The Internet of Things: Automating Demand

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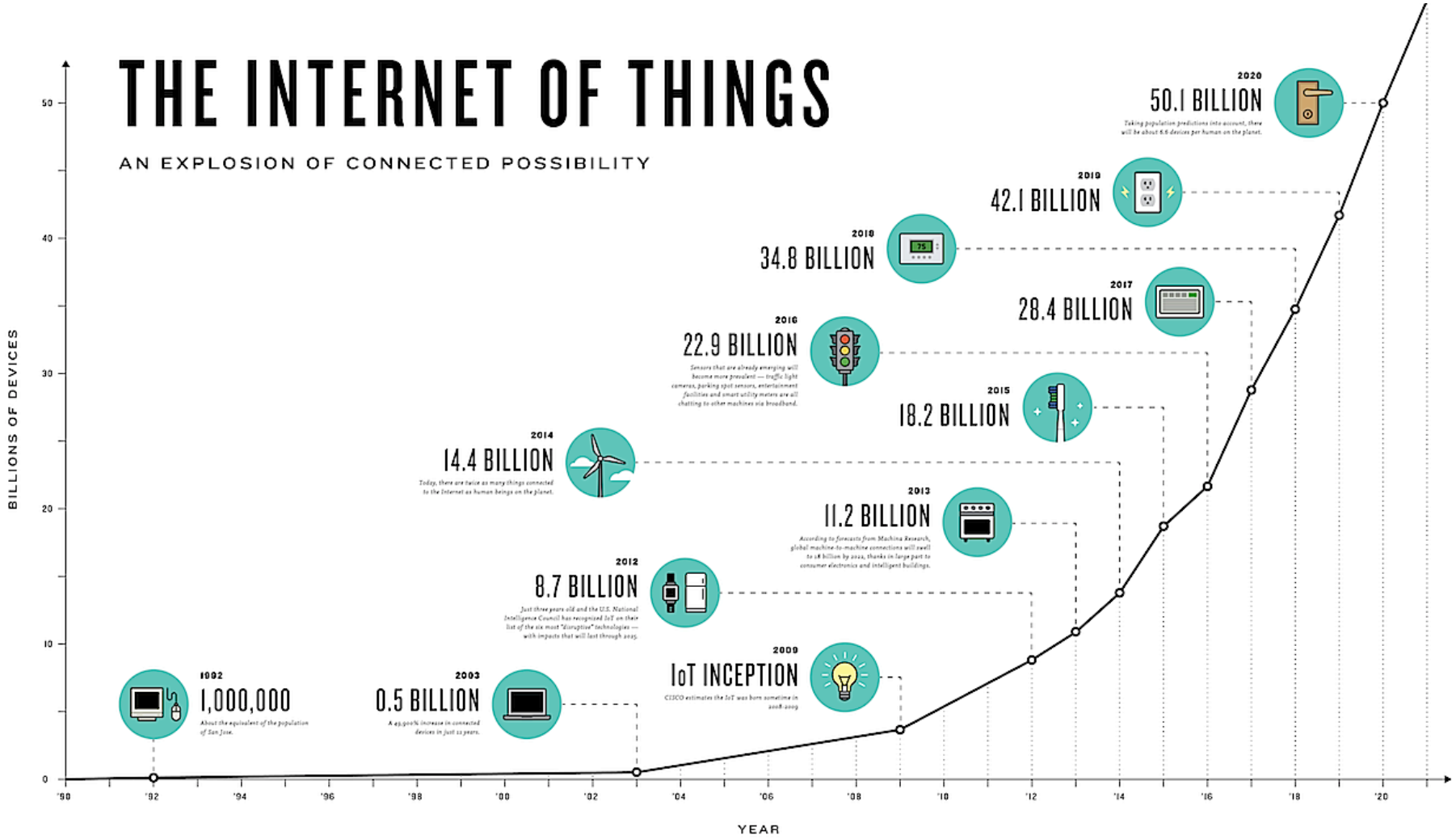
Lancaster University



From The Connectivist, based on Cisco data (circa 2014). Reproduced From i-scoop.

Direct Energy

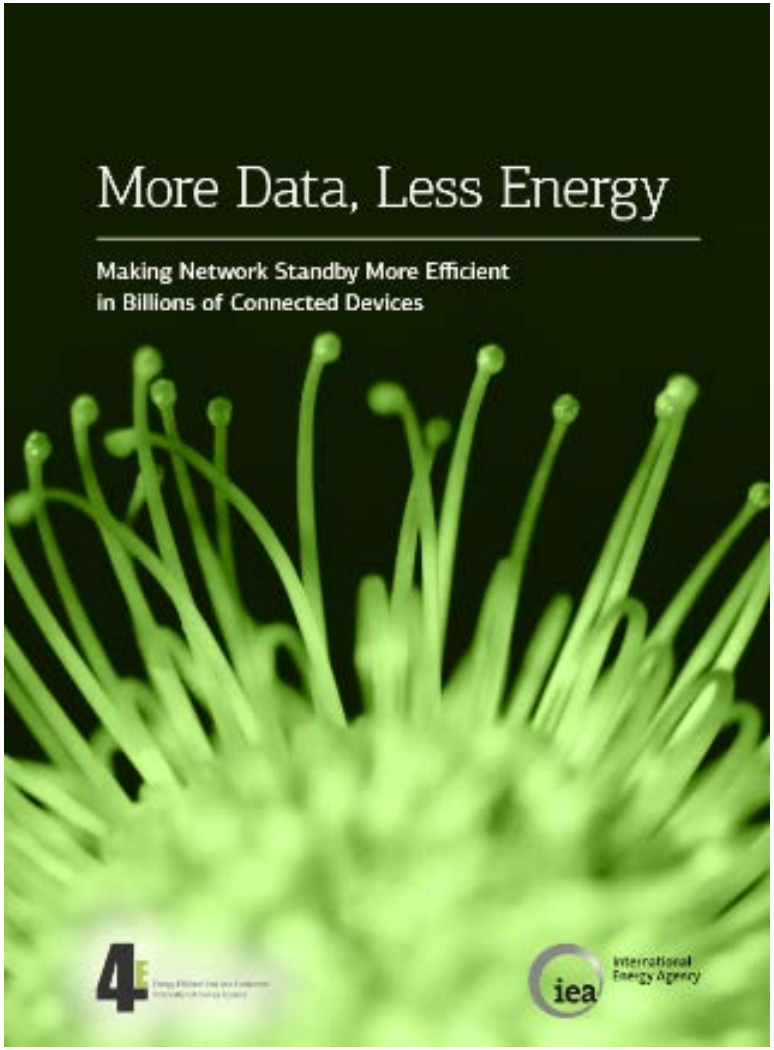
Network Standby

IEA, 2014

Number of devices with network-standby:
50 billion by 2020
100 billion by 2030
500 billion over the following decades
(OECD, 2012)

Includes **smart meters and demand-response** enabled devices.

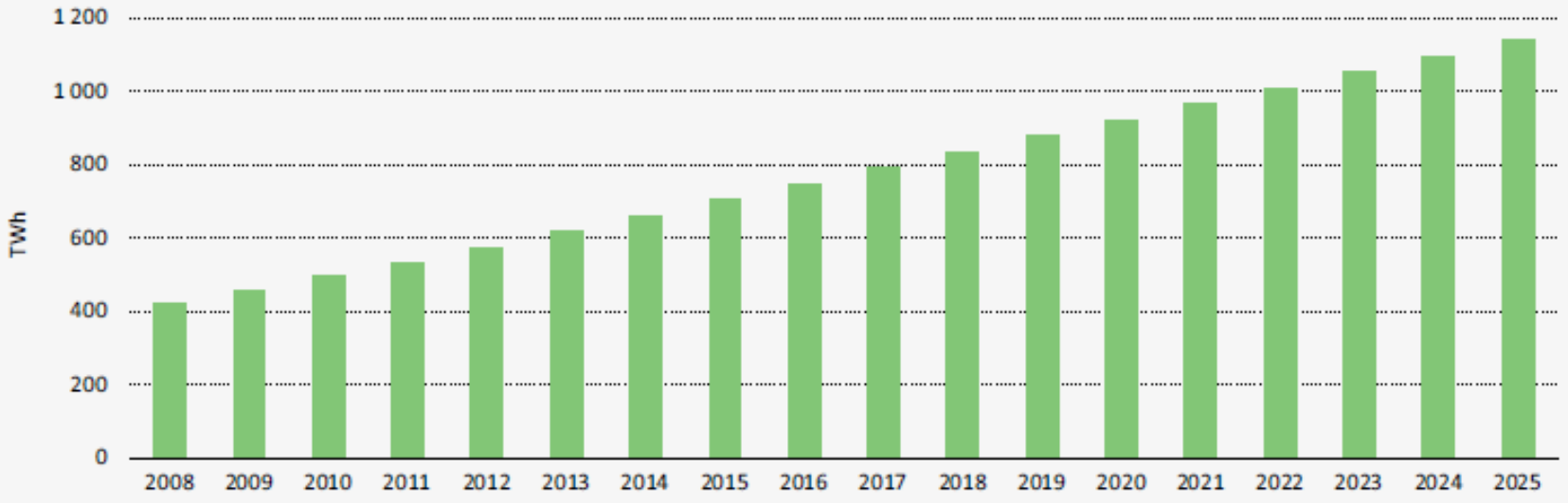
“up to 80% of their electricity consumption is used just to maintain a network connection.”



Direct Energy

By 2025: 6% of total global electricity consumption

Figure 2.3 Current and projected global network-enabled device electricity consumption



Notes: Domestically and professionally used network-enabled devices, connected to external or internal networks. Projections start with 2012.
Source: Bio Intelligence Service, 2013, Inputs provided.

Key point *By 2025, the energy demand of network-enabled devices could reach 1 140 TWh, corresponding to 6% of current total final global electricity consumption.*

Reproduced from IEA, 2014

Infrastructural Energy

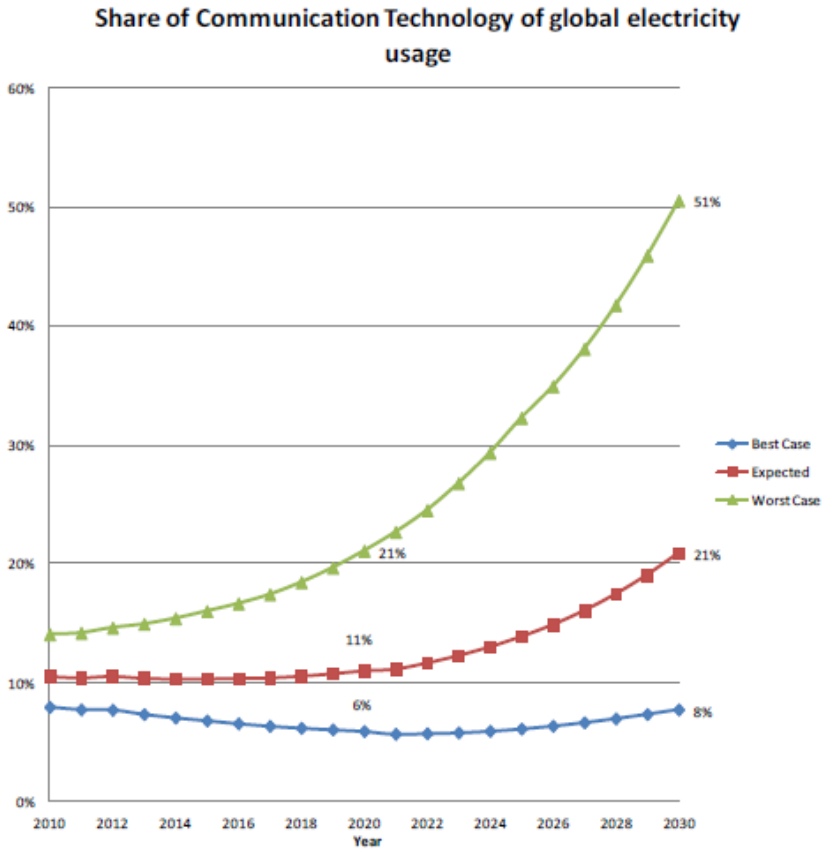
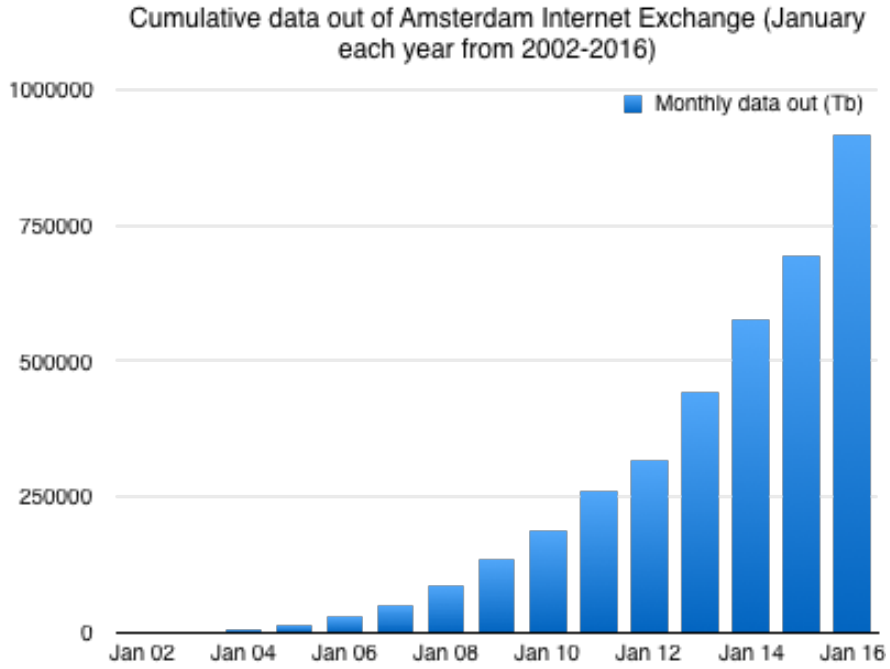


Figure 8. Share of communication technology of global electricity usage 2010–2030

Reproduced from
Andrae and Edler, 2015

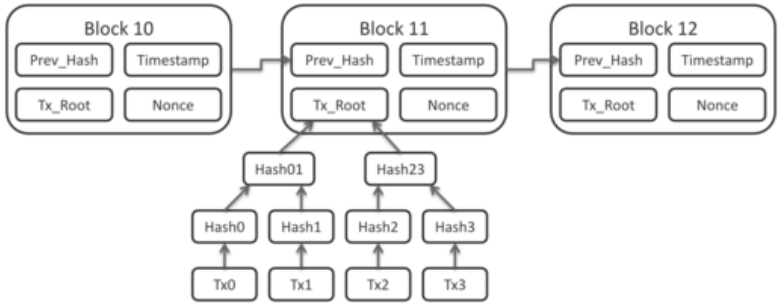
Data Traffic Growth



Monthly data traffic
Amsterdam Internet Exchange: 2002-2016
Hazas et al (2016),
based on Amsterdam Internet Exchange Statistics

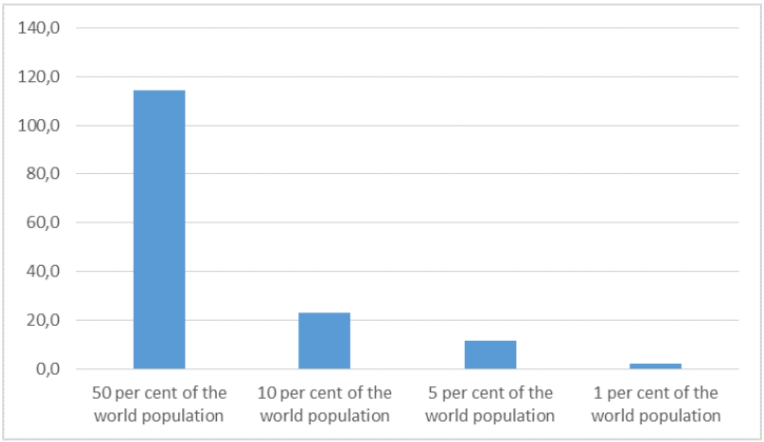
Infrastructural Energy

‘Invisible’ data intensification



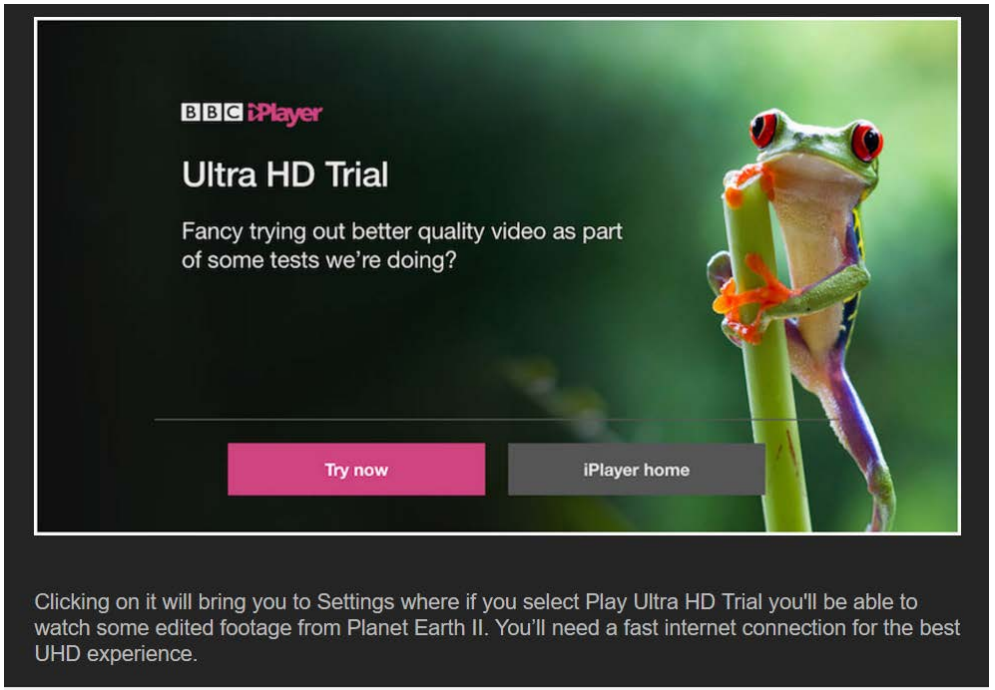
By Matthäus Wander via Wikimedia Commons

Figure 1: Energy consumption of the mining process



Note: Yearly energy consumption of the bitcoin blockchain mining process in 2030 as percentage of worldwide energy supply in 2014 for different population participation rates. Source: blockchain.info, International Energy Agency, Sorge/Krohn-Grimberghe, United Nations, own calculations

Reproduced from
Demary & Demary, 2017

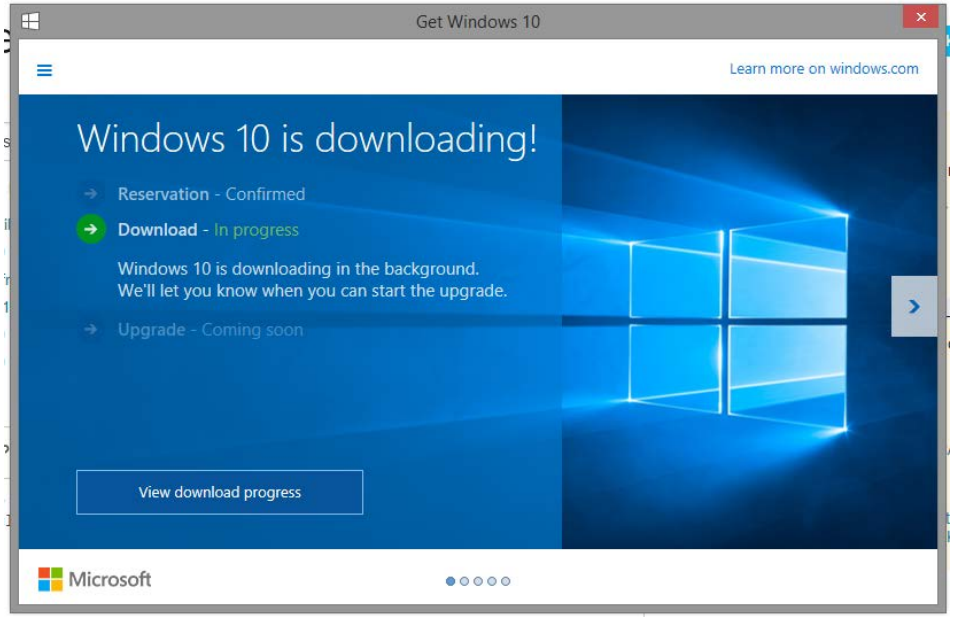


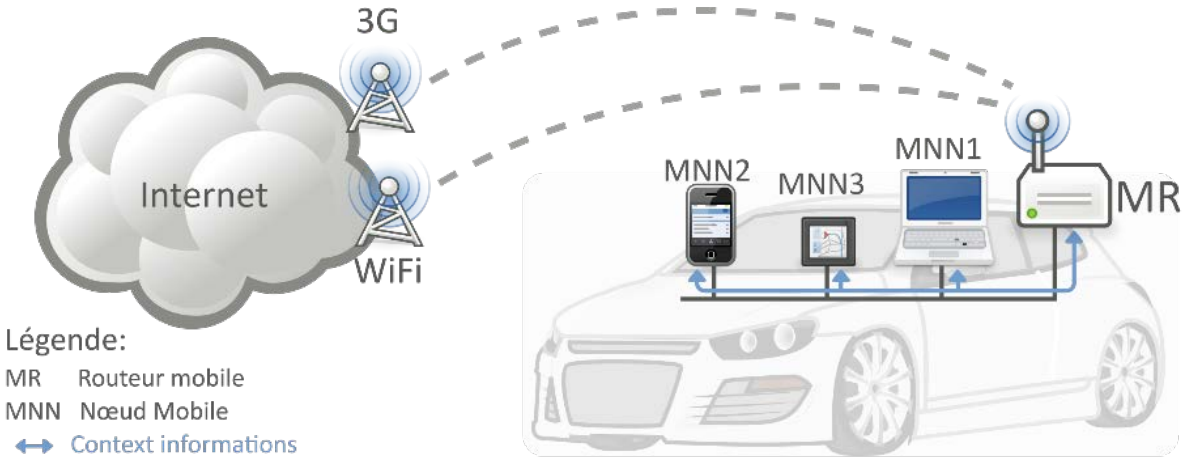
https://www.bbc.co.uk/iplayer/help/planet_earth_4k

Duane Storey via Flickr

Infrastructural Energy

Automating updates

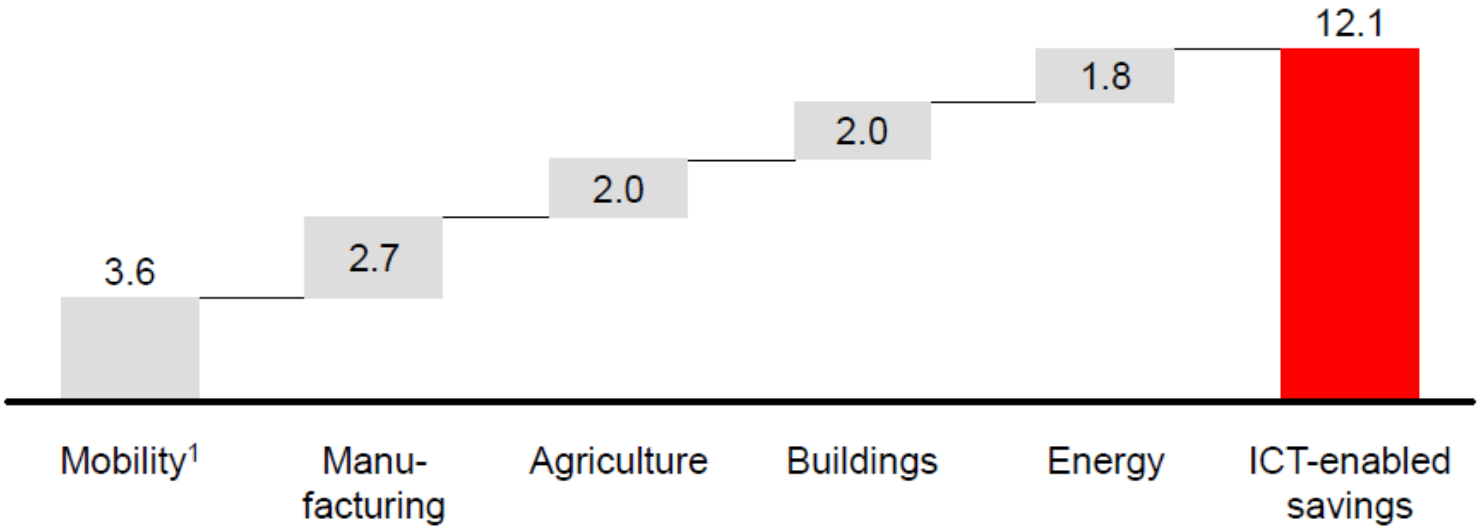




Other Energy Demand

Co-evolving Implications

Figure 1: CO_{2e} abatement potential by sector (2030)



1 Mobility solutions consider ICT-enabled improvements to private and commercial mobility and additionally consider the reduced need to travel from various sectors, including health, learning, commerce, etc.

Source: WRI, IPCC, World Bank, GeSI, Accenture analysis & CO2 models

Reproduced from GeSI, 2015

Saving 10x the footprint of ICT by 2030

Other Energy Demand

ELECTRICITY MAY BE THE DRIVER. One day your car may speed along an electric superhighway, its speed and steering automatically controlled by electronic devices embedded in the road. Highways will be made safe—by electricity! No traffic jams . . . no collisions . . . no driver fatigue.

Power Companies Build for Your New Electric Living

Your air conditioner, television and other appliances are just the beginning of a new electric age.

Your food will cook in seconds instead of hours. Electricity will close your windows at the first drop of rain. Lamps will cut on and off automatically to fit the lighting needs in your rooms. Television "screens" will hang on the walls. An electric heat pump will use outside air to cool your house in summer, heat it in winter.

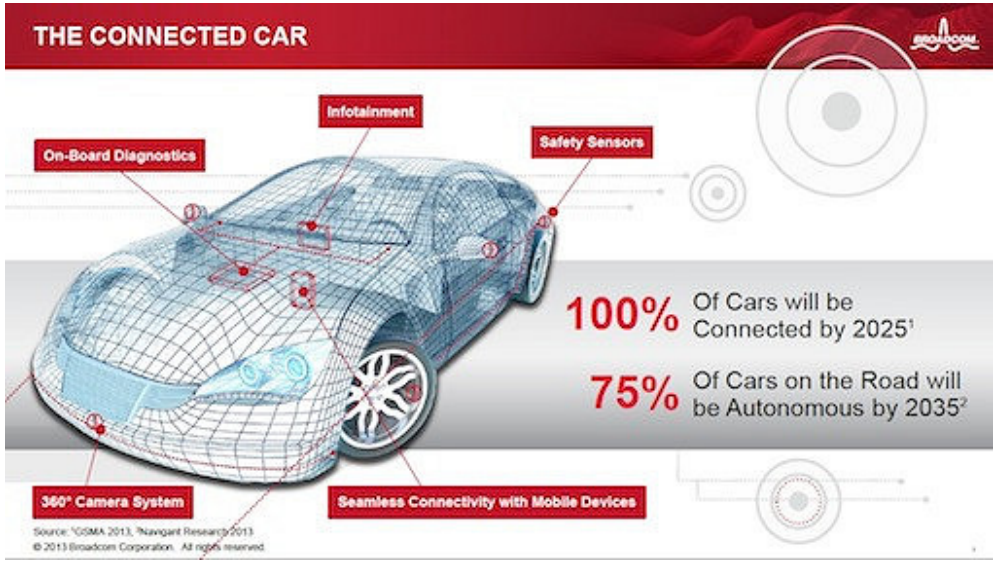
You will need and have much more electricity than you have today. Right now America's more than 400 independent electric light and power companies are planning and building to have twice as much electricity for you by 1967. These companies can have this power ready when you need it because they don't have to wait for an act of Congress—or for a cent of tax money—to build the plants.

The same experience, imagination and enterprise that electrified the nation in a single lifetime are at work shaping your electric future. That's why in the years to come, as in the past, you will benefit *most* when you are served by independent companies like the ones bringing you this message—*America's Independent Electric Light and Power Companies**.

*Company names on request through this magazine

[Paleofuture]

Co-evolving Implications



[Sam Churchill] via Flickr

Self-Driving Vehicles

Other Energy Demand

Co-evolving Implications

Home Automation

Saving energy?
New demands?

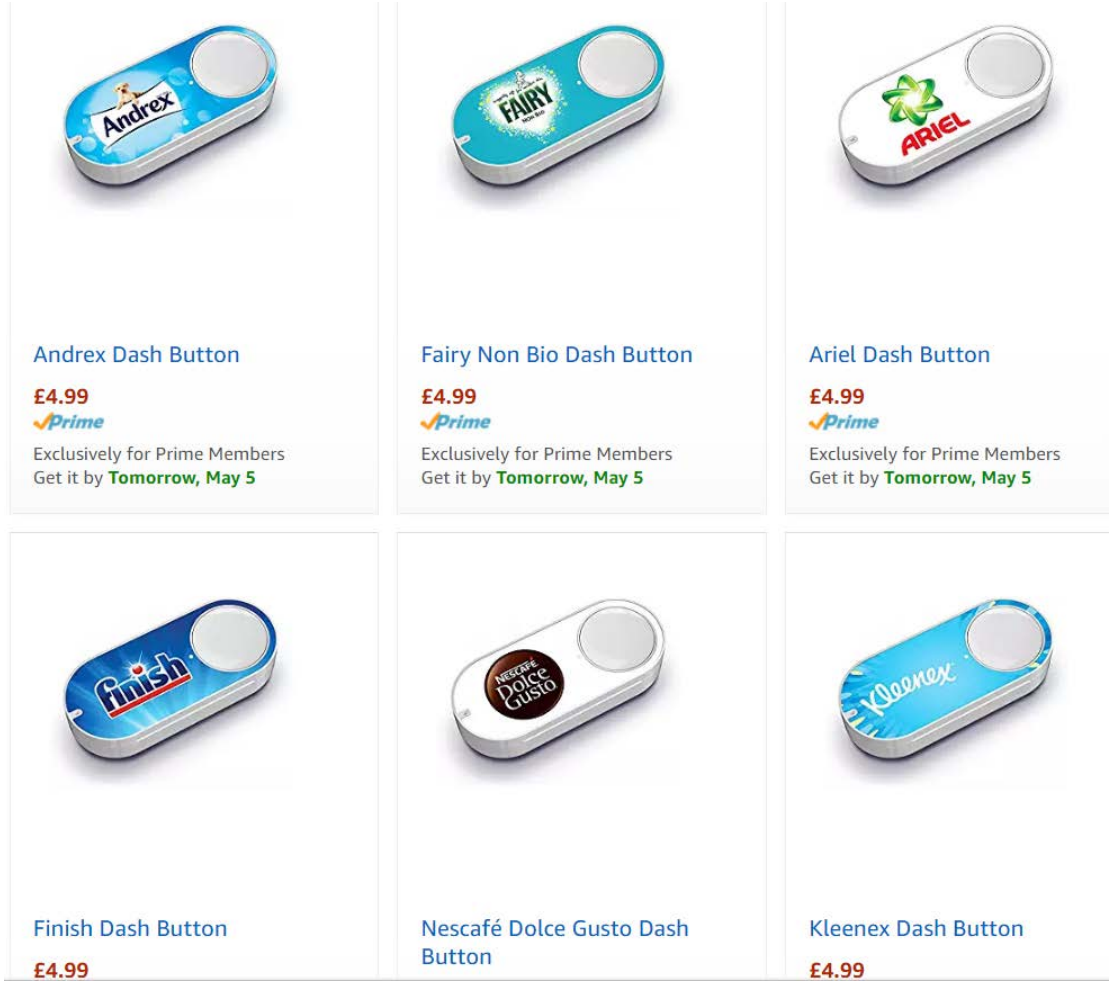
- Software-related obsolescence
- New expectations
- Customisation
- Remote control
- Surveillance

Wikipedia

Strengers et al (2016)

Other Energy Demand

Systemic Changes?



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Prime
Exclusively for Prime Members
Get it by **Tomorrow, May 5**

Fairy Non Bio Dash Button
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Kleenex Dash Button
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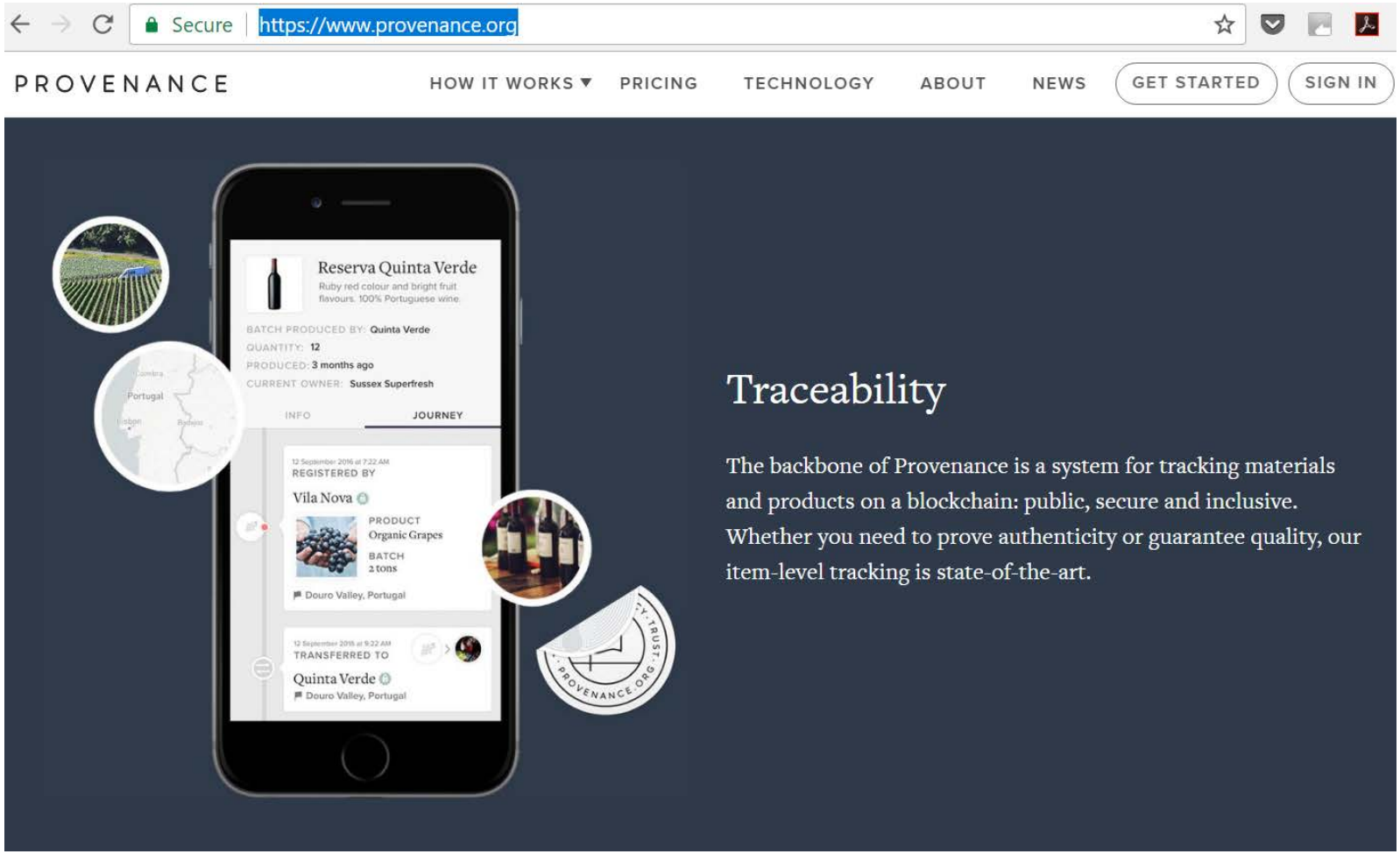
[Amazon]

Other Energy Demand

Systemic Changes?



[Provenance]

Key Points

- Electricity demanded by ICTs growing
- Electricity use not directly ‘embedded’ in activity
  - Growth not related to population & time-use
  - Especially with IoT
- Other energy savings are less clear
  - Systems are evolving

Resources and References

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