Copper switch-off
A European benchmark

Analysis

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Executive summary

- There is limited progress towards copper switch-off in Europe.
- From the countries studied, only EE has made major steps to switch customers from copper to FTTH, while switch-off from copper to wireless has progressed in SE.
- More progress has been made towards PSTN switch-off (a prerequisite for copper switch-off). PT, EE, NL and DE should achieve all-IP by 2020, but other countries such as FR, PL and UK are not set to achieve all-IP until 2025.
- The reasons for the limited switch-off plans are diverse. In some countries FTTH has yet to be widely deployed. In others strict controls on exchange closure may be delaying switch-off. A lack of understanding of the benefits of fibre and challenges in switching to a fibre operator may also be hampering consumers from migrating in other cases.
- Member states and regulators could usefully act to enable PSTN switch-off, remove regulatory barriers to copper switch-off, and ensure that consumers are informed about which offers are based on full fibre, and its benefits.
Global overview

- Despite having several countries with extensive fibre coverage, **Europe has been slow to switch-off copper**
- In **Australia**, copper switch-off began in 2014 in conjunction with the deployment of the NBN, and acquisition by the NBN Co of Telstra’s copper and cable network.
  - Customers in “NBN ready” areas, have 18 months notice to switch to the NBN (a mix of FTTH, FTTC and cable), before the legacy copper network is switched off.
  - As of Dec 2017, NBN Co reported that around 75% of households had connected to its network within the 18 month migration window
- In Oct 2018, Verizon announced that it would phase out copper for FTTH in parts of 6 **US** states. Customers will be migrated by a technician, with no change to voice prices and a special offer for fibre-based broadband (Fios)
- In **New Zealand**, there are plans to allow operators to start withdrawing services in “fibre-ready” areas from Jan 2020
Of the countries studied, Estonia has made the most progress towards copper switch-off

Incumbent Telia completed the PSTN switch-off process in July 2017 (2.5 years after the programme started)

70% of copper exchanges were switched off at end 2018

All ADSL connections will be switched off by end 2020 – moving to 50% fibre, 40% FTTC/G.fast and 10% fixed mobile

Telia expects to benefit from lower fault rates and increased consumer satisfaction as well as considerable energy and space saving

The process was facilitated by the prior PSTN switch-off (which supported ‘plug and play’ installation of new routers with POTS port for old equipment), short notice periods for exchange closure (6 months), limited reliance on copper access and one to one contact with businesses

Spain and Sweden also have active programmes in place
The Netherlands has been a pioneer in PSTN switch-off, starting its all-IP programme in 2007.

In 2016 85% of POTS customers had been migrated. KPN is aiming to achieve a complete transition to VoIP by 2019.

There is no formal programme for copper switch-off yet. However, in November 2018, KPN announced 6 pilot areas for switch-off to test the process and gain experience.

Pilots will focus on overlay areas (copper and fibre), where the majority of customers use fibre.

There are also small pilots focused on business customers aimed at testing specific technical challenges.

Legacy equipment is a key challenge. KPN is preparing a campaign to inform residential and business customers of the consequences of migration on legacy equipment.

In its 2018 decision, NRA ACM allowed a 1 year notice period for exchange closure if a reasonable alternative wholesale product was provided to LLU.
### Switch-off progress

**Copper**

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>2018</th>
<th>2020</th>
<th>2023</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estonia</td>
<td>2015</td>
<td>70%</td>
<td></td>
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</tr>
<tr>
<td>Sweden</td>
<td>2009</td>
<td>42%</td>
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<tr>
<td>Spain</td>
<td></td>
<td>2%</td>
<td>7.40%</td>
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<tr>
<td>Portugal</td>
<td></td>
<td>0%</td>
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<td>Italy</td>
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<td>0%</td>
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</tbody>
</table>

R=regional switch-off, P=partial switch-off (feeder segment)

Source: WIK-Consult based on interviews

- Limited progress towards copper switch-off
- Estonia and Sweden are clear leaders amongst the countries studied
- No concrete plans in 5 of 10 countries
The greatest progress has been made in Estonia, with 70% of copper exchanges closed in 2018 and plans to remove copper access for 60% of broadband subscribers by 2020.

Spain has an active copper switch-off program to FTTH, but numbers are limited.

Slow process in Portugal with aim of 75% switch-off by 2030.

Sweden has an active program, but focus on rural/wireless.

Planned switch-off in Italy for feeder segment (FTTC).

<table>
<thead>
<tr>
<th>Country</th>
<th>Copper switch-off incumbent replacement technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estonia</td>
<td>FTTH (50% subs), fixed wireless (10% subs) FTTC (40%)</td>
</tr>
<tr>
<td>Sweden</td>
<td>Fixed wireless</td>
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<tr>
<td>Spain</td>
<td>FTTH</td>
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<tr>
<td>Portugal</td>
<td>FTTH</td>
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<tr>
<td>Italy</td>
<td>FTTC</td>
</tr>
<tr>
<td>Netherlands</td>
<td>FTTH (pilot)</td>
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<tr>
<td>France</td>
<td>No plans*</td>
</tr>
<tr>
<td>Poland</td>
<td>No plans*</td>
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<tr>
<td>Germany</td>
<td>No plans**</td>
</tr>
<tr>
<td>UK</td>
<td>No plans**</td>
</tr>
</tbody>
</table>

New deployments * mainly FTTH, ** mainly FTTC, some FTTH.

Source: WIK-Consult
Transition to all-IP is a pre-condition for copper switch-off, but can occur independently.

PSTN switch-off has been linked to copper switch-off in IT, ES, SE,

PSTN switch-off pursued independently of copper switch-off in UK, DE, NL, FR.

As of 2018, full transition to VoIP with PSTN switch-off had occurred in Germany and Estonia, with near full transition in the Netherlands.

In contrast, there is limited VoIP in the UK except for new build/FTTH and some business. Italy and Poland also start from a low base of VoIP lines.

### % incumbent voice lines provided through VoIP

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<tr>
<td>Netherlands</td>
<td>2006</td>
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<td>50%</td>
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<td>100%</td>
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<td>Spain</td>
<td>2009</td>
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</table>

Source: WIK-Consult based on interviews
Copper switch-off
Benefits to operators (1)

- Telia, EE reports copper switch-off enabled:
  - Lower fault rates, increased satisfaction and hence lower churn
  - Considerable energy saving and space saving as Telia was able to close exchanges

- Telia, SE reports copper switch-off enabled:
  - Lower maintenance cost compared with copper
  - Dismantling of 500,000 poles (but limited savings)
  - 100 engineers to be moved from copper to fibre in 10 years
Telefonica, ES reports that significant cost savings and efficiencies are possible from copper switch-off:

- A fibre PoP covers the equivalent of 4 copper switches
- Access technology equipment for fibre occupies 15% of the space occupied by copper; and
- Copper switch-off saves 60% energy cost

Verizon, US: “fibre is overall 60% cheaper compared to copper”

- Real estate 60-80% savings
- Energy 40-60% savings
- Reliability; fibre is 70-80% more reliable than copper. 60% fewer costly truckrolls and savings of 40-60% on maintenance
In a 2017 representative survey of consumers in the fibre-rich Swedish market, WIK found that 82% of FTTH customers were happy with their service compared with only around 50% of DSL customers.

87% of FTTH users highlighted high bandwidth as a benefit of FTTH.

The range of services and value for money were also cited.

Source: WIK-Consult 2018 socio-economic impact of FTTH
• FTTH users in Sweden were more likely to be online daily, and were more active on the Internet than users in Germany

• More than 30% of Swedes surveyed streamed all their music and video content online

Source: WIK-Consult 2018 socio-economic impact of FTTH
Copper switch-off
Benefits to customers (3)

- Entry level prices for 100Mbit/s in Sweden are priced at a small premium to “basic broadband”

Source: WIK-Consult based on operator website
Copper switch-off
Enablers & incentives

• Copper switch-off requires the ability and incentive to switch by the incumbent, challenger operators and customers
  – Installation of FTTH incumbent and/or willingness by incumbent to use competing FTTH infrastructure
  – Availability of FTTH access for access seekers and a willingness to migrate, or own FTTH (co-)investment
  – Understanding of benefits of FTTH, willingness, and ability of residential and business customers to migrate

• Incentives for operators and consumers to migrate can in turn be influenced by regulatory approaches to access regulation and pricing, migration and advertising standards
Copper switch-off
Regulatory barriers

• Switch-off also necessitates the removal of legal and regulatory barriers which might unduly delay or prevent switch-off

• Examples of regulatory conditions which could impede migration from copper to fibre amongst otherwise willing parties include
  – Unduly restrictive conditions for closing copper exchanges or shutting down PSTN such as long notice periods and/or onerous wholesaling requirements
  – Obligations to continue to supply copper-based/analogue wholesale products (through the market analysis) or retail products (through USO conditions)
  – Obligations for line powering to ensure service continuity in the event of a power cut
Copper switch-off
Overview of barriers

<table>
<thead>
<tr>
<th>Country</th>
<th>(Dis)incentives</th>
<th>Practical and regulatory challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE</td>
<td>Incumbent prefers not to access FTTH</td>
<td>Customer reluctance</td>
</tr>
<tr>
<td>FR</td>
<td>Access seekers reluctant to switch</td>
<td>Challenges legacy equipment</td>
</tr>
<tr>
<td>DE</td>
<td>Strict conditions to close exchange</td>
<td>Copper access obligations</td>
</tr>
<tr>
<td>IT</td>
<td>Line powering obligations</td>
<td></td>
</tr>
<tr>
<td>NL</td>
<td></td>
<td></td>
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<tr>
<td>PL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ES</td>
<td>Settled 2009</td>
<td></td>
</tr>
<tr>
<td>SE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>Not settled</td>
<td>Settled 2018</td>
</tr>
</tbody>
</table>

Red: interviewees indicated significant barriers, Yellow: some barriers

Source: WIK-Consult based on 2018 interviews
Copper switch-off
Overview of barriers

- The leading country for copper switch-off to FTTH (Estonia) benefits from incumbent FTTH deployment, absence of regulatory barriers and limited wholesale copper reliance.
- The gradual pace of incumbent FTTH deployment and reliance on copper upgrade technologies is a core factor delaying switch-off in UK, DE and IT.
- Strict conditions or a lack of precise guidance on conditions for exchange closure may be hampering switch-off in PT and FR. No rules have yet been established in the UK.
- The reluctance of customers may be hampering switch-off in FR, PL. This was managed in EE through “plug and play” equipment and support for legacy equipment.
- Transitioning of critical legacy equipment continues to be a concern in SE, PL, UK, NL.
- Copper access obligations such as WLR persist in the UK.
- Line powering obligations were a barrier to switch-off in some countries, but this issue has now been addressed in all the countries studied.
Previous studies by WIK and others have suggested that access regulation and the relative pricing of FTTH vs copper affect incentives to invest and migrate.

In theory, the most positive conditions for investment and migration are copper and fibre wholesale and retail pricing which are (a) sufficient to support investment; and (b) close to each other once fibre is deployed. Limited or no copper access can also ease the process of switching to FTTH for the incumbent.

Two countries in the sample had similar or lower FTTH wholesale charges compared with copper wholesale: EE and PL.

Other countries had higher (sometimes significantly higher) wholesale fibre rates compared with copper.

There are too many other factors involved to draw conclusions about the effects of wholesale pricing on migration from copper to fibre from the countries studied.
## Copper switch-off

### Access regulation overview

<table>
<thead>
<tr>
<th>Country</th>
<th>FTTH access obligations</th>
<th>Regulatory pricing approach FTTH vs copper</th>
<th>Regulated FTTH wholesale price vs copper</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE</td>
<td>Nationwide FTTH access</td>
<td>Cost-orientation based on top down historic costs both copper and fibre. Pricing is similar</td>
<td>Same</td>
</tr>
<tr>
<td>FR</td>
<td>Symmetric FTTH terminating segment obligations</td>
<td>Cost-orientation with risk adjustment on WACC for FTTH access. Long term pricing (IRU) offered alongside monthly rental</td>
<td>Higher €15/€9.50 unbundled access</td>
</tr>
<tr>
<td>DE</td>
<td>Nationwide FTTH bitstream obligation on DT</td>
<td>FTTH bitstream not yet regulated in practice. NRA proposal for replicability test vs cost-orientation with mark-up for FTTC</td>
<td>Higher</td>
</tr>
<tr>
<td>IT</td>
<td>Symmetric FTTH terminating segment + nationwide SMP FTTH bitstream + VULA on TI</td>
<td>Differentiated WACC for FTTH VULA vs FTTC VULA reflecting risk presumption</td>
<td>Higher</td>
</tr>
<tr>
<td>NL</td>
<td>Nationwide FTTH unbundling SMP access obligation on KPN</td>
<td>FTTH unbundling cost-based with risk premium on WACC vs NRA presumption of no premium for FTTC and copper</td>
<td>Higher ~€19.50 vs ~€8 unbundled access</td>
</tr>
<tr>
<td>PL</td>
<td>SMP FTTH access (regional deregulation for BSA) alongside symmetric obligations</td>
<td>SMP copper and FTTH access on basis of cost-orientation, no risk premium</td>
<td>Lower ~€13 100Mbit/s vs ~€16 10Mbit/s</td>
</tr>
<tr>
<td>PT</td>
<td>No FTTH access obligations</td>
<td>Not relevant</td>
<td>Not relevant</td>
</tr>
<tr>
<td>ES</td>
<td>Geographic VULA SMP access obligation on TF (~65% HH)</td>
<td>FTTH VULA pricing based on replicability test vs cost-orientation for copper</td>
<td>Higher</td>
</tr>
<tr>
<td>SE</td>
<td>Nationwide FTTH unbundling SMP access obligation on Telia</td>
<td>FTTH unbundling pricing based on replicability vs cost-orientation for FTTC/copper</td>
<td>Higher</td>
</tr>
<tr>
<td>UK</td>
<td>Nationwide FTTH VULA SMP access obligation on BT</td>
<td>FTTH VULA pricing based on replicability test vs cost-orientation for 40Mbit/s FTTC and copper</td>
<td>Higher</td>
</tr>
</tbody>
</table>
Voluntary migration by customers from copper to fibre is influenced by the relative pricing of the products in relation to their perceived value.

The perceived value is in turn affected by how broadband is marketed to customers and how they are made aware of the difference between copper, partial fibre, and full fibre.

Customers also need to be able to switch easily from a practical perspective. This includes switching platforms, when fibre is deployed by alternative operators.

Customers may be deterred from switching by the need for a site visit or requirements to replace their legacy equipment. Solutions which provide a “plug and play” option for consumers and support legacy equipment eg EE could help alleviate these concerns.

As legacy equipment issues are related to the move from PSTN to IP – pursuing PSTN switch-off could also be a helpful precursor to copper switch-off.
Copper switch-off
Relative retail prices

Source: Broadband Internet Access Cost 2017 study for the European Commission
*Triple play offers

Similar retail prices can spur migration for consumers
Copper is not actively marketed by the incumbent in ES, PT and relative retail prices support voluntary migration from ADSL to FTTH in FR, PT and SE
FTTH is not widely available from incumbents in DE, IT and UK. Incumbent pricing aims to facilitate migration from ADSL to FTTC
Copper switch-off
Migration conditions

• Once FTTH is deployed, migration conditions set by the regulator have a direct effect on the timescale and ease of achieving forced migration, which is likely to be needed towards the end of the migration process to achieve full operational benefits.

• There was a large variation in the conditions in the countries studied on switch-off notice periods:
  – Switch-off leader EE benefits from particularly short notice period of 6 months for exchange closure.
  – NL and DE allow 1 year notice to close exchanges if suitable wholesale products are offered, but there is limited FTTH coverage.
  – Other countries impose long deadlines of 3 years or more on closing exchanges with co-located operators, e.g., FR, PT, IT, ES.
  – No rules on exchange closure have yet been established in the UK.

• There were also differences in wholesaling approaches. While some countries require specific products to be made available which mimic copper-based access, others rely on existing commercial or regulated solutions on the replacement technology.
## Copper switch-off
### Migration conditions overview

<table>
<thead>
<tr>
<th>Country</th>
<th>Notice period for exchange closure</th>
<th>Wholesaling obligations linked to exchange closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE</td>
<td>6 months</td>
<td>None, but fibre wholesale access is available on similar conditions to copper wholesale access</td>
</tr>
<tr>
<td>FR</td>
<td>5 years - shorter period may be requested for copper in &quot;fibred&quot; zones, but 5 years applies to PSTN switch-off</td>
<td>Wholesale offers must allow altnets to replicate „in an equivalent manner“ offers available on the copper network</td>
</tr>
<tr>
<td>DE</td>
<td>1 year notice to withdraw LLU</td>
<td>Alternative wholesale offers must be made - in practice cabinet VULA, regional bitstream</td>
</tr>
<tr>
<td>IT</td>
<td>3 years if no LLU, 5 years if LLU - can be reduced to 3 if suitable wholesale</td>
<td>Technically and economically equivalent VULA guaranteed for 2 years after switch-off</td>
</tr>
<tr>
<td>NL</td>
<td>3 years or 1 if suitable wholesale</td>
<td>Unbundled FTTH, VULA FTTH or WBA FTTH - KPN must offer different price model if scale is obstacle for access seekers</td>
</tr>
<tr>
<td>PL</td>
<td>12 months</td>
<td>No specific wholesale requirements</td>
</tr>
<tr>
<td>PT</td>
<td>5 years or 3 if equivalent wholesale</td>
<td>Products &quot;equivalent&quot; to copper wholesale</td>
</tr>
<tr>
<td>ES</td>
<td>5 years (LLU), 1 year (no LLU)</td>
<td>No specific wholesale requirements</td>
</tr>
<tr>
<td>SE</td>
<td>5 years for exchanges with co-located operators, but commercial agreements made with 18 month notice</td>
<td>No specific wholesale requirements</td>
</tr>
<tr>
<td>UK</td>
<td>No established rules</td>
<td>No established rules, but WLR obligation in place until 2020</td>
</tr>
</tbody>
</table>
There has been limited progress towards copper switch-off in Europe thus far.

There are only a few examples of active replacement of copper with FTTH e.g. Estonia, Spain. Other switch-off cases involve migration to FTTC (Italy) and wireless connectivity in rural areas (Sweden).

Migration to FTTH is most likely where FTTH is prevalent and supported by all operators, consumers are aware of its benefits, and there are no regulatory barriers to switching.

The main factor delaying migration to FTTH in several countries is the continued reliance by the incumbent on copper rather than investing in or accessing FTTH networks.

Where FTTH has been deployed, a key challenge can be restrictive conditions for closing copper exchanges and/or reluctance by customers to switch voluntarily.

Countries which are pursuing early PSTN/ISDN switch-off (EE, DE, NL) have a head-start towards copper switch-off by accommodating or promoting alternatives to analogue equipment.
Consumer surveys in Sweden show that once customers make the switch to FTTH, they are significantly more satisfied with their broadband service and make more use of digital services. Most consumers responding to the Swedish survey also find that FTTH is good value for money.

Operators pursuing copper switch-off have cited a number of benefits including significant energy savings and reductions in operational cost, the opportunity to close and sell exchange buildings, fewer faults and greater customer satisfaction and loyalty.

Copper switch-off can also significantly improve the business case for FTTH by increasing penetration on the FTTH network, thereby supporting a more widespread deployment.
Based on evidence that switching from copper to FTTH delivers benefits to both consumers and operators and improves the business case for FTTH, there is scope for policy makers and NRAs to:

- Incentivise FTTH deployment and/or use of FTTH access by incumbents and avoid promoting continued reliance on copper and copper upgrades such as FTTC
- Facilitate switch-off of the copper network and enable PSTN switch-off as a precursor
- Review conditions (notice periods and wholesale obligations) for copper exchange closure and PSTN switch-off
- Improve customer awareness by clearly distinguishing FTTH from FTTC in advertising
- Encourage operators to find solutions that support legacy equipment or inform consumers of alternatives
- Improve processes for switching between the incumbent and alternative FTTH platforms