Towards a smarter Amsterdam

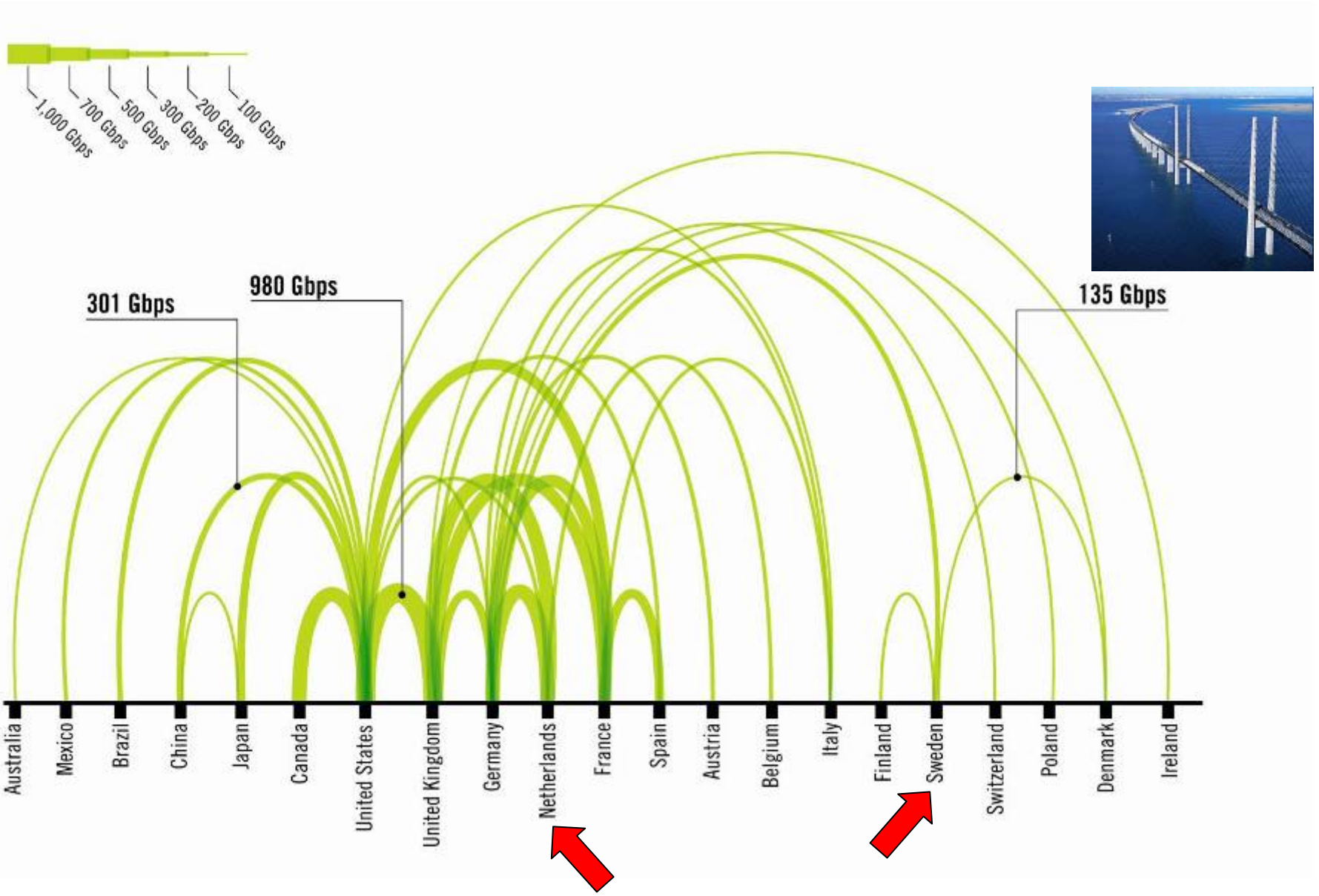
digging for the future

Stockholm, November 2009
Dirk van der Woude
City of Amsterdam

Agenda

- Amsterdam’s third harbour
  - With a home internet use of now 93% of population
- Laying the infrastructure for the Future Internet
  - A point to point network: topology DOES matter
  - which is very not too expensive
  - No fiber, no high capacity wireless
  - Update on Dutch turnabout on Next Generation Networks
- There's more to being smart than only fiber
- Program & some parts of Amsterdam Smart City approach

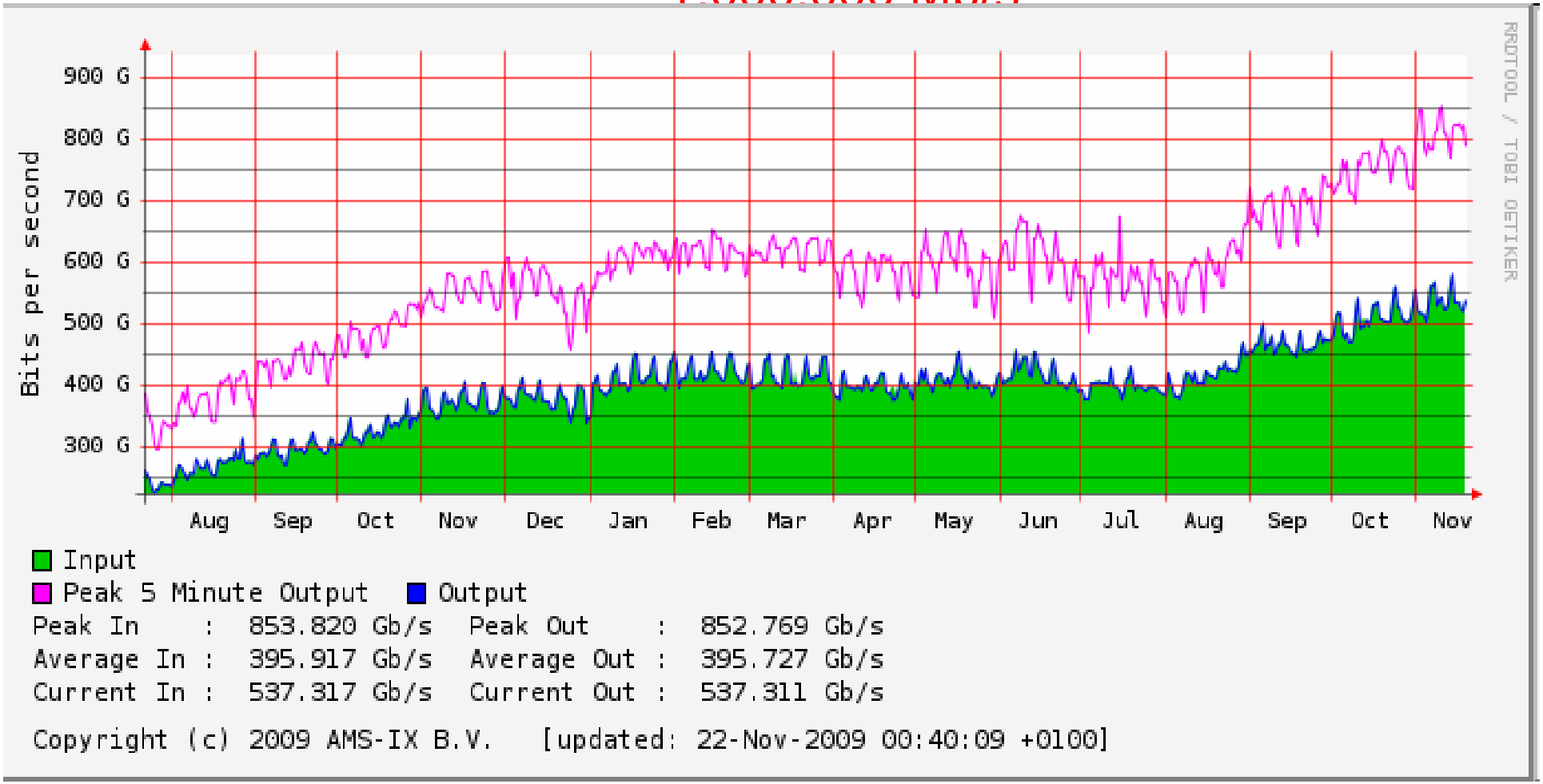
And a lesson from history…



(Source: Teleography, world map of bandwidth between countries)

Amsterdam Internet Exchange, peak traffic

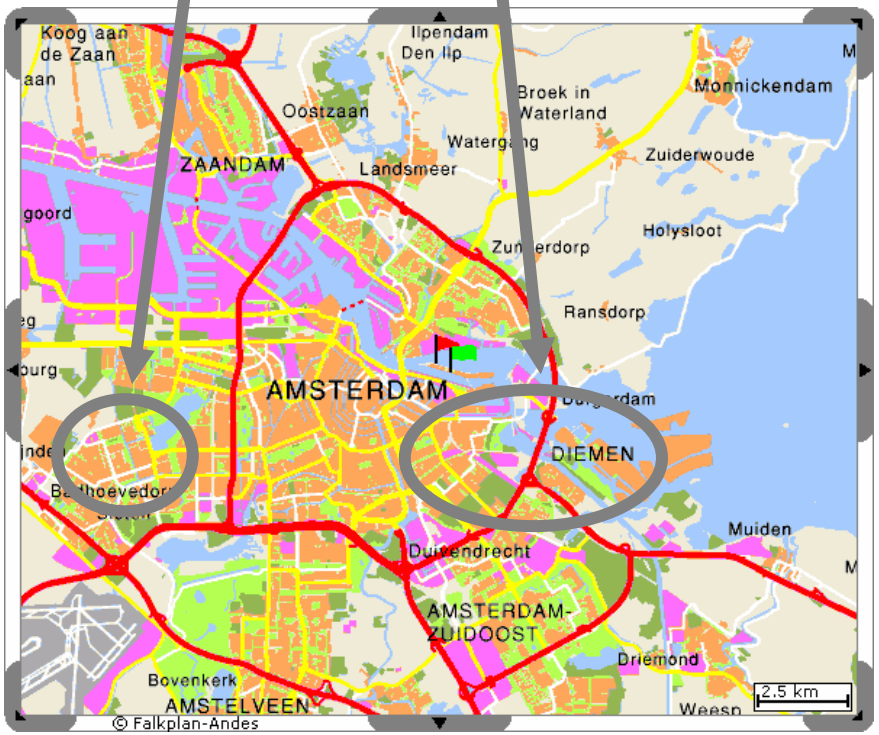
1997: < 100 Mb/s, in 2009 towards 1.000.000 Mb/s



European cities : high density, multi-dwelling units, underground cables

FttH programs Amsterdam

FttH: Parts of boroughs of
Osdorp and Zeeburg & Oost



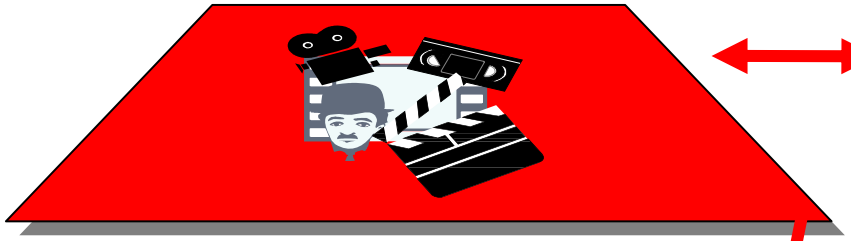
Three separate programs:

- *Fiber to the **Home***: > 40,000 addresses
  - 2007/2008: to 10% of homes, representative sample
  - 2009 PPP with Reggefiber & KPN on open FttH
  - aim: whole city per 2012-'15
- *Fiber to the **School***: 1 symm Gb/s
  - July 2009: to 500 schools and non-profits
  - upgrading of existing **a**symm DSLof 6/1 Mb/s ***per building…***
  - self organisation, organizing supported by city
- *Fiber to the **Theater***: 1 symm Gb/s
  - to >15 major theaters
  - once-only grant City (< 15%)
  - sector innovation very slow
  - FabChannel leading, had to close shop as records industry refuses to innovate

Fiber to the Home

Amsterdam 2009: *43,000 addresses now increasing to 400,000*

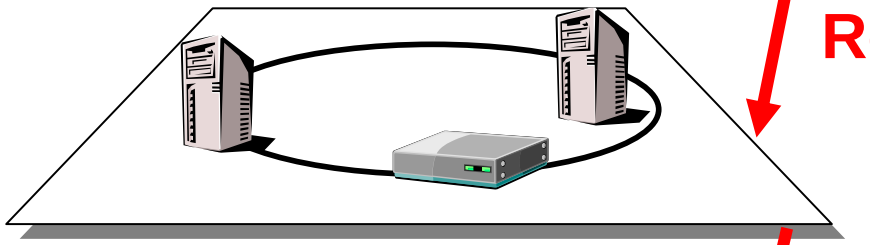
Service providers
100% open market



consumer/ SME

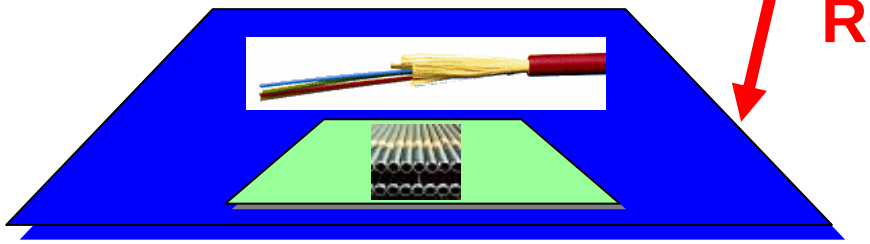
Rent

Wholesale operators
open access
100% open market



Rent

Passive infrastructure:
GNA CV
15% municipal shares
5% municipal euro's

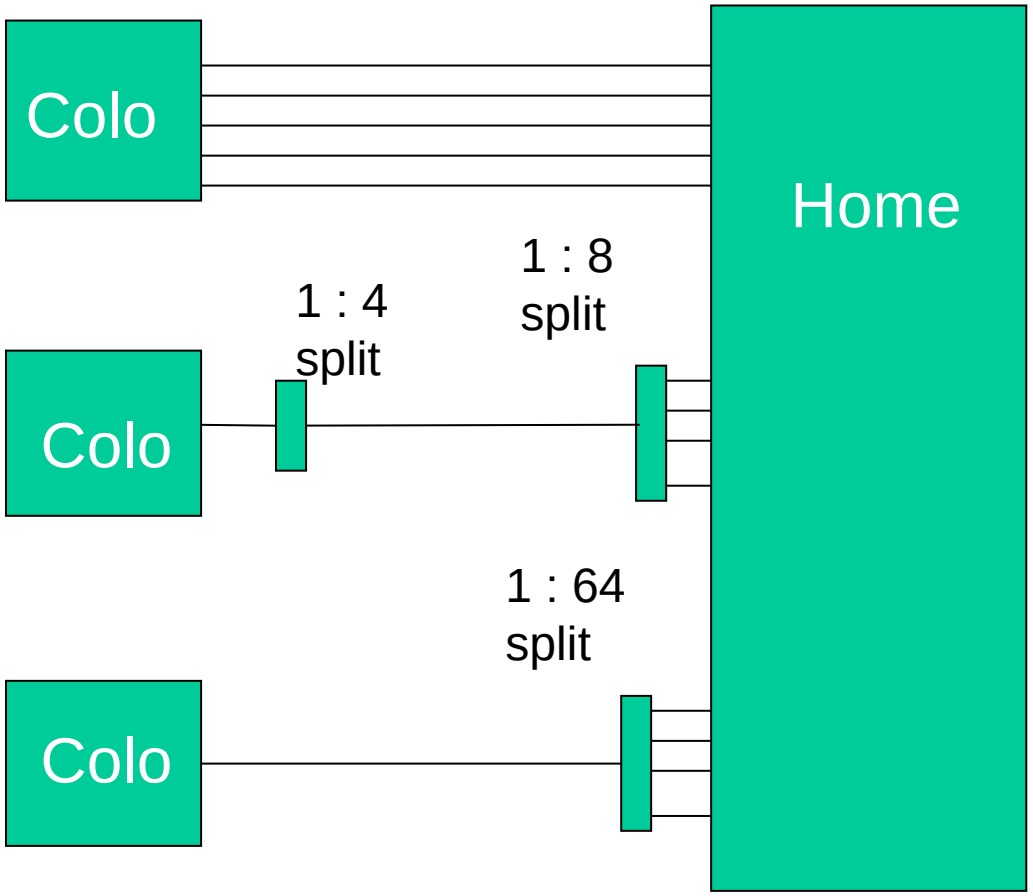


Topology, technology, unbundling

Point to point
Any technology (Ethernet, Gpon, 10 Gpon, Lambda) in any mix
Full unbundling loop for competitors

Staged PON
Gpon, 10 Gpon upgrade
Unbundling per 8, or patch closet in street

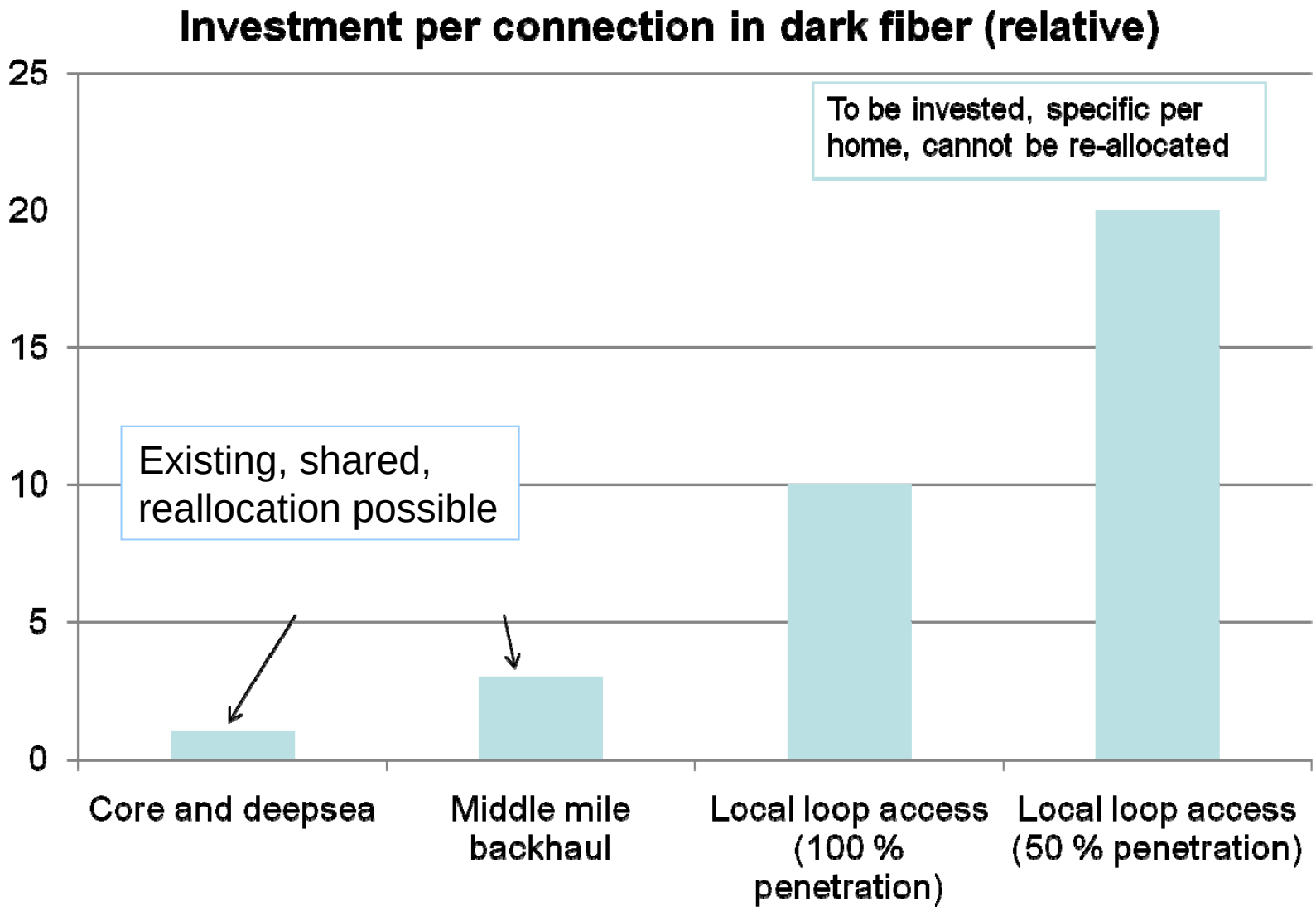
Deep PON
Gpon,
Only Bitstream wholesale, or patch closet in street



Digging in an old city...

- > 95% high rise MDU
  - Vertically stacked homes can be troublesome
- > 90% city below sea level
  - No problem for cables, POP's however…
- Rolling out FttH is a once only operation...


Anybody home?
'Hoop, Liefde en Fortuin', De Rietlanden


Investment per connection in dark fiber (relative)
25
20
15
10
5
0
To be invested, specific per home, cannot be re-allocated
Existing, shared, reallocation possible
Core and deepsea
Middle mile backhaul
Local loop access (100 % penetration)
Local loop access (50 % penetration)

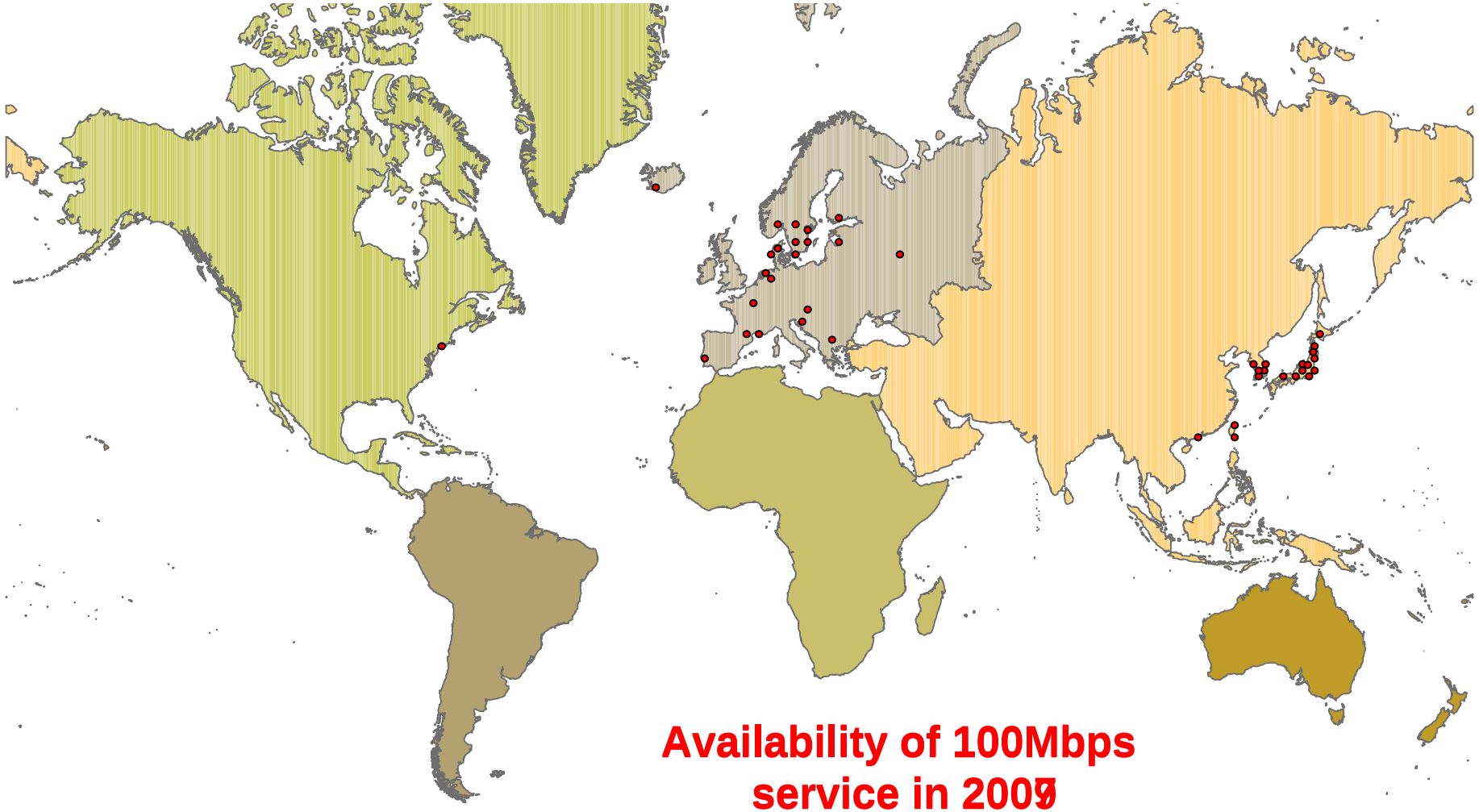
However, Capex in perspective…

…depreciation time is 25 to 30 years

Developments since December 2008

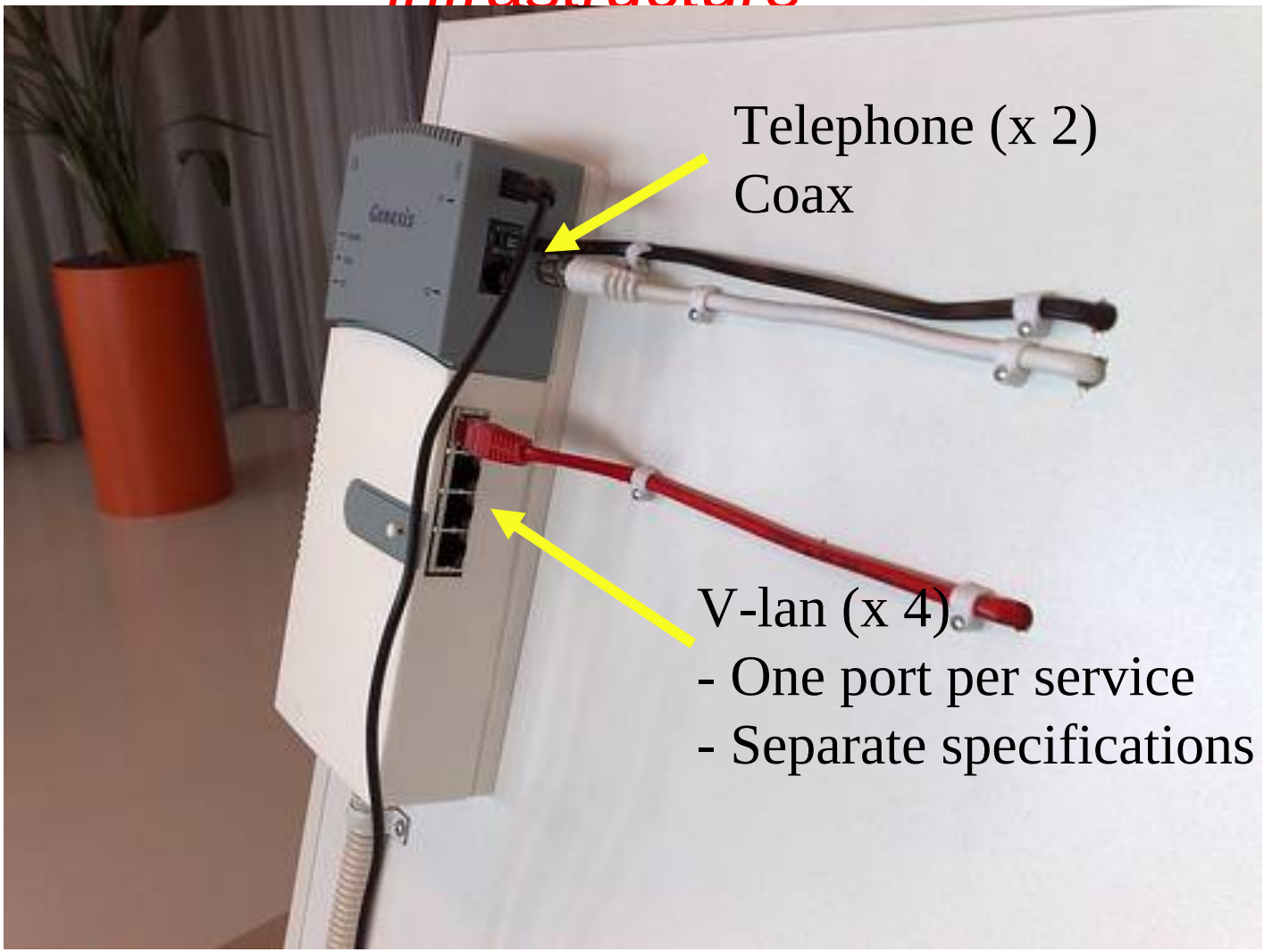
- After a legal battle of 8 years

- December ‘08:
  - Regulators OPTA & NMa publish their Rules on open FttH, ODF-tariff regulated, profit controlled
- Amsterdam’s vision of open networks now institutionalized
  - However regulation is not equal digging...
- Spring ‘09: City signs agreement with KPN & Reggefiber on a phased city wide roll out
  - Fall 2009: all legal intricacies dealt with, roll out continues
- Nov. ’09:
  - Nov. 3: Parliament adopts Motion demanding a National NGaN roll out plan by Spring ’10. Goverment gladly accepts task
  - Nov. 18: Parliament withdraws Law of 2005, introduced (by cable lobby) to scare off cities from following Amsterdam’s PPP example

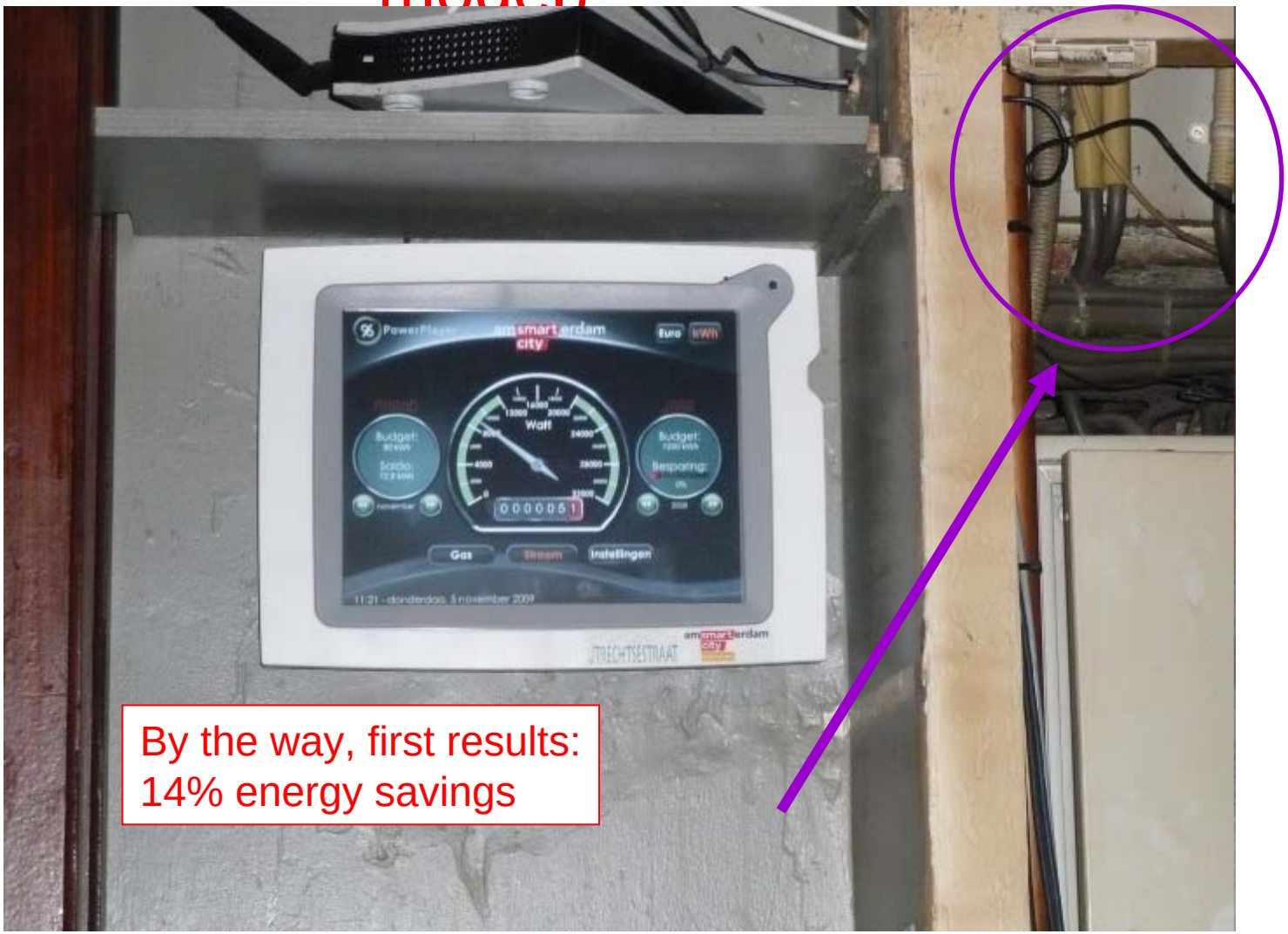


Availability of 100Mbps service in 2009

Technology and infrastructure



Feed back screen (pilot model)



By the way, first results:
14% energy savings

Air power – the 21st century tussle

- Most wireless will be very localized, very dense (homes, buildings, campuses)
- Wireless supported by fiber – fiber transport is utility underlying wireless, not single termination.
- Strategy for fiber is to capture wireless support market.

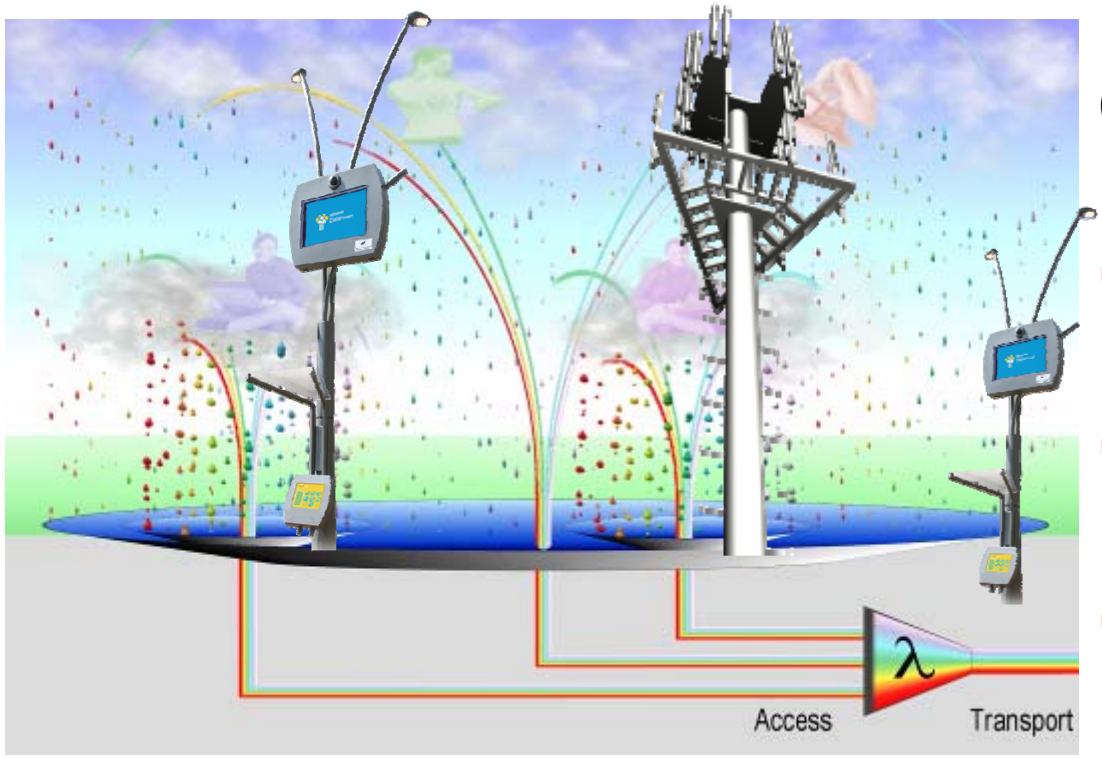
Source: FCC Workshop on Fiber, 19-11-2009

Fiber – key to wireless broadband at scale

- Highest capacity wireless architecture is a distributed, low power, short range system
- Fiber (or equivalent) backbone to provide longer interconnect links among nodes
- Fiber-to-Radio eventually becomes direct microwave-optical up/down conversion (in early trials today)

Source: FCC Workshop on Fiber, 19-11-2009

A citywide base for sustainable growth



(New) Emerging environmental benefits:

- substitute physical by virtual travel
- green personal IT: PC As a Service, ***Saas 2.0***
- teleworking, reduction of commuting

There is more to being Smart than only fiber

Amsterdam Climate *challenge*

Climate goals with challenging deadlines:

- 40% CO2 reduction in 2025 from 1990 baseline
- 20% energy reduction in 2025 from 1990 baseline
- Municipal organization CO2 neutral before 2015

Smart Grid *opportunity*

The required upgrade of current grids presents the perfect opportunity to implement Smart Grids:

- Smart Grids / Smart Meters are a key enabler to address climate issues, since they use two way communication to maximize energy efficiency

Some figures on Amsterdam

- 400,000 households @ 3,600 Kw/year
- 225,000 cars @ 16,000 Km/year (which translates to 2,500 Kw/year

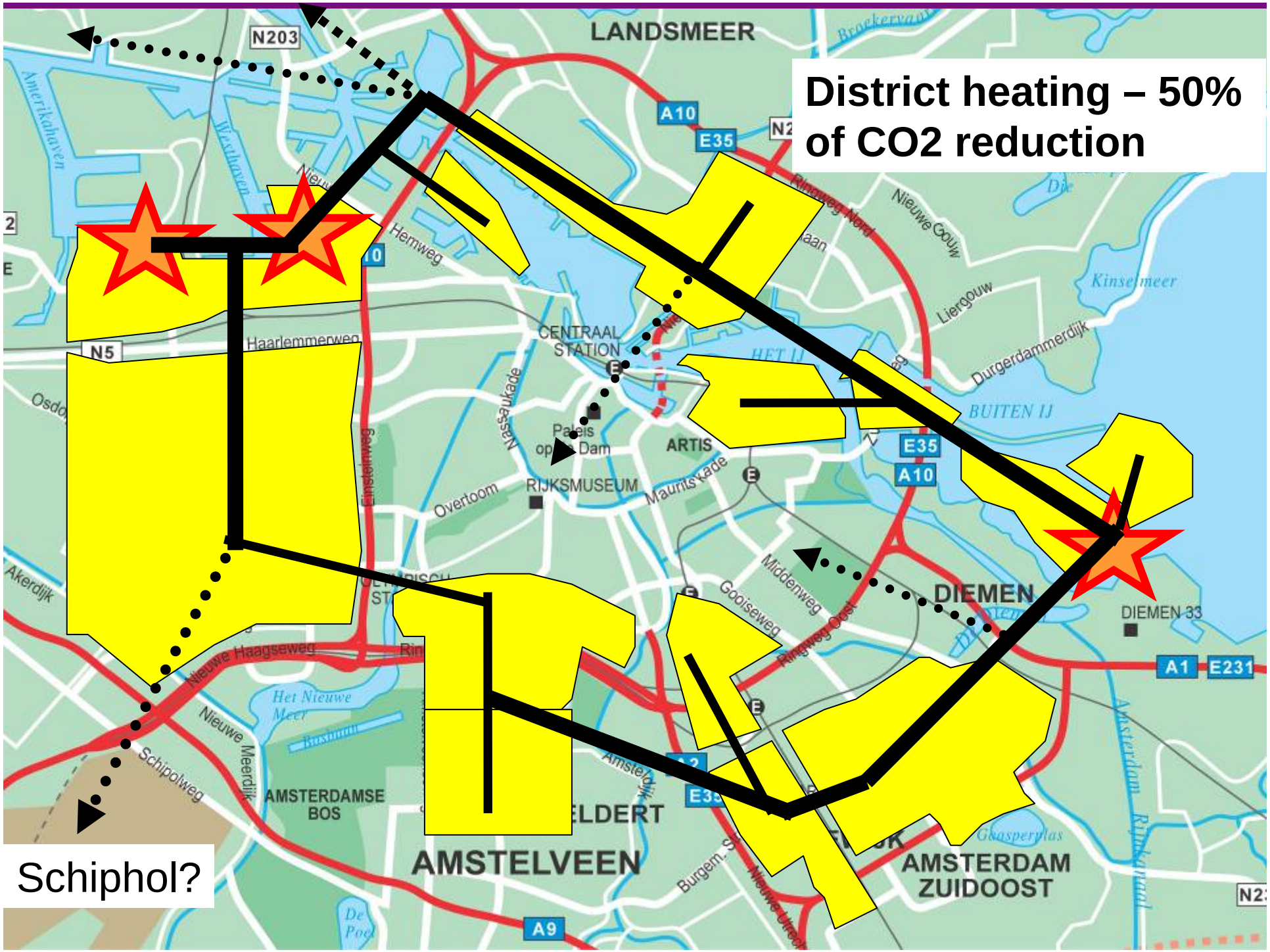
* Source: Accenture End-Consumer Observatory on Climate Change

A smart program for Amsterdam

- A loosely connected set of programs and projects
  - Often more bottom up than top down
  - So enhancing a climate for open innovation
- Wherever possible: PPP
  - creating ‘coalitions of the willing’ from market, public and science
- Realizing that one can not
  - Be the Great Coordinator forcing all and everything to successfully cooperate, “or else..!”
  - Combine all physical projects (we in Amsterdam tried to – you do not want to pay for that lesson…)

A smart program for Amsterdam

- Energy
  - Smart metering, local production, street lighting
  - Pilot 1, 2008, 20 homes, result -/-14%
  - Pilot 2, 2009/10: 100 – 200 homes
  - Pilot 3, 2010/11: 10,000 homes, **with combined FttH modem/smart meter**
- Waste
  - Reduce waste, reduce waste transport, generate energy with waste incineration & re-use heat
- Water
  - District heating program, vast CO2 reduction
  - Cold water cooling
- Telehealth/Telecare (ICT)
  - Smart Living combination Pilot of 250 – 400 homes (2010)
  - Next generation network
  - Wired-wireless synergy
  - Greening of data centers
  - FttH to all of city
- Transport
  - Concentric parking fee policy (result 2008: 35% decrease of trafic in city center)
  - Teleworking & smart work centres
  - personal travel assistant as a means to attractify public transport
  - Electrify the car park, ASAP
- CO2 emissions
  - Identify & decrease top 5


District heating – 50% of CO2 reduction
Schiphol?
LANDSMEER
N203
A10
E35
CENTRAAL STATION
Haarlemmerweg
N5
Hemweg
Nassaukade
Overtoom
RIJKSMUSEUM
Paleis op de Dam
ARTIS
Mauritskade
Middenweg
Gooiseweg
Ringweg Oost
DIEMEN
DIEMEN 33
A1
E231
Durgerdammerdijk
BUITEN IJ
Kinselmeer
Nieuwe Haagseweg
Het Nieuwe Meer
Nieuwe Meerdijk
Schipholweg
AMSTERDAMSE BOS
AMSTELVEEN
A9
AMSTERDAM ZUIDOOST
Akerdijk

Key challenge: bring parties together, get them to start projects to address climate goals & the upgrade to smart grids (2)

Progress

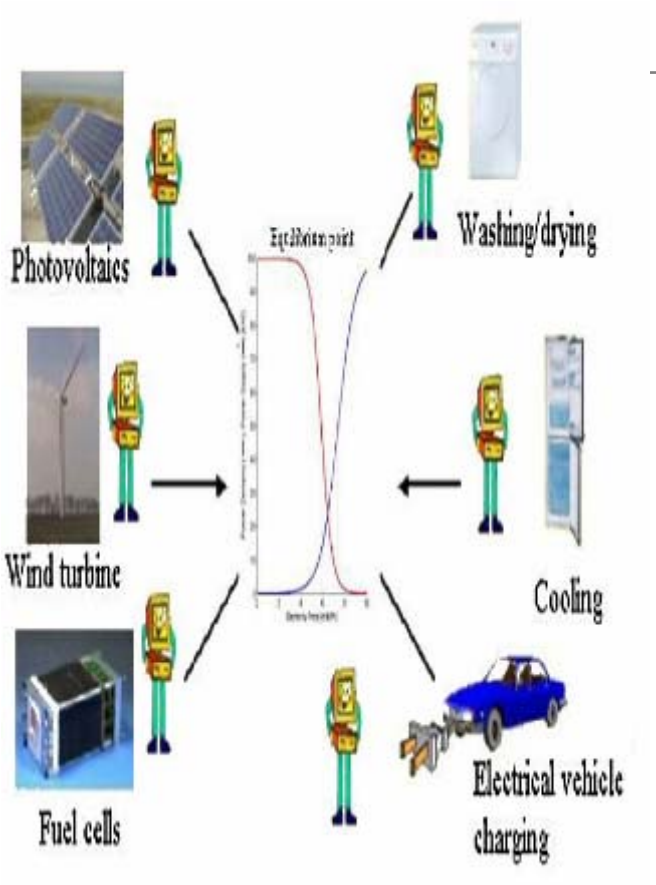
- Even were many are willing to change, too little action has been taken due to:
  - limited capabilities and different interests of separate stakeholders
  - Required parties not teaming up, therefore too few projects being initiated. There is a gap between intentions and actions *

Key Challenge

- Amsterdam & partners aim at successful initiatives with substantial impact to implement Smart Grids, key challenges:
  - Bring the parties together that are required to deliver a substantial impact
  - Initiate action between these parties to deliver this required substantial impact

* Source: Accenture End-Consumer Observatory on Climate Change

Smart Grid Technology: supply & demand matching



- Combining multi-agent systems with microeconomic principles, creating a coordination system for supply and demand of electricity in networks with a high share of distributed generation.
- SDM is concerned with optimally using the possibilities of electricity producing and consuming devices to alter their operation in order to increase the over-all match between electricity production and consumption.
- In this model each device is represented by a control agent, which tries to operate the process associated with the device in an economical optimal way. The electricity consumed or produced by the device is mediated by the device agents on electronic exchange markets.

smartcity

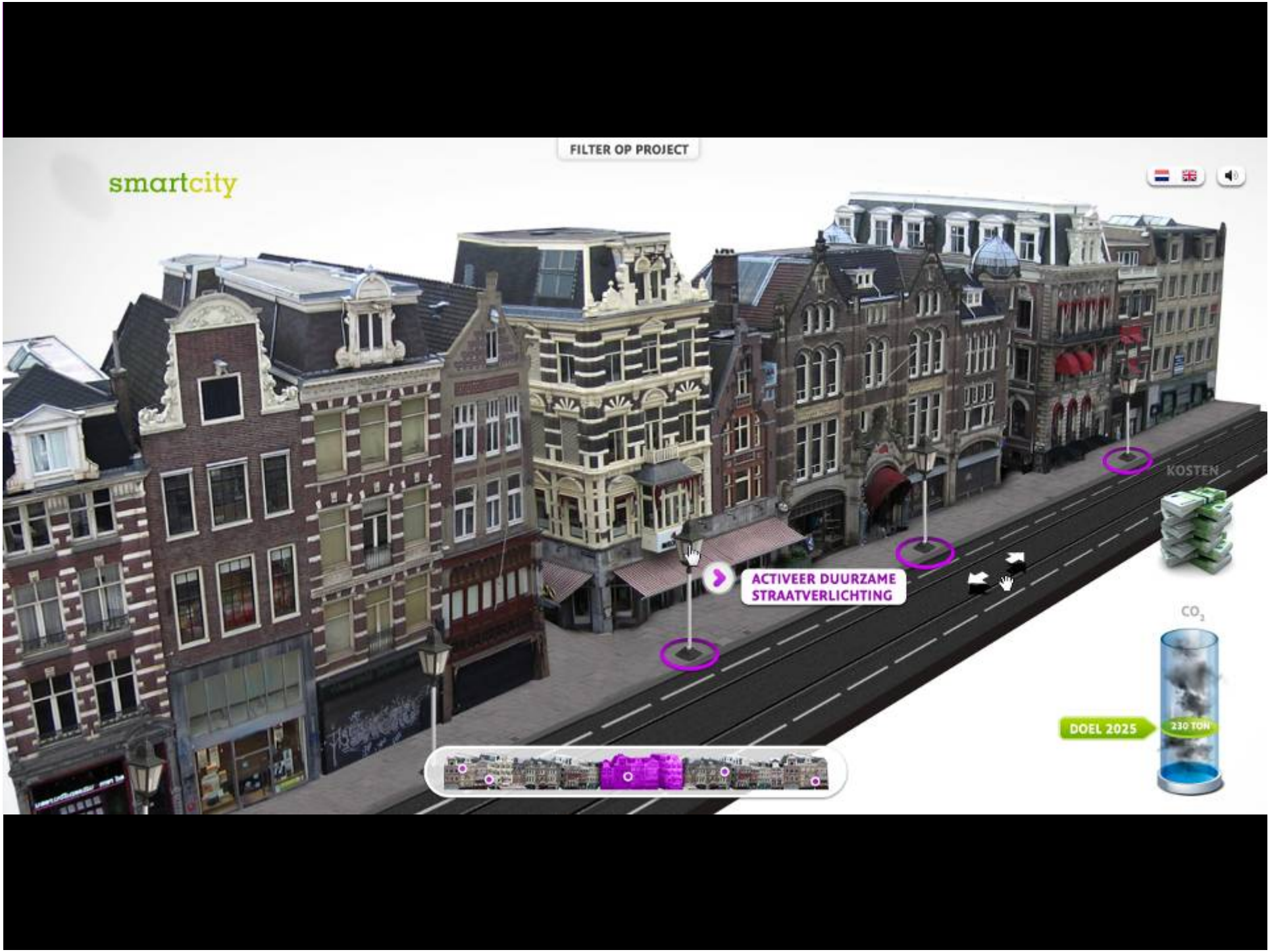
GEMEENTE TRANSPORT BEWONERS ONDERNEMERS

klimaat straat

De klimaatstraat is een initiatief van zeven grote ondernemingen om de eerste klimaatneutrale straat van Europa te realiseren.

KOSTEN

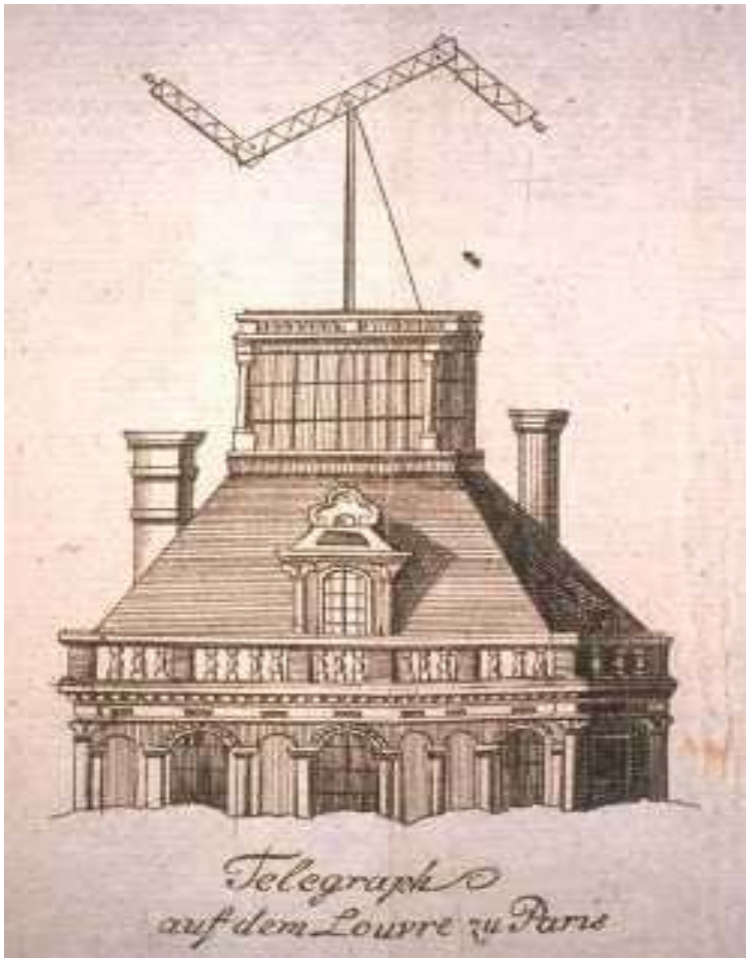
CO_2


FILTER OP PROJECT
smartcity
KOSTEN
ACTIVEER DUURZAME
STRAATVERLICHTING
CO_2
DOEL 2025
230 TON

Nothing new *(2)*

La Fibre?

No, 18th century WiFi…



1792

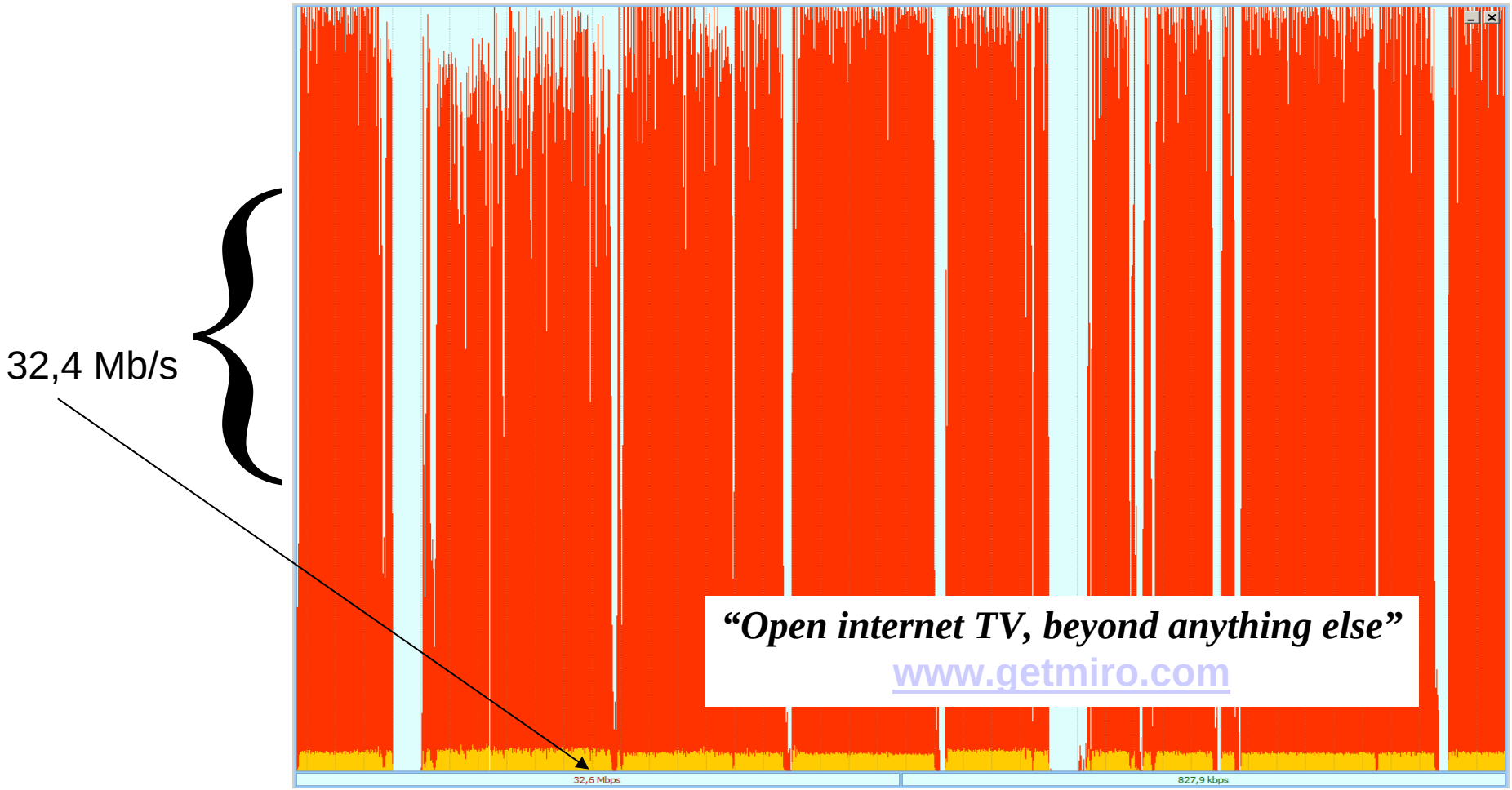
Lille => Paris:

- 15 stations
- 36 characters in 32 minutes
- all records broken, huge success

- ***And up to 1846 cause for the French to resist investing into a copper telegraphe network***

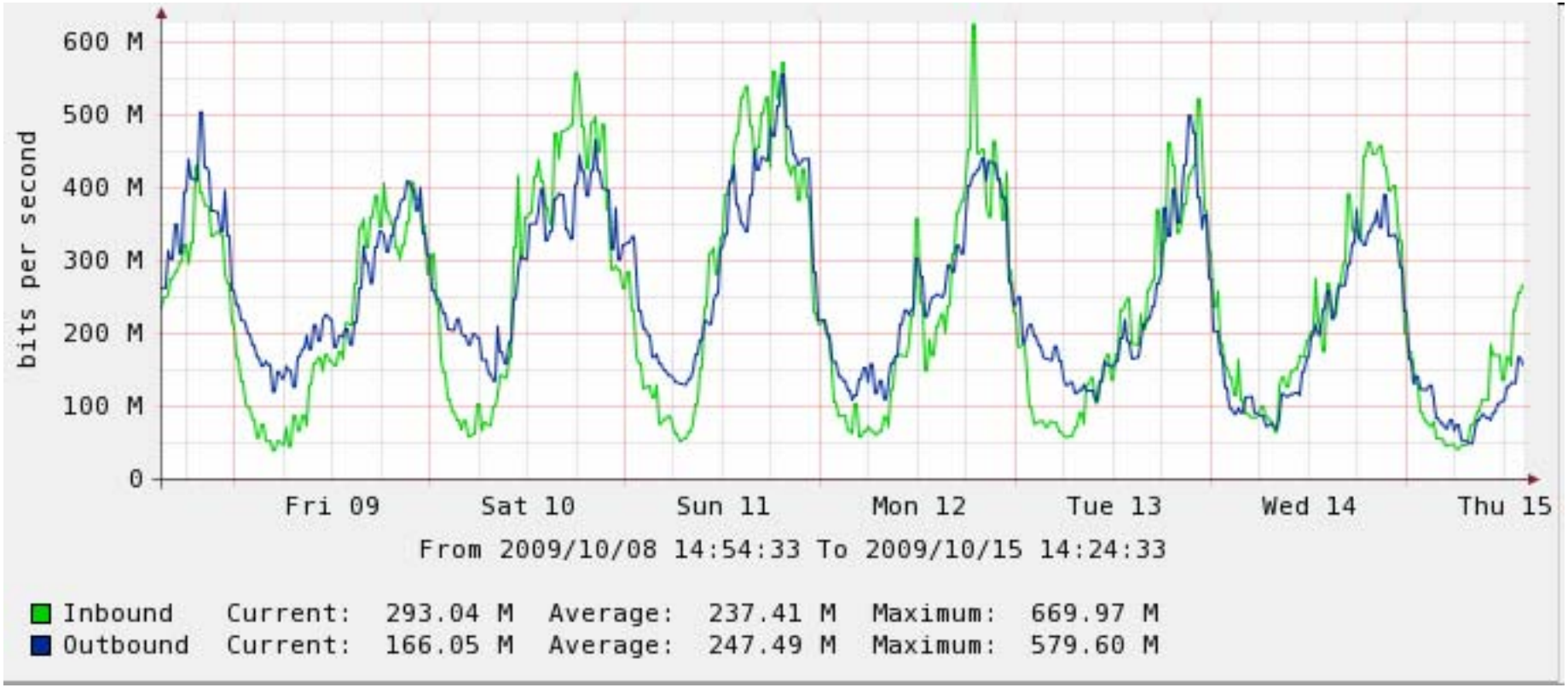
- ***L' histoire se répète…***

(Exhibit 1) Found to be untrue:
“There are no apps that need this”



(Exhibit 2) And there's FttH loving hardware as well…

- HD Video (720P)
- Data: 60 Megab**Y**te per minute, 32.000 MB total recording capacity
- Some more upload capacity would be rather convenient…
- £ 77 at Amazon.co.uk (1080P model: £ 117)



Data use mid Oct 2009) in symmetric FttH town in The Netherlands

- 7,000 subs, demography: urban rural, no students, no creative class, average knowledge of other languaged

Appendix 2 – Zoom in on ASC pilot project ‘Climate-street’

Concept

The Climate-street pilot is a holistic concept for urban shopping streets, targeting all aspects: hardware in the public space, logistics in the street and the interiors of shop/bar/restaurant owners and people living in the street

Applied initiatives

Public space

- New sustainable street/facade lighting, threefold saving: integrating street- and facade lighting eliminates over-lighting, energy efficient bulbs, the entire system can be dimmed
- Tram stops and billboards replaced by more sustainable versions based on Life Cycle Analysis, solar power for lighting & displays
- Garbage bins with built in solar-powered garbage press reduce the empty frequency by 5 times!
- **Logistics/Waste**
- Goods delivered at a central location outside city centre, forwarded (bundled) with electric vehicles to the street.
- As these vehicles are empty as they leave the street they collect the waste in new clean waste ‘boxes’ in the same run, thereby minimizing traffic intensity and pollution

Interior

- Smart electricity and gas meters w energy feedback displays
- Energy saving interior lighting + advice

- **"Smart City”** = a city that makes a conscious effort to innovatively employ information and communication technologies (ICT) to support a more inclusive, diverse and sustainable urban environment.

- **The maturing of Future Internet technologies and services:** The internet with its services and social networks has become a critical part of our daily life, and internet-based services are now at the centre of our society and economy. At the same time, new and possibly disruptive internet technologies are emerging – location-based technologies, internet of things, new trust and security platforms, multimodal user interfaces, 3D content, simulation technologies, to name just a few. This so-called Future Internet is expected to be the basis for a new wave of internet-based services.

- **Cities as platforms for new internet-based services:** This next generation of internet-based services has the potential to transform our lives, society and business in the ‘smart’ city and in general. Cities, as microcosms at the heart of social and economic life, offer important platforms for the development, testing and benchmarking of these new internet-enabled services. In order to speed take-up and ensure everybody is able to benefit from this transformation, it is essential that these new internet-based services are based on common open platforms.

Climate change needs to be halted and current electricity networks need to be upgraded – these changes can best be initiated in cities (1)

Problem definition – Context

The climate is changing …

- EU inhabitants use twice as much energy than the global average
- Only 7% of 2006 EU energy consumption was renewable
- Fossil fuel reserves are limited
- Climate is changing fast due to increasing greenhouse gas emissions (mainly CO2)

… and new electricity grids are required

- Energy trends include: decentralized energy generation, energy storage, electric vehicles and (more fluctuating) renewable reverse energy flows
- These developments require flexible ‘smart grids’
- Current EU electricity grids are not ready for these changed energy dynamics and need to be upgraded

* Source: EU Covenant of Mayors

Climate change needs to be halted and current electricity networks need to be upgraded – these changes can best be initiated in cities (2)

Start in cities

- Over half of greenhouse gas emissions are created in and by cities: 80% of the population lives and works in cities, where up to 80% of energy is consumed *
- Mayors can address the development of alternative energy or pollution control, energy management or changes in behavior by public authorities and citizens in a coherent way *
- At the city level, the required coalition of private parties with ideas & technologies and public parties with trust of inhabitants can be brought together to build effective, scalable concepts
- Therefore, cities are the most suitable platform to start the movement towards a more sustainable future, enabled by a new generation of grids

* Source: EU Covenant of Mayors