisions.



ELIMINATING YOUTUBE DIGITAL WASTE

# Eliminating Video Digital Waste

Share of Music Audio Only	Emissions Reductions (KtCO <sub>2</sub> e)
10%	117
25%	293
50%	586

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# KEY MESSAGES

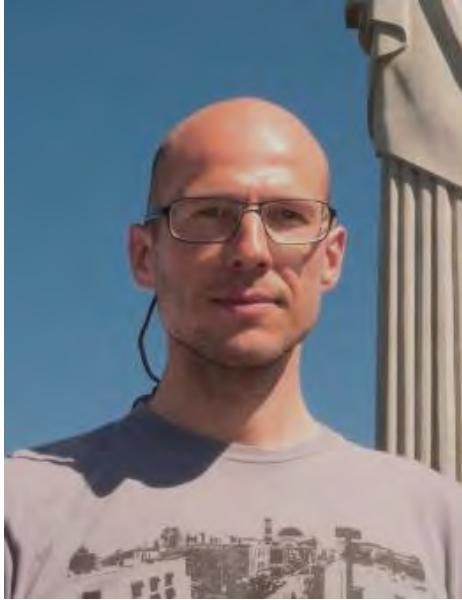
- Our individual digital footprint is relatively small, but lots of us do it.
- So design, rather than behaviour change, is key.
- In the home ‘virtualization’ of STBs can offset much of the increase in energy use from streaming.
- ... though streaming user device size will increase. (Smart TVs)
- But the increased use of streaming ‘on the move’ over mobile networks is driving demand for high-bandwidth connectivity everywhere, and so increasing energy use.

# Working across the industry



**PARTNERING  
FOR A SUSTAINABLE  
SECTOR**

# Thank You!



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# Structural Rebound....



# 'Enabling' Negative Impacts on the Environment



# 'Enabling' Negative Impacts on the Environment



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IT is an accelerator that moves society faster in whatever direction it is pointing.

So, like money, not intrinsically 'good' or 'bad'....

IT can accelerate a move to a sustainable economy, but only if society chooses to point in that direction....

# Process-Based vs Top-Down....

- Process-based only includes 'direct' processes.
  - Eg Does not include IT used in the support office, content creation etc.
  - Also does not include a share of analytics traffic, CDN cacheing, storage, backup processes.
  - (As with all process LCAs...But is it more significant for digital?)
- Top-down tries to include a share of everything.
  - The overall (global) estimate will necessarily be very approximate.
  - Datacentres: How to allocate them?
  - Network equipment: What is an appropriate system boundary, and how can a global estimate account for this?