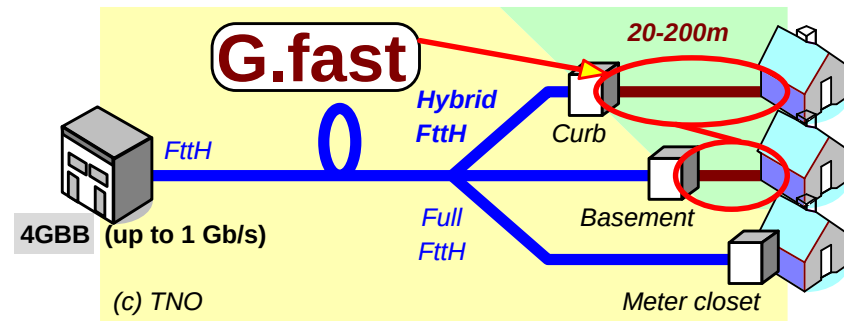


Geographic deployment and cost studies for G.fast

Hybrid vs Full FTTH: *Amsterdam case study*



Rob F.M. van den Brink – TNO





How to deploy
up to 1 Gb/s
“everywhere”?
(4GBB)

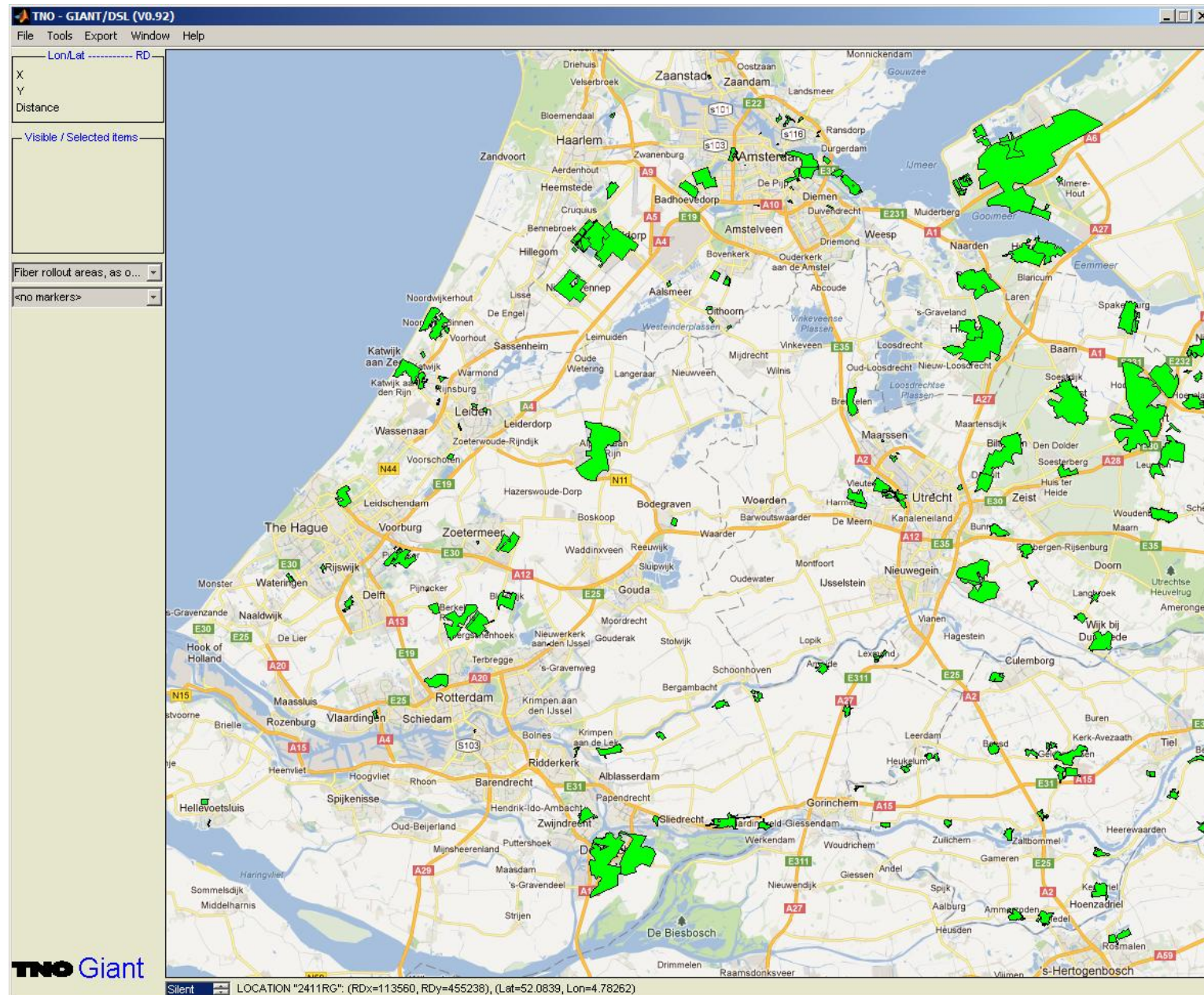
à Use Fiber



Fiber
deployments in
the Netherlands
(announced or
deployed)

Fiber
deployment is
quite scattered

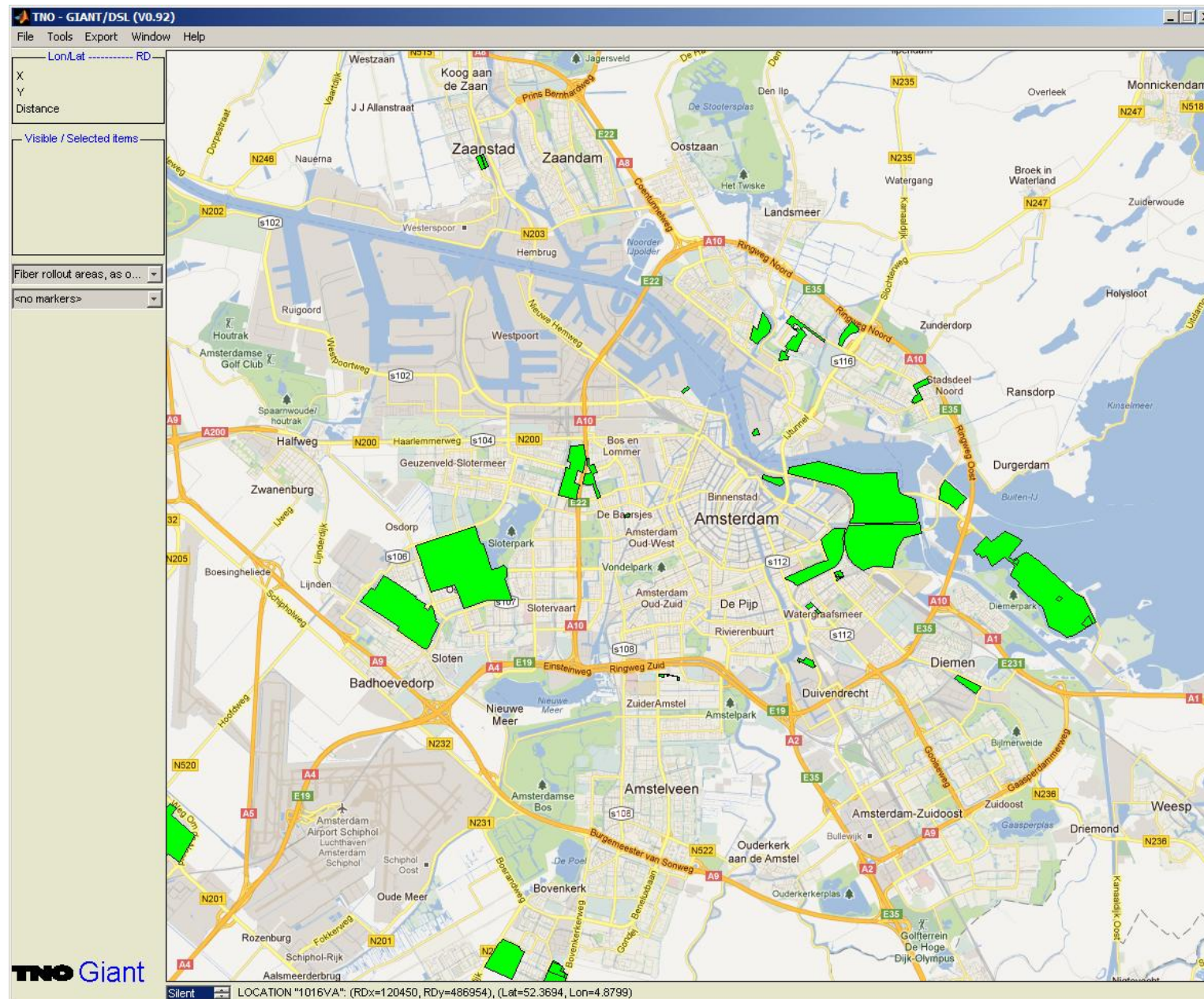
Concentrated
around the low
hanging fruit



Fiber
deployments in
the “Randstad”

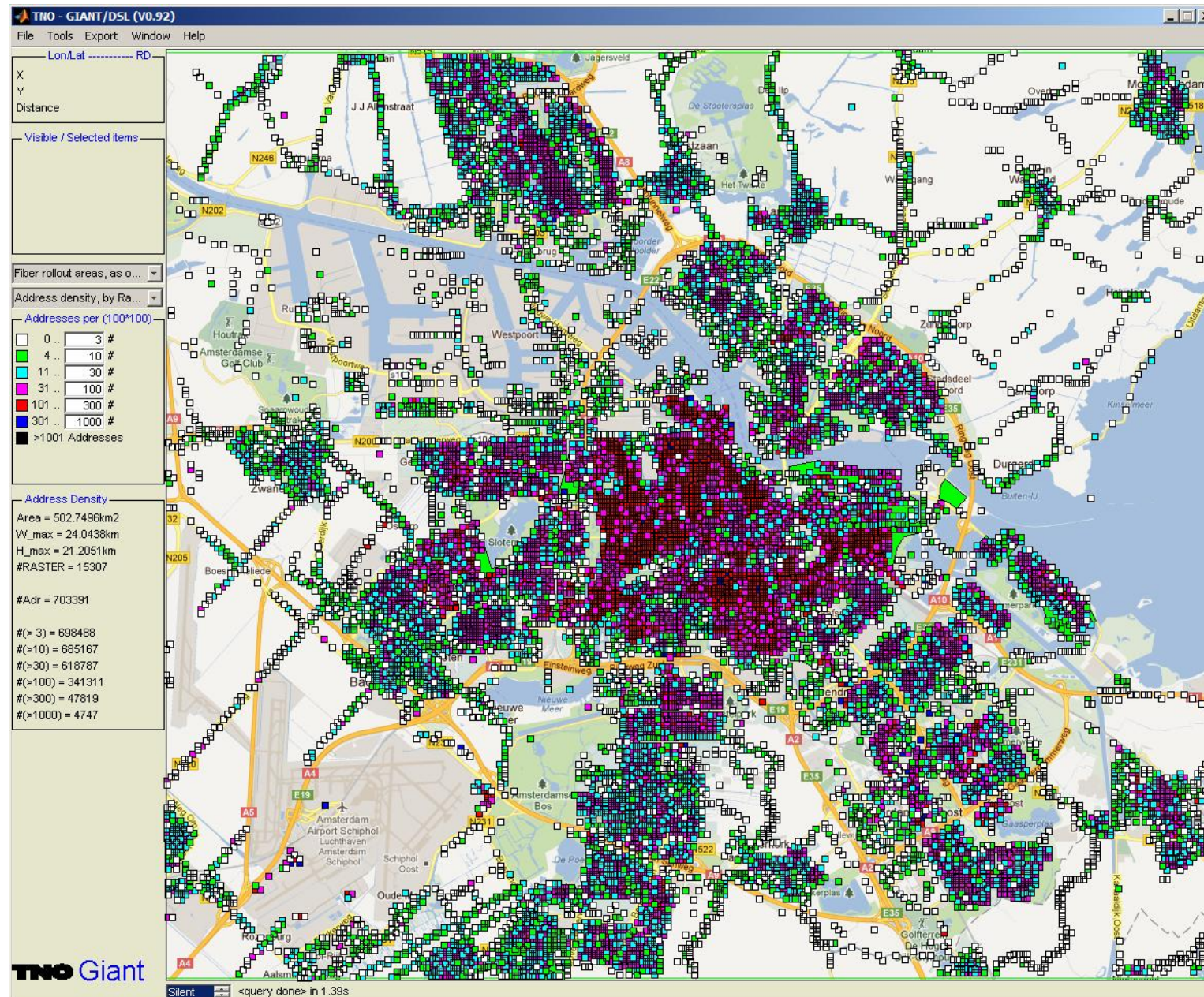
Den Haag
Rotterdam
Utrecht
Amsterdam

à Still to be
done



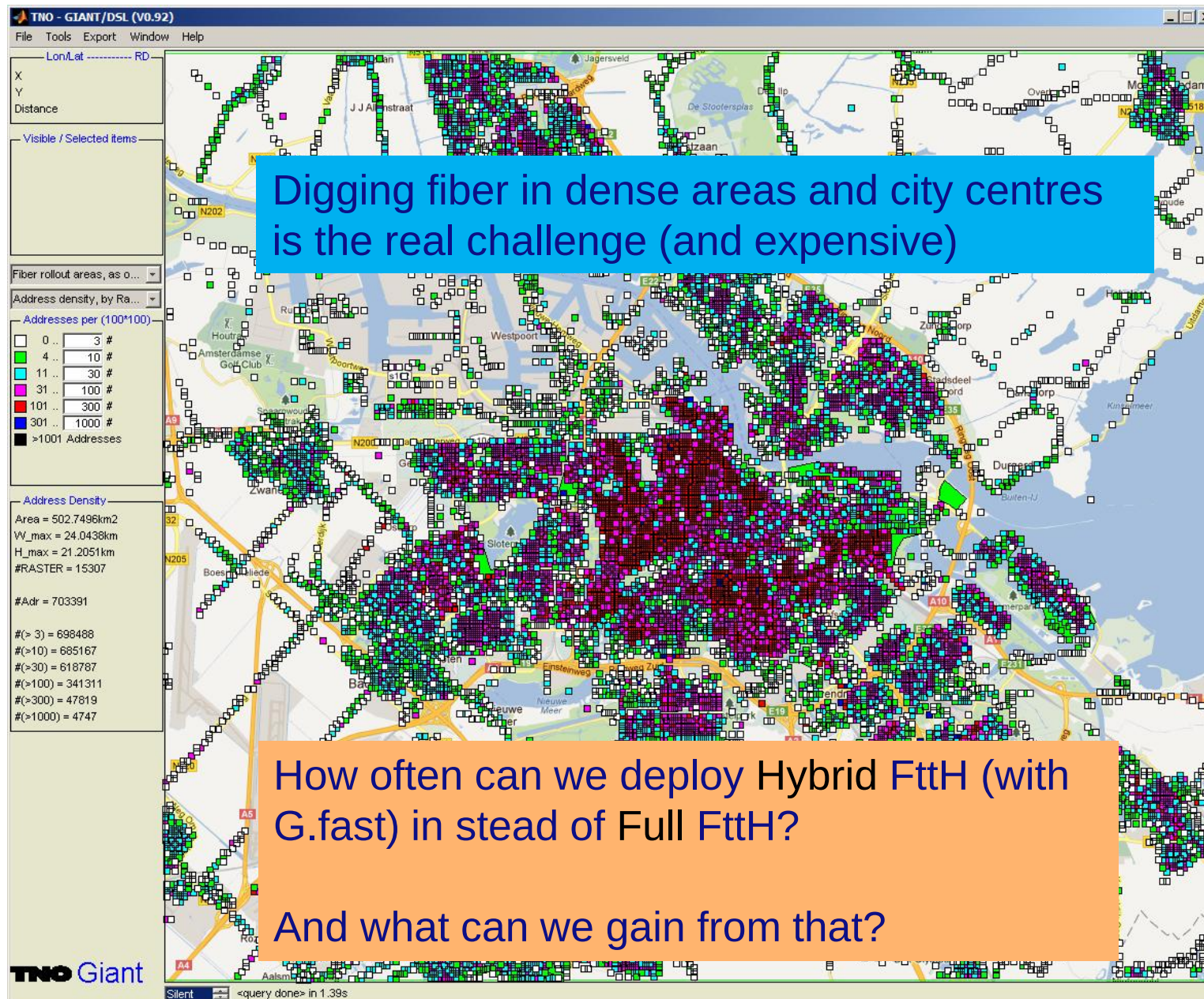
Fiber
deployments
around
Amsterdam

Dense areas
and city center
are still to be
done



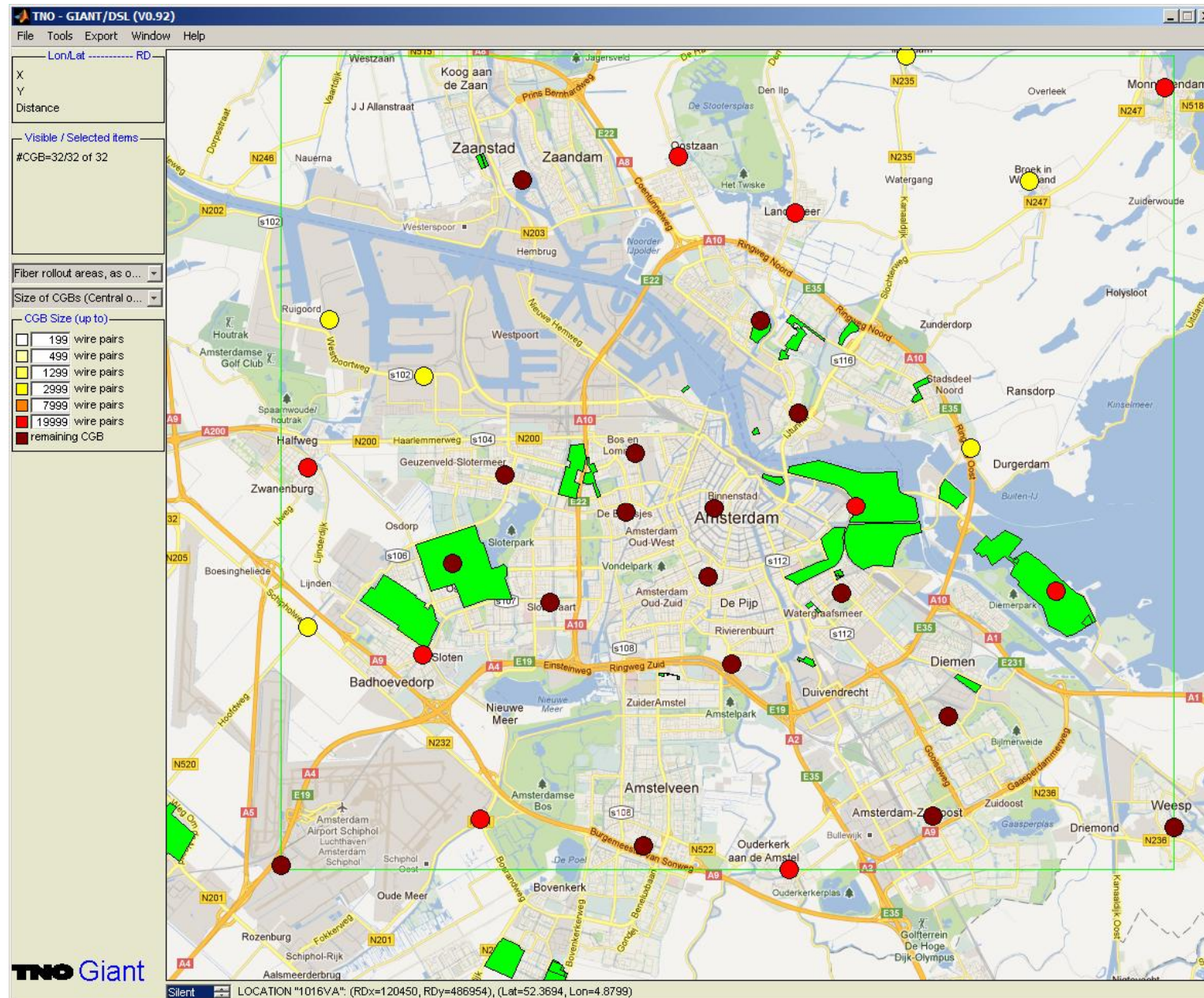
Fiber
deployments
around
Amsterdam

Bet here live
the people!



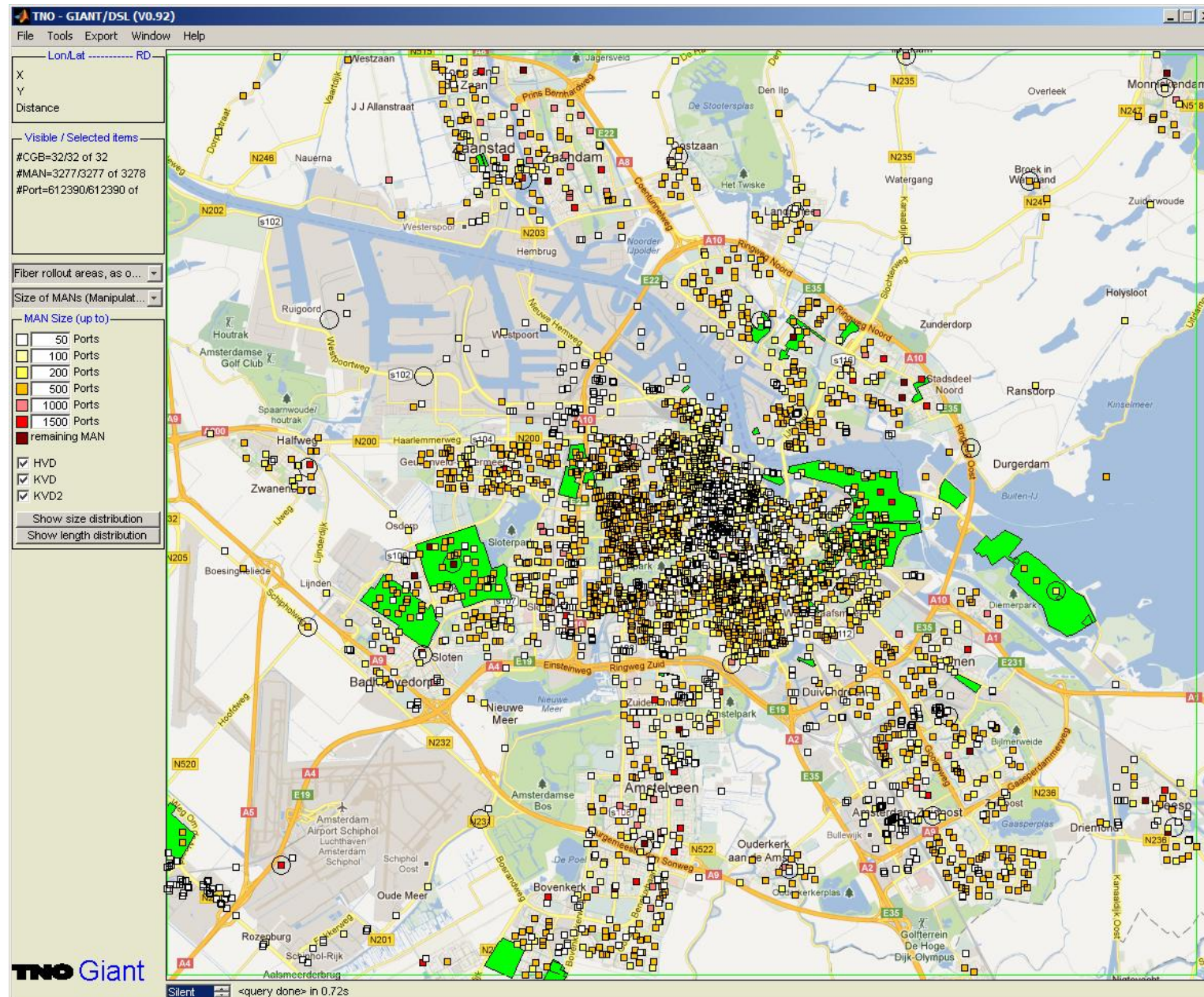
Fiber
deployments
around
Amsterdam

Digging fiber in
city centers is a
real challenge



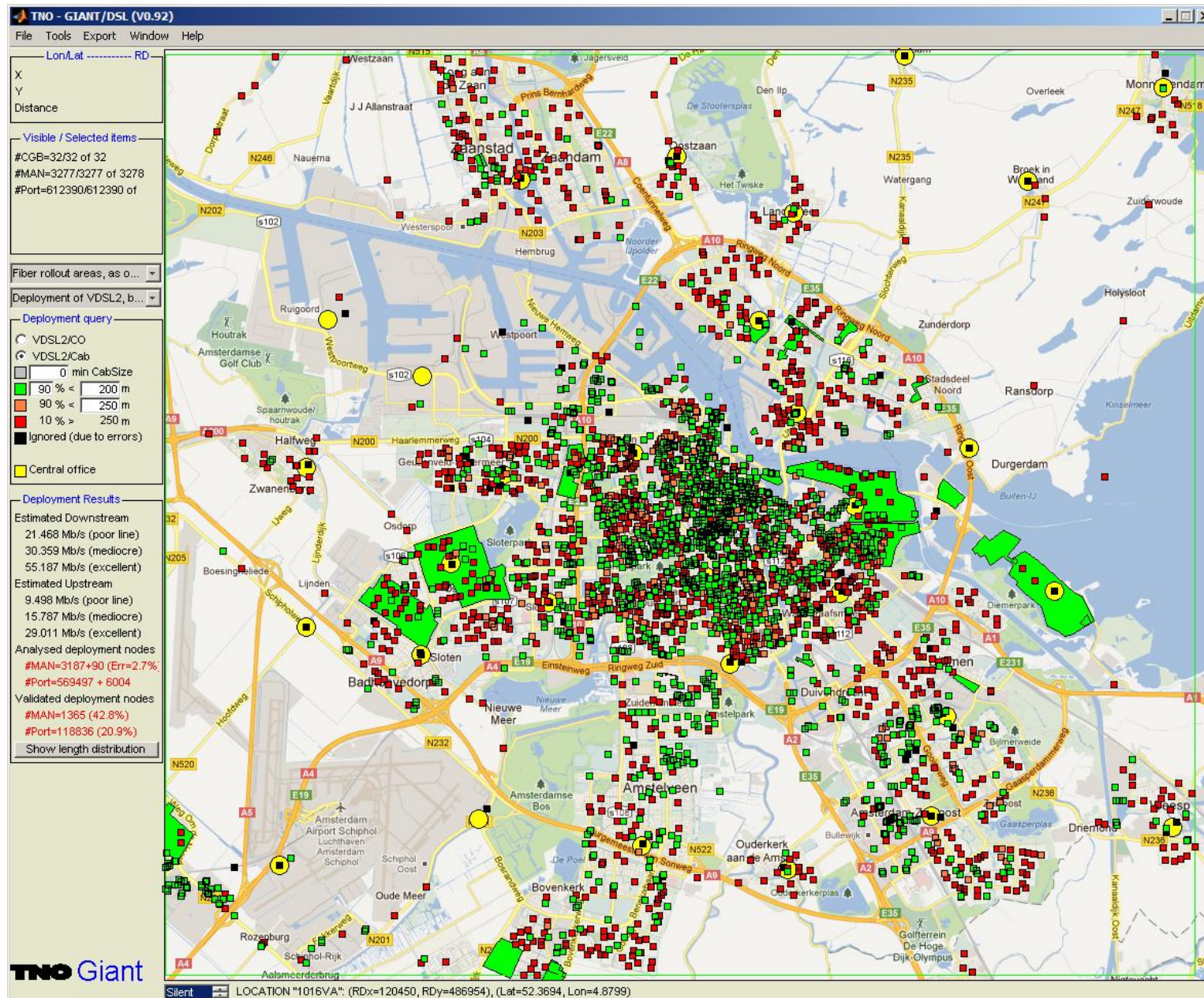
Let's study the
Geometry of the
copper
infrastructure

Several central
offices



Let's study the
Geometry of the
copper
infrastructure

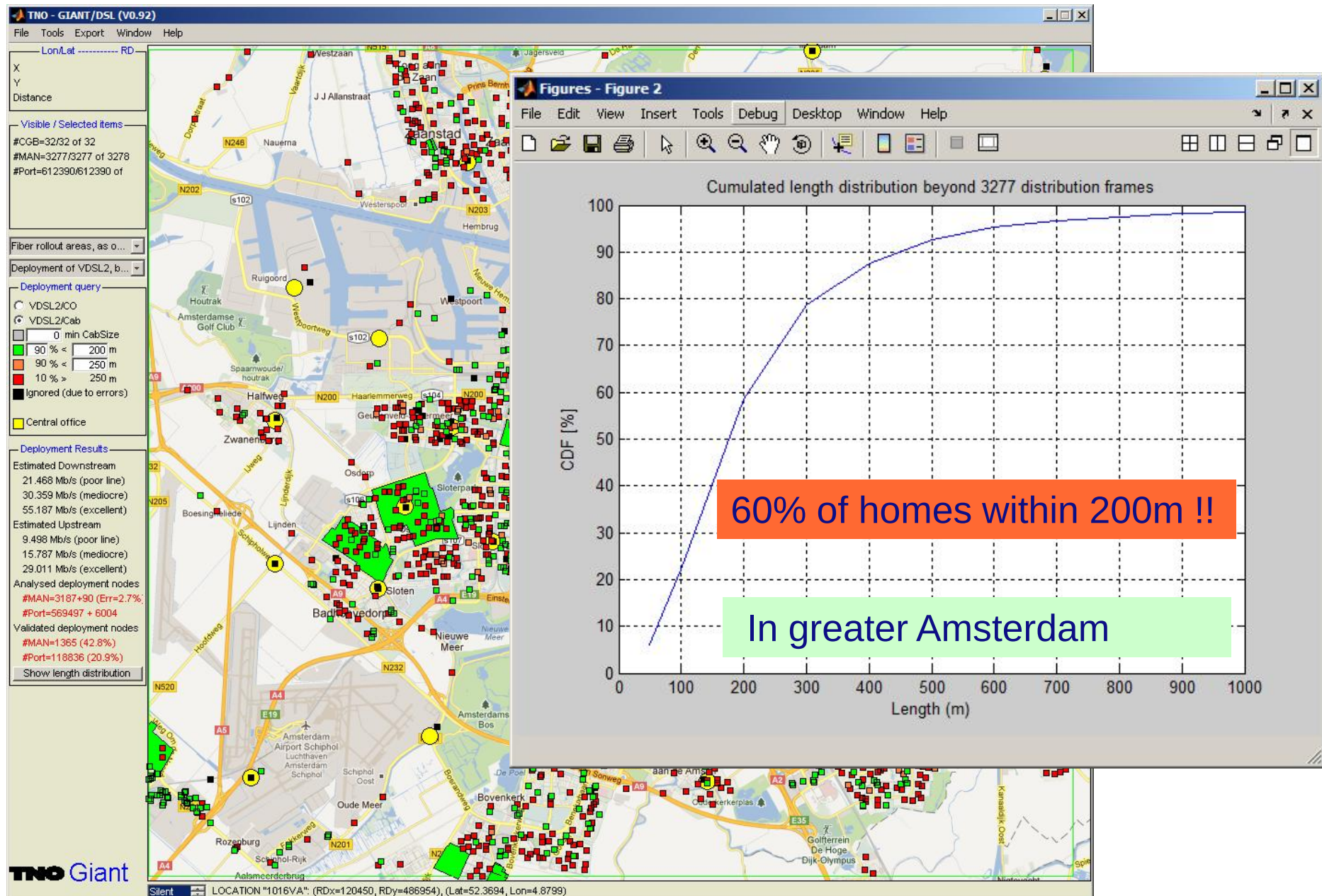
Many street
cabinets of
different sizes

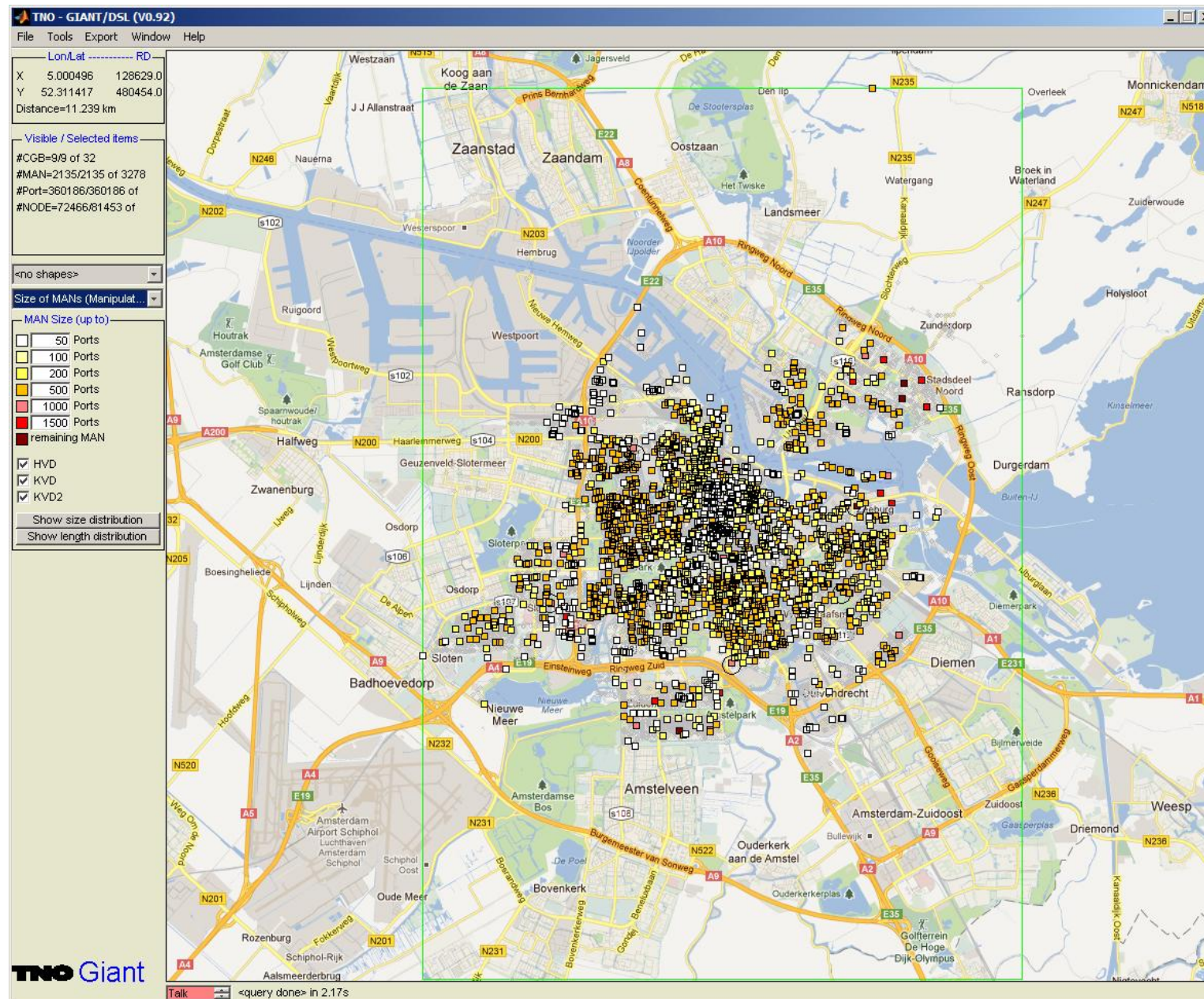


Let's study the
Geometry of the
copper
infrastructure

Many street
cabinets within
200m from
homes

Quite convenient
for **G.fast** from
existing
cabinets!

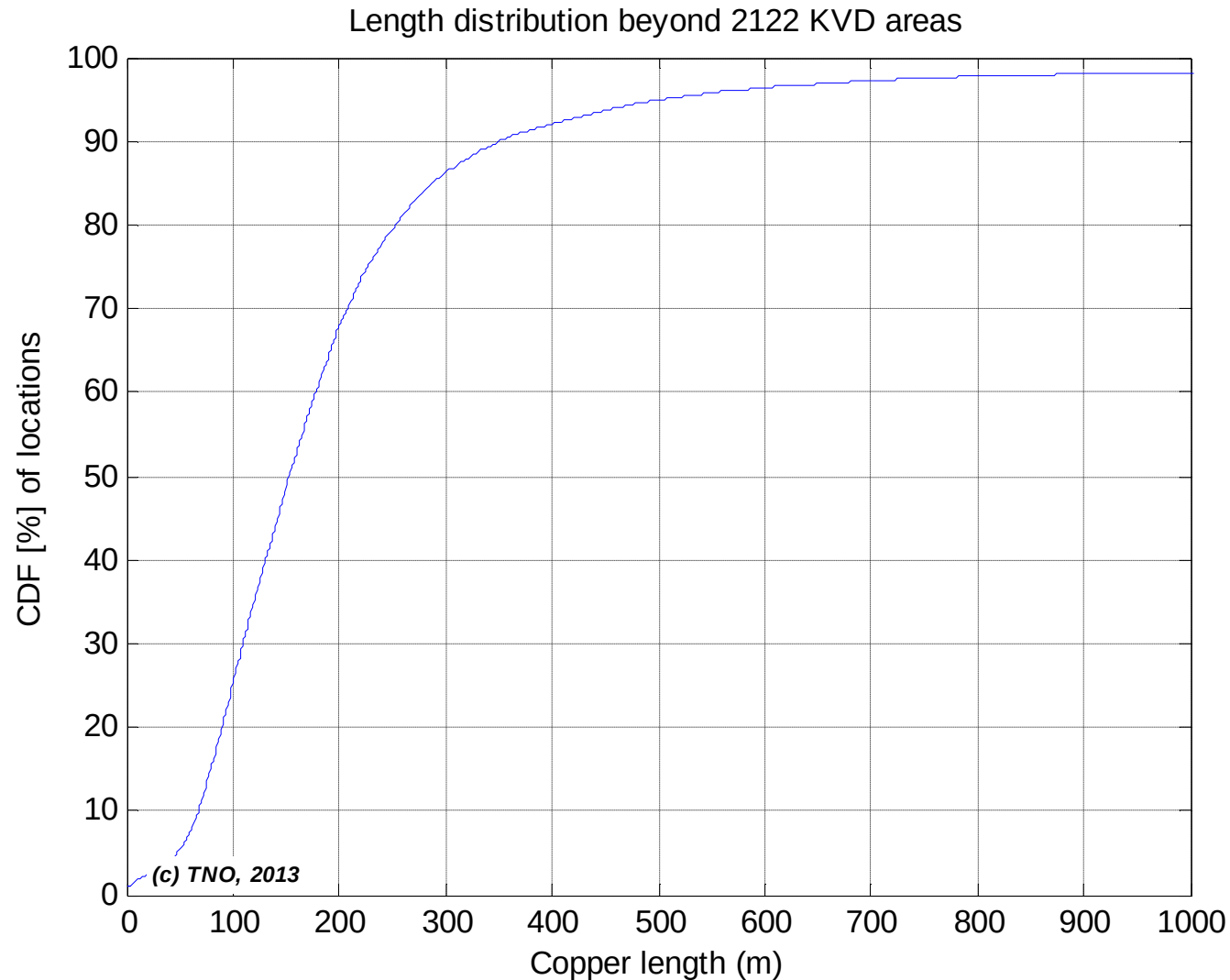




Let's focus on
the center +
surroundings of
Amsterdam

Many street
cabinets

Copper length from these street cabinets

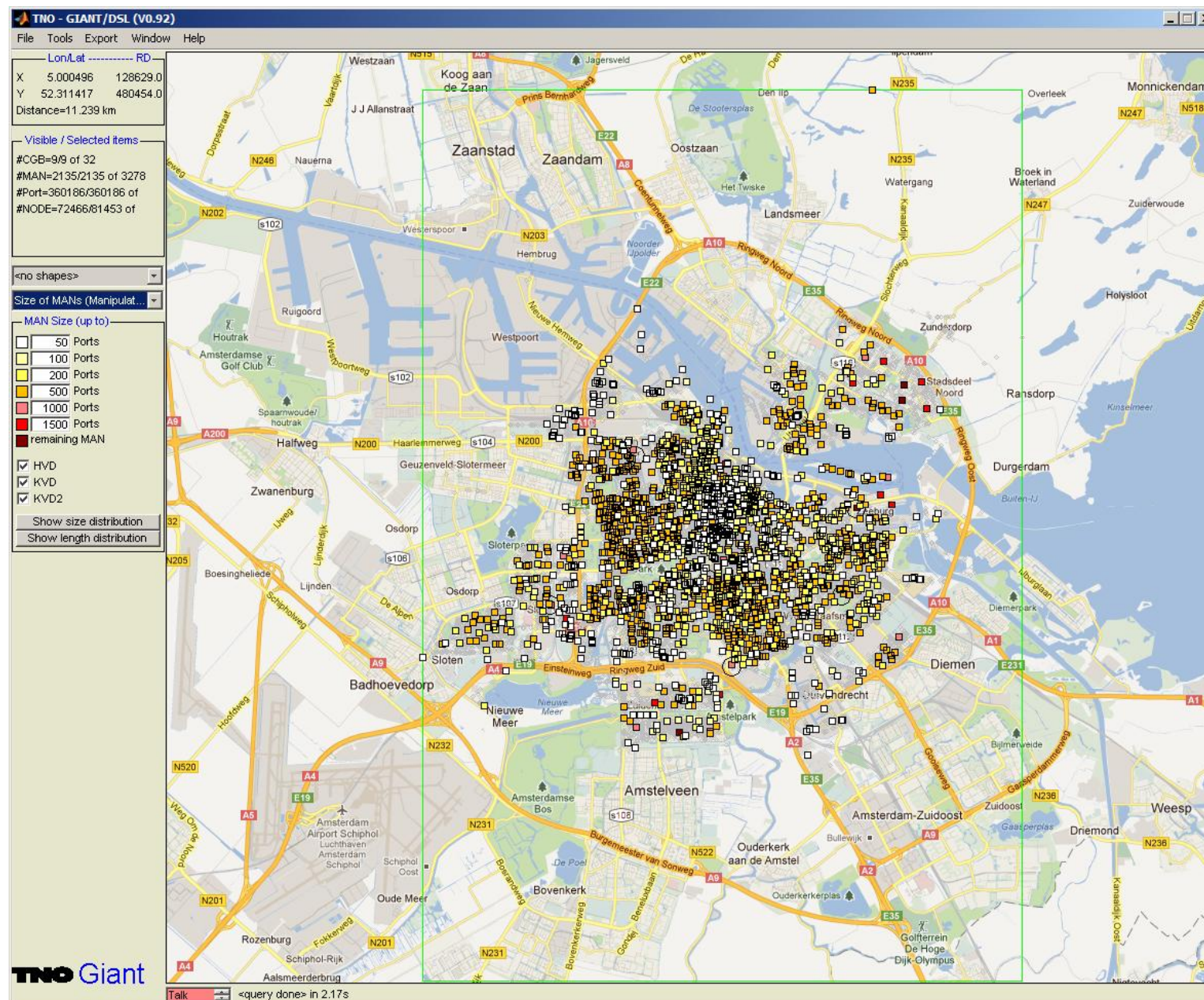


In Amsterdam city
and surroundings

About 360 000
locations

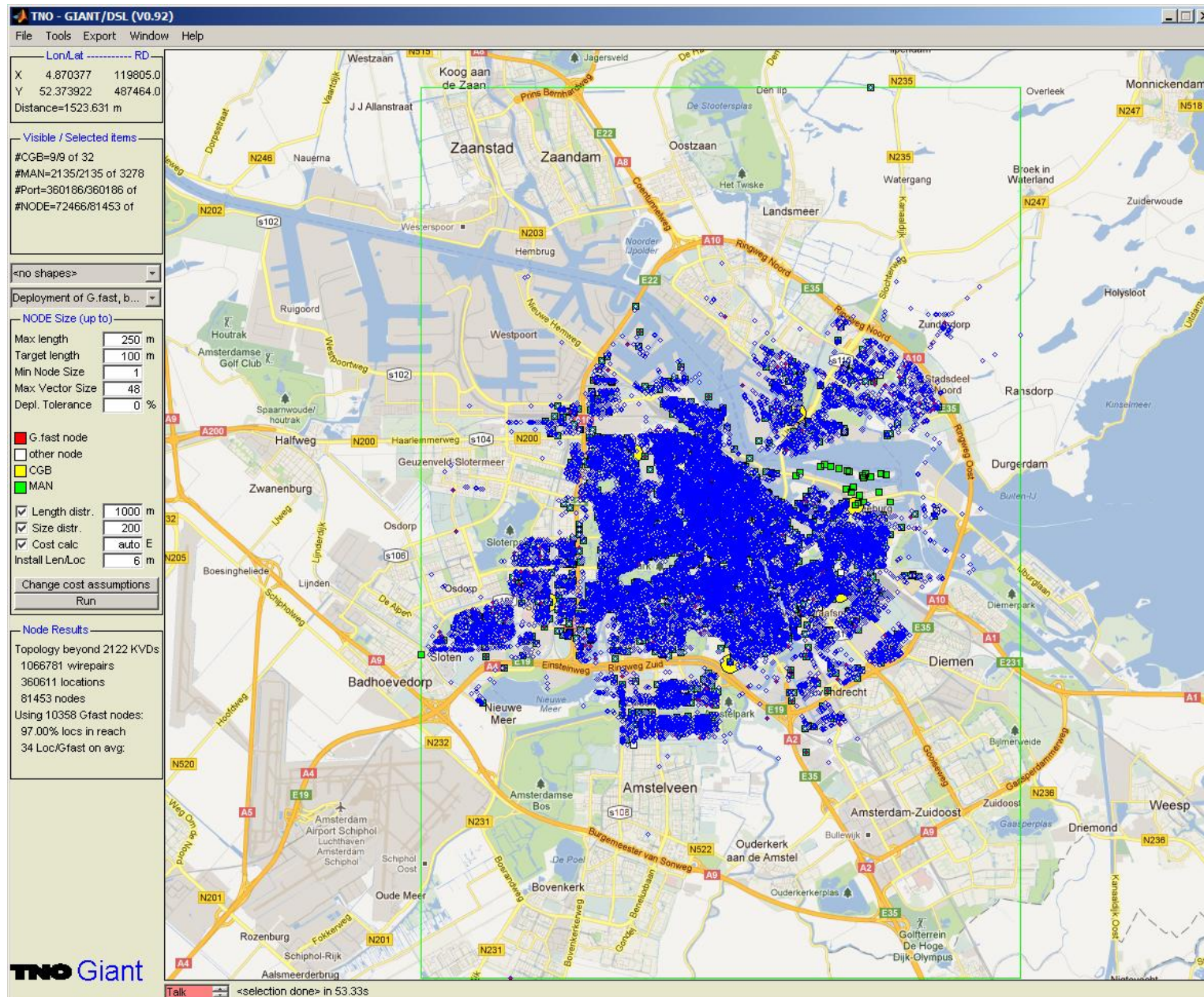
About 2100 street
cabinets

Can we shorten
copper length
for G.fast?



Let's focus on
the center +
surroundings of
Amsterdam

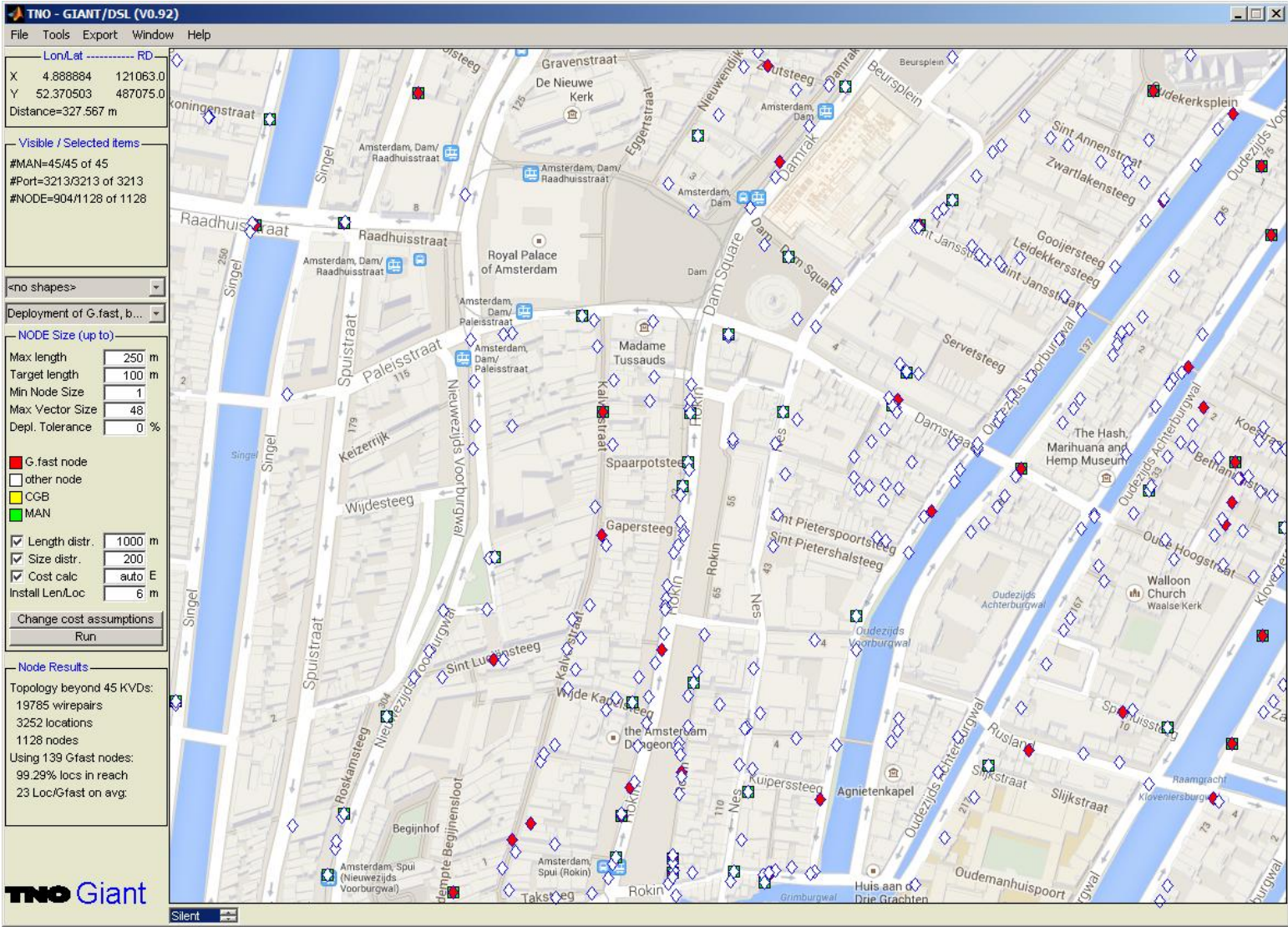
Many street
cabinets



Let's focus on
the center +
surroundings of
Amsterdam

Many street
cabinets

For covering
>95% with G.fast
we should
consider **splice**
locations as well

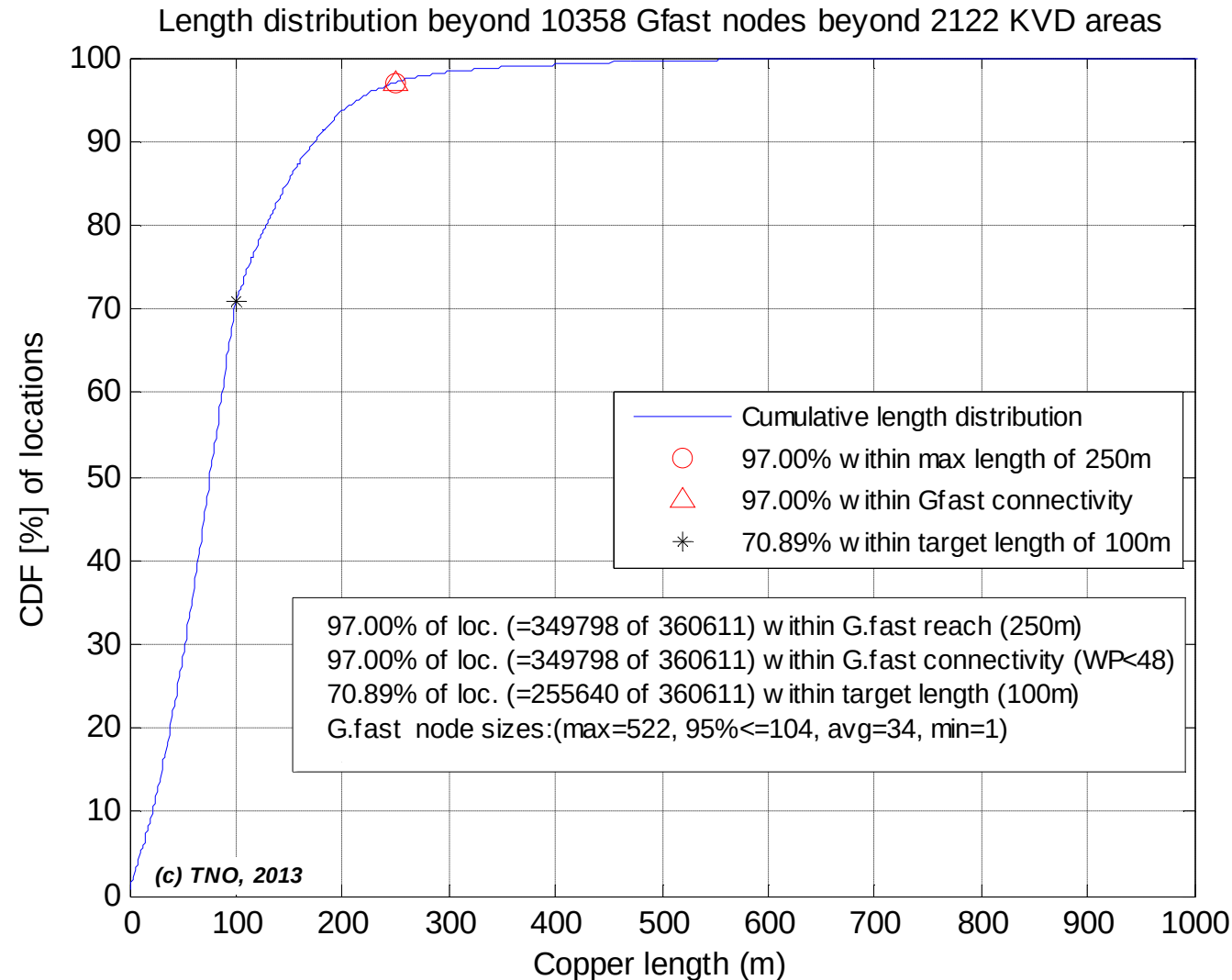


Let's focus on
the center +
surroundings of
Amsterdam

Many street cabinets

For covering
>95% with G.fast
we should
consider **splice**
locations as well

Copper length from potential G.fast nodes @ splices



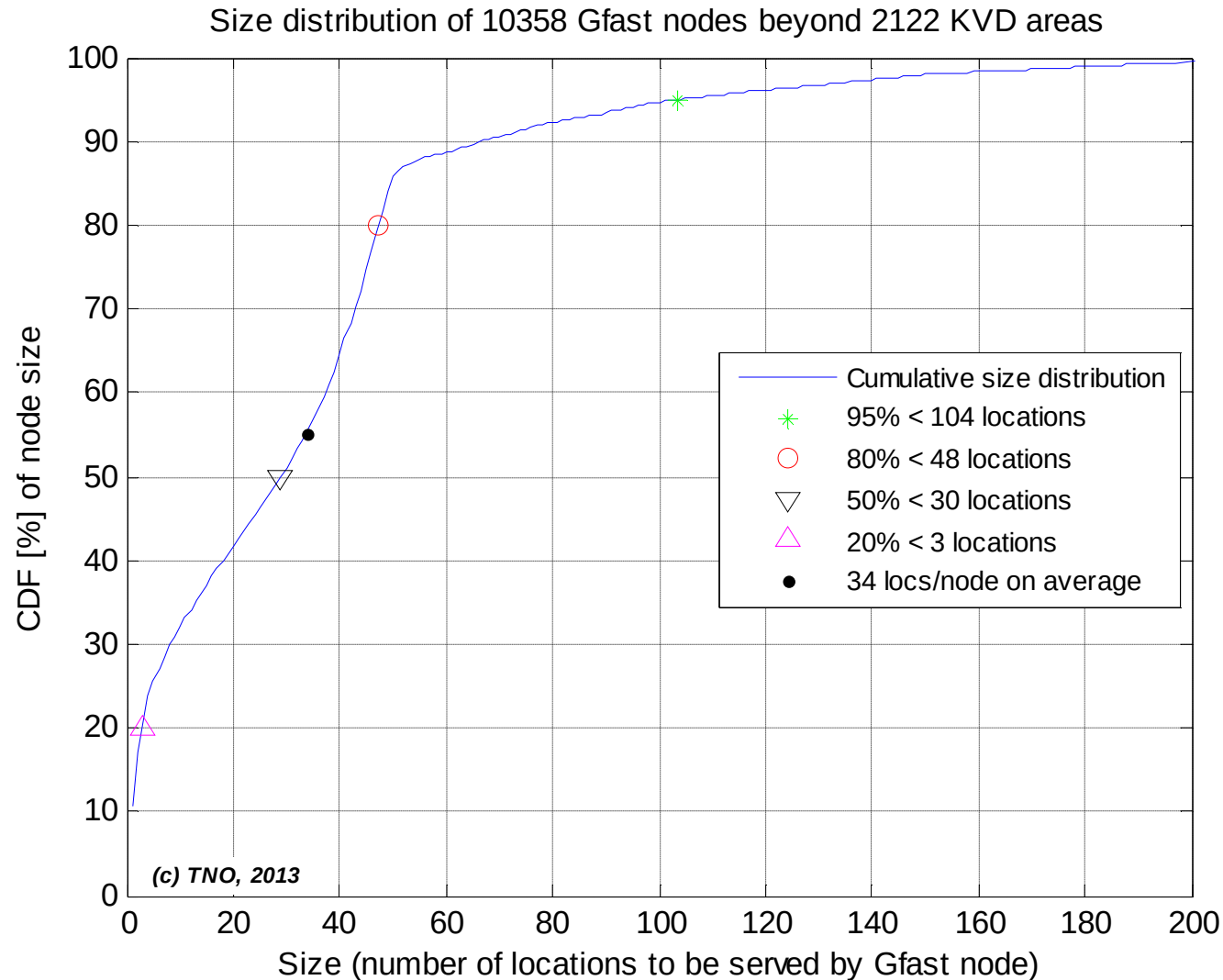
In Amsterdam city
and surroundings

About 360 000
locations

About 2100 street
cabinets

Yes, by
implementing
about 10300
G.fast nodes at
selected splice
locations

Size of G.fast nodes (# locations served by a single node)



In Amsterdam city
and surroundings

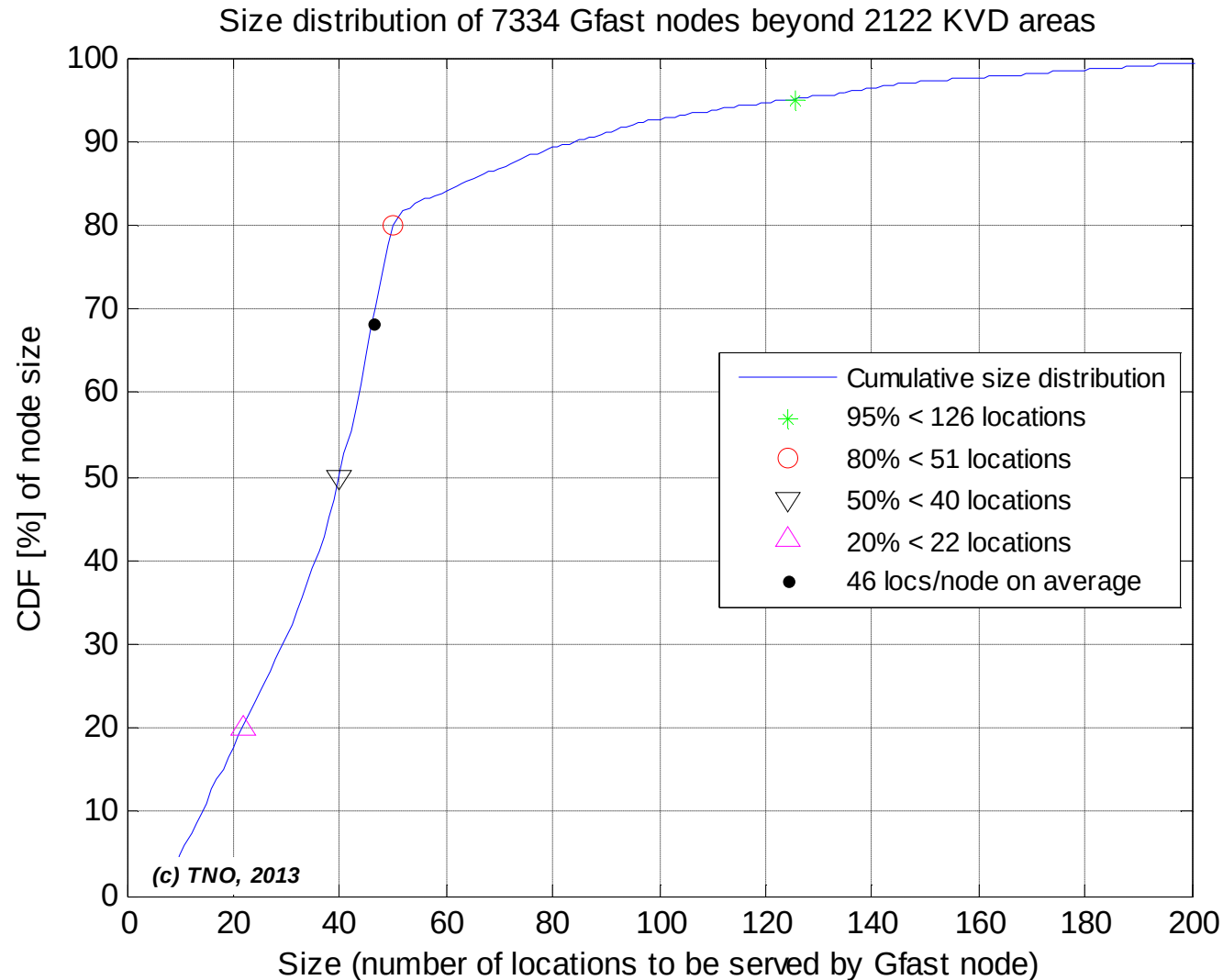
About 360 000
locations

About 2100 street
cabinets

Implementing
about 10300
G.fast nodes

34 locations
per node on
average

Size of G.fast nodes (prevent nodes < 8, “too” small)



In Amsterdam city
and surroundings

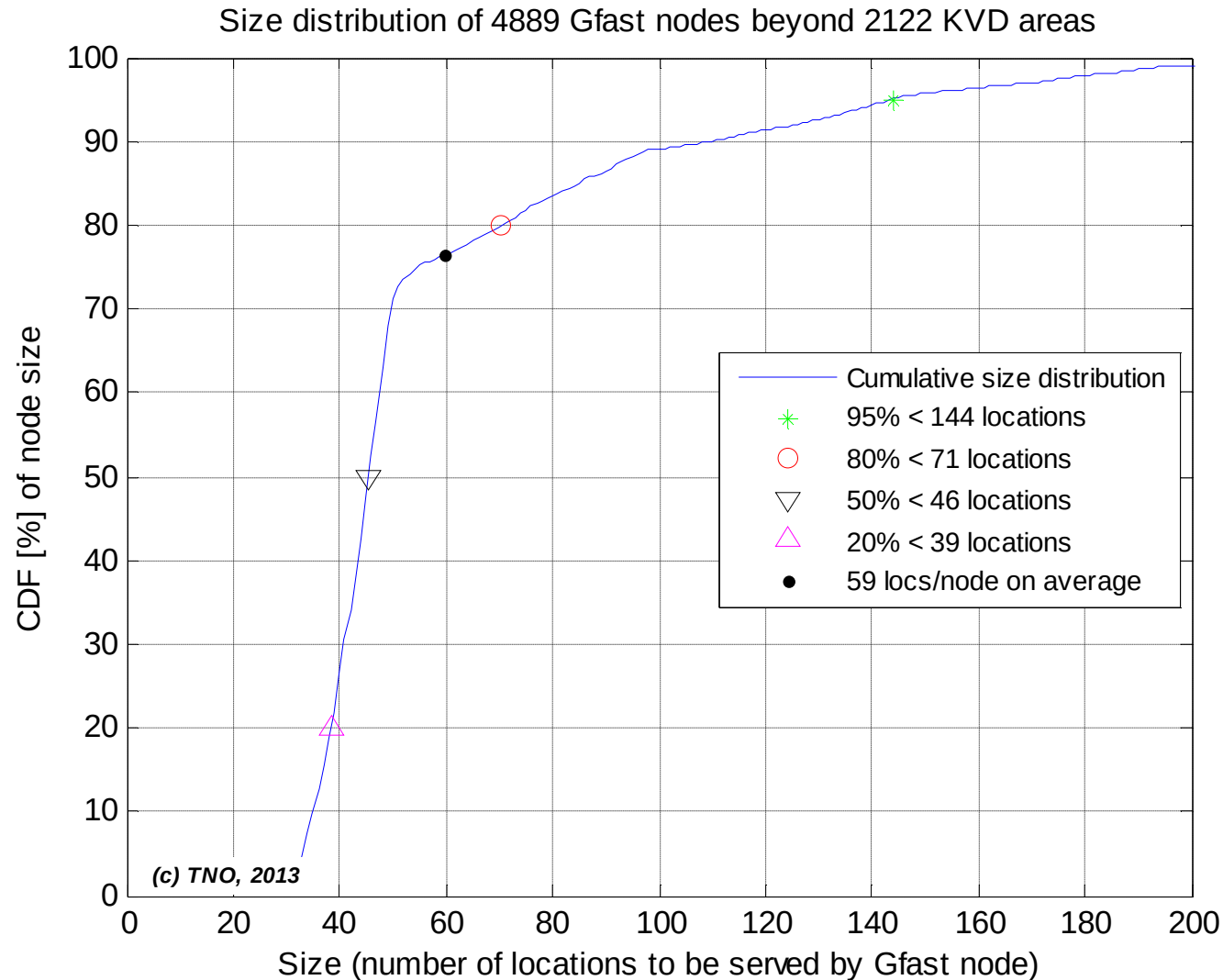
About 360 000
locations

About 2100 street
cabinets

Implementing
about **7300**
G.fast nodes

46 locations
per node on
average

Size of G.fast nodes (prevent nodes < 32, “too” small)



In Amsterdam city
and surroundings

About 360 000
locations

About 2100 street
cabinets

Implementing
about **4900**
G.fast nodes

59 locations
per node on
average

What are the consequences of FTTH with G.fast?

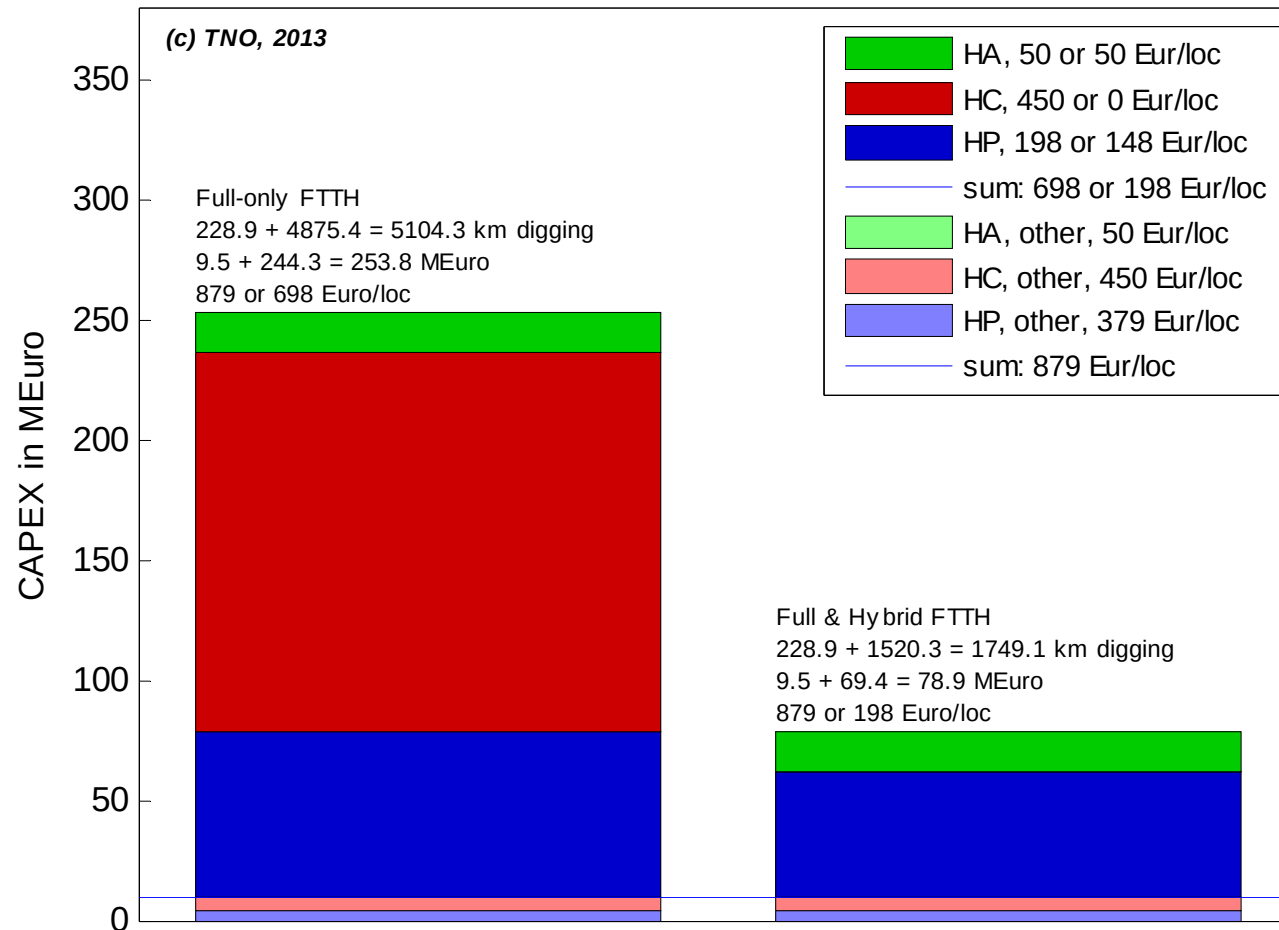
What are the **additional** cost of FTTH, when all streets cabinets have fiber (due to VDSL2 deployment), and x% is implemented as **Hybrid FTTH** and the rest as **Full FTTH**?

Cost assumptions

Homes passed	Digging costs	25 €/m
	Fixed cost per node	500 €/node
	Variable cost per node	25 €/port
Homes connected	Digging costs into the homes (6m)	25 €/m
	Installation costs (full FTTH)	300 €/home
	Installation costs (hybrid FTTH)	0 €/home
Homes activated	Equipment costs (Full FTTH)	50 €/home
	Equipment costs (Hybrid FTTH)	50 €/home

Cost analysis of deploying Hybrid FTTH with G.fast

Cost comparison of deployment to $10813 + 349798 = 360611$ locations



In Amsterdam city and surroundings

360 000 locations
 2100 street cabinets,
 10300 G.fast nodes
 100% deployment

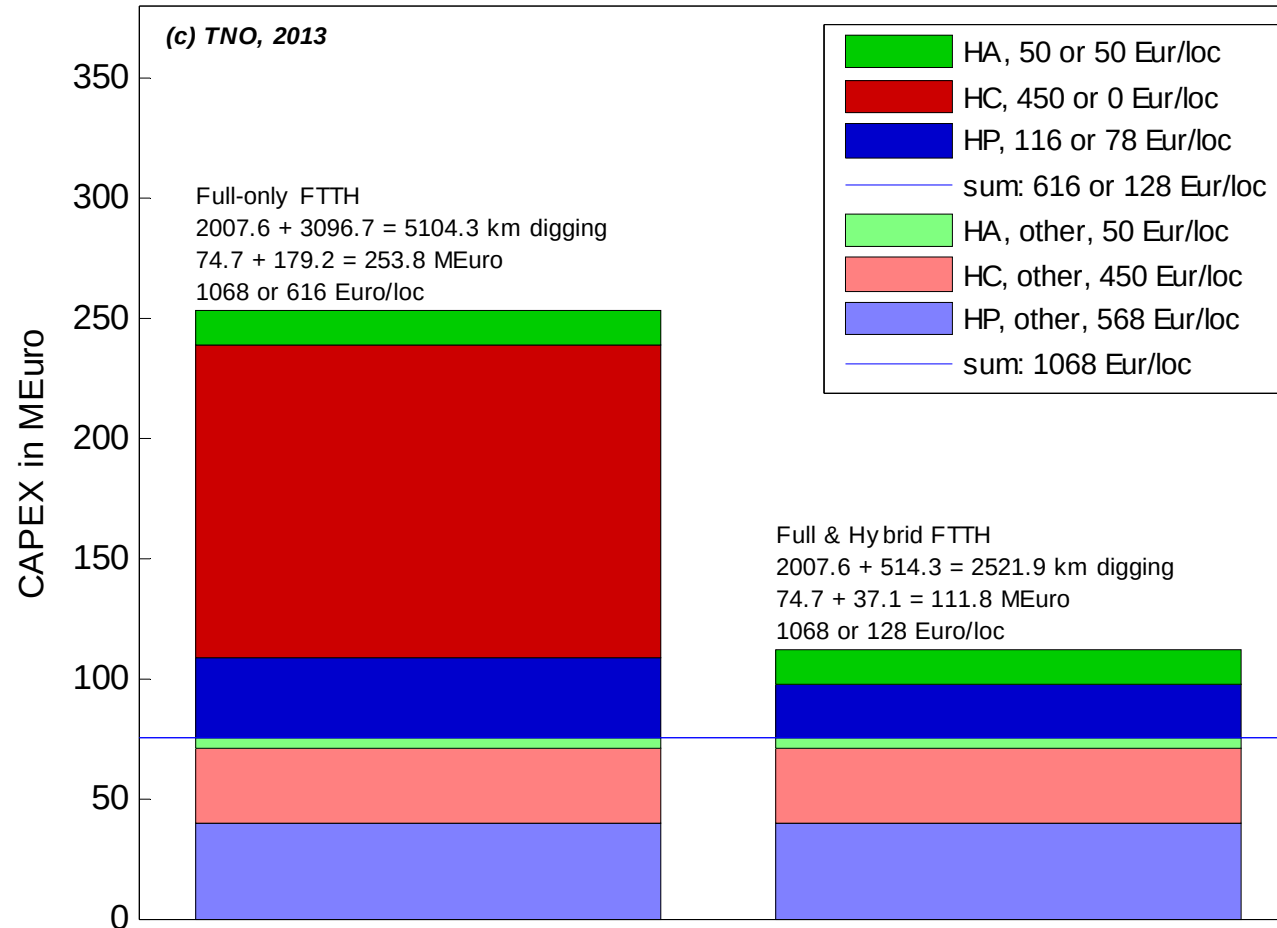
Full-only FTTH
 à 254 M Euro

Mixed FTTH
 (Full & Hybrid)
 à 79 M Euro

Most cost savings
 due to "Homes
 connected"

Cost analysis of deploying Hybrid FTTH with G.fast

Cost comparison of deployment to $69943 + 290668 = 360611$ locations



In Amsterdam city and surroundings

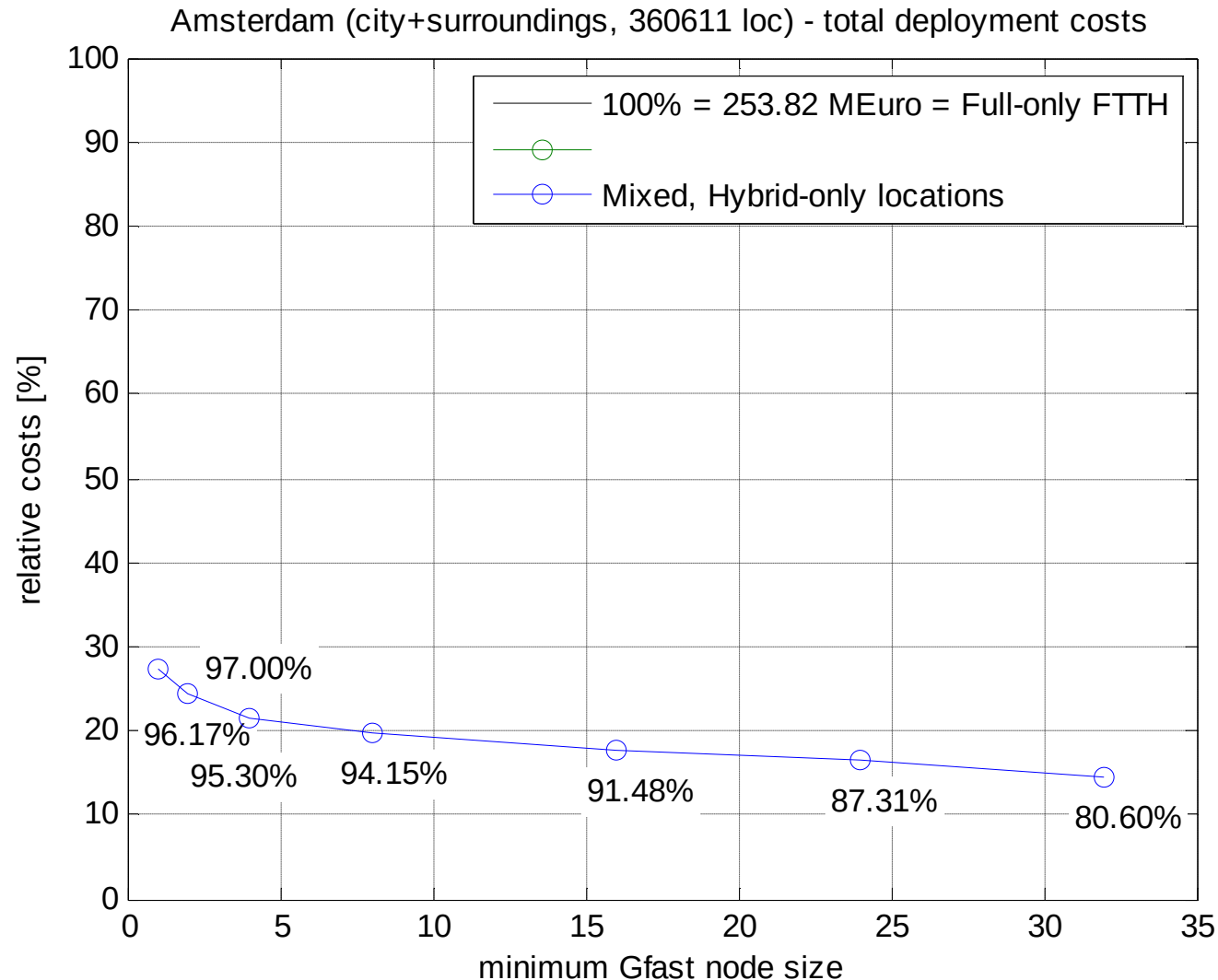
360 000 locations
 2100 street cabinets,
 4890 G.fast big nodes
 100% deployment

Full-only FTTH
 à 254 M Euro

Mixed FTTH
 (Full & Hybrid)
 à 112 M Euro

Most cost savings
 due to "Homes
 connected"

Cost development of FTTH (prevent small G.fast nodes)

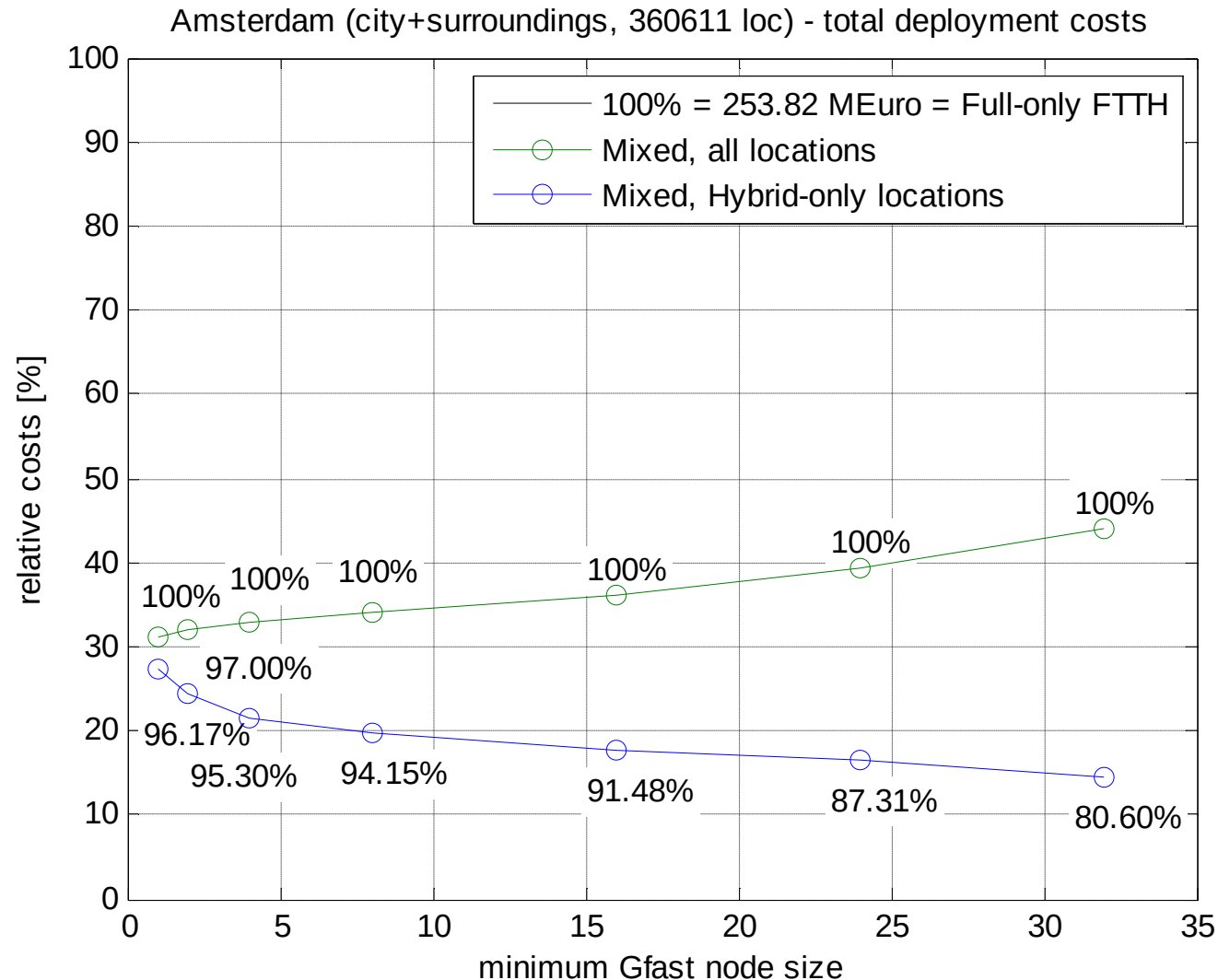


In Amsterdam city and surroundings

360 000 locations
2100 street cabinets,
100% deployment

Hybrid FTTH with
G.fast is **significant
cheaper** than Full
FTTH
.... especially
when we prevent
small G.fast nodes

Cost development of FTTH (prevent small G.fast nodes)



In Amsterdam city and surroundings

360 000 locations
2100 street cabinets,
100% deployment

Hybrid FTTH with G.fast is **significant cheaper** than Full FTTH
.... especially when we prevent small G.fast nodes

But remaining locations are **more expensive** with Full FTTH

Is this typical for all cities in NL?

- Another geographic study à Den Haag
- Very different beyond street cabinets
- Similar results beyond “g.fast-nodes”

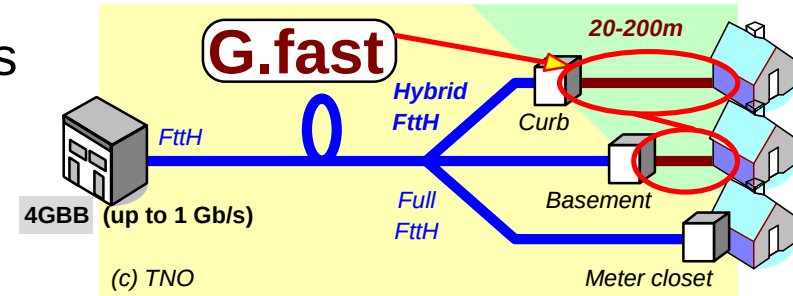
Is this typical for all cities in NL?

- Another geographic study à Den Haag
- Very different beyond street cabinets
- Similar results beyond “g.fast-nodes”
- How about other cities in NL?
- How about elsewhere in Europe?

Conclusions

detailed geographic analysis of Amsterdam,
using huge databases, covering all wire pairs

- Deploying up 1 Gb/s requires fiber
 - Full FTTH: feasible but expensive
 - Hybrid FTTH, with G.fast: is often feasible and then much cheaper
- Both FTTH solutions require a network upgrade (digging, installation, ..)
 - G.fast nodes @ selected splice locations à good location candidates
 - Amsterdam: 97% within <250m, 70% even within 100m
 - Typically 35-60 ports per G.fast node, on average
 - *(We observed similar results for Den Haag)*
- Cost savings by using Hybrid FTTH are significant (CAPEX)
 - Amsterdam: “Hybrid” is only 30% of the costs of “Full” FTTH
 - Most savings in transition from “Homes Passed” to “Homes Activated”



Deploying a mix of Hybrid and Full FTTH is an attractive option

TNO