

# The implications of 4G coverage obligations in the context of upcoming 5G licensing

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## Introduction

The wave of 4G license auctions in Europe in 2010-2012 had a number of common characteristics. One of these is the prevalence of coverage obligations in the license conditions. The idea, from the regulators' point of view, was to ensure that operators would use these limited common national resources in a way that benefited the entire population, not just those pockets of population that said operators considered most profitable.

A little over half a decade on, it is apparent that most European countries can boast a very broad coverage of LTE mobile services, usually above 95% for most if not all market players, and occasionally around or above 99% of population covered. While it is difficult to draw a direct line between coverage obligations and coverage, the fact that a number of regulators have recently entered a new round of negotiations about these same licenses to extend or refine coverage obligations suggest that they (at least) believe that obligations are useful and necessary.

The purpose of this paper is to examine some of the models that regulators in various European countries have adopted for 4G coverage obligations and the rationale behind them. The countries examined are the UK, France, Germany, Italy, Spain, Sweden, Finland, Ireland, Greece and Switzerland. Of those, the latter two have no coverage obligations for 4G. The remaining 8 have a variety of models and approaches. As mentioned above, some countries have renegotiated coverage obligations recently (France) or are in the process of doing so (UK). We will examine why as well. It should be stressed that for obvious reasons, there is no statistical way to evaluate the efficiency of coverage obligations (too many factors, too small samples) so when we mention a proportion of countries that have chosen a certain path in their obligation set-up this is not intended as a comment of statistical value, just a statement of fact within our limited sample.

## The philosophy behind coverage obligations

Spectrum is considered a common good, a form of natural resource that is in limited supply, and owned by the state. While in recent years, it may have seemed like spectrum was a resource solely used for mobile telephony and broadband, that is not the case: it's also used for radio and TV, critical communications, national defense, and other more niche applications.

Allocation of spectrum to mobile operators therefore is not a purely commercial arrangement in which the state gets license revenues and the operators get the resource they need to build a commercial service. It can, and in many instances is being used to achieve specific policy objectives.

In the context of 4G specifically, many regulators saw (and still see) these spectrum bands as a means to extend mobile broadband service across the population. A certain amount of that will happen organically, both because the mobile

operators need scale to generate as much revenues as they can, and because a mobile service by definition is more valuable the farther it reaches.

Like in all industries requiring infrastructure to operate, however, there comes a point in deployment when the additional value in the extra bit of coverage considered yields too little return to be justified on a purely economic basis. This is where coverage obligations, accepted by the MNO as an integral part of the license when attributed, can make a difference. It forces the reallocation of a little profit from the most profitable areas to areas that would otherwise have been considered not to be profitable enough to cover.

## Nature of coverage obligations

At their most basic level, coverage obligations (when they exist) are expressed in terms of 4G service availability, generally to a percentage of the population, and occasionally also to a percentage of the country area.

Mobile service however is (by definition) mobile. So how can coverage be expressed in 'percentage of population' when the mobile user moves around? That is one of the key challenges. The shortcut essentially is that population coverage is in reality a mix of population density and area coverage. In other words, when a regulator (or mobile operator) says that such a network covers 95% of the population, what they really mean is that the network covers areas where 95% of the population lives. As customers move around though, they might very easily traverse areas where their mobile phone cannot track a signal.

Few regulators measure (or publish results) for both population coverage and area coverage, but the example of France (who does) illustrates the point above: Orange, the operator with the highest population coverage (92%) at the end of 2017 covered 'only' 65% of the territory.

## Geographical coverage

Population coverage being, in fact, geographical, we use this terminology to express the different layers of population coverage in license obligations:

### Nationwide obligations

Half the operators in our sample have nationwide coverage obligations. These may differ per spectrum band in some cases (see below), but are generally expressed as a percentage of population to be covered within a certain timeframe. There are no associated obligations expressed in area coverage in our sample, and we are not aware that these exist anywhere.

The degrees of ambition associated with coverage obligations vary widely however.

- The lowest bar in our sample is Ireland, which requires 70% coverage nationwide within 3 years of license attribution.
- The most ambitious is the UK with 99% population coverage nationwide within 4 years of attribution. In the obligations, this is expressed as 98% indoor, estimated to be equivalent to 99% outdoor.
- Finland also has a 99% population coverage obligation within 5 years in the 800Mhz spectrum band and a 99% obligation in the 700Mhz band within 3 years.
- Sweden has a 100% coverage obligation of households and businesses with no associated timeframe (but for some reason still report coverage in percentage of population).
- France has a 98% nationwide population coverage obligation within 12 years of attribution (and 99.6% by Year 15) in the 800Mhz band and a 75% coverage by Year 11 in the 2600Mhz band.

It is easy to see the limits in imposing only a nationwide obligation however, and many regulators seem to have understood that. Only two countries in our sample (Finland and Ireland) impose only a nationwide obligation. In the case of Finland, that obligation is very high and is complemented by a more complex « right to broadband »<sup>1</sup> which we will not delve into here but puts additional pressure (although with associated subsidies) for deep rural coverage.

### Regional obligations

A number of countries with geographical coverage obligations either have both a nationwide and a regional coverage obligation, or only a regional coverage obligation. The idea of the latter is to impose coverage in percentage of population in each region or district to ensure a fair spread of availability to all parts of the national territory.

- UK nationwide obligations (only applied to one license, see Regulatory Strategies below) are complemented with a high level indoor coverage obligation to 90% of each of the four UK Nations. That is still a very broad obligation.

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<sup>1</sup><https://www.viestintavirasto.fi/en/internettelephone/righttoatelephoneandbroadbandsubscription/rightto1Mbpsbroadband.html>

- In addition to its nationwide obligations, France imposes 90% coverage for each French département (the smallest administrative division above the town) of which there are 96 in France. The timeframe is quite generous (12 years, and 95% by year 15) but it does make it harder for operators to have purely regional deployment strategies, overlooking certain parts of the territory.

### Local obligations

A number of regulators in the sample, while still imposing a form of geographical coverage, do so in a very localised way. The philosophy here is that obligations should not apply to areas where service is likely to be deployed anyway. The obligation tool therefore is solely focused on areas that are either lacking in service or where it is anticipated that the business model will be most challenging (and therefore operators might decide not to deploy if left to decide on their own.) Germany, Spain and Italy has only such localised obligations while France has both Nationwide, Regional and Local obligations:

- The German model imposes a list of underserved areas in each of the 16 federal states. These are classified by size. Coverage obligations impose that 90% of the localities in each state be available for service before service can be offered elsewhere in the state. Service must be deployed first in the lowest population areas in the underserved list.
- The Spanish model is similar although a little less constrictive: it imposes 90% population coverage in all towns of less than 5000 inhabitants listed in the obligations. There is an associated bandwidth obligation of 30Mbps for these underserved towns, but the rest of the network deployment is unconstrained, unlike in Germany.
- The Italian model follows a similar pattern with one crucial difference: the targeted towns listed are not the same for each licensee. Effectively, the regulator made a choice between coverage of white spots and competition in these underserved areas arguing that even if not all licensees covered these areas at least there would be one service available.
- Finally, France - in addition to its national and regional obligations - also imposes a coverage of 90% of population by Year 10 in what it calls a 'priority zone' of low-density population that represents 18% of the population but 63% of the territory. The regulator might have considered this last obligation ineffective, or at least not as effective as anticipated since in 2018 it renegotiated with operators: the regulator defined a strict list of 5000 towns where 4G is currently not available. Operators have 12 months to offer service there if the local government helps with site acquisition and 24 months otherwise.

## Other forms of coverage obligations

While geographical coverage is at the heart of all the coverage obligations we have examined, some regulatory frameworks include other types of obligations, or structure the geographical obligations differently.

### Spectrum related obligations

Few regulators impose different obligations for different spectrum bands. This makes sense since the tradeoff with spectrum is that higher bands offer better bandwidth but do not reach as far. Therefore, by and large, obligations when they exist tend to apply to 800Mhz (or 700Mhz when it is available, but not necessarily to higher spectrum bands. Only France and Italy have obligations pertaining to higher bands:

- France imposes a coverage obligation on 2600Mhz in addition to the obligation on 800Mhz. That obligation is much lower, at 75% coverage as opposed to 99% for 800Mhz.
- Italy has a more complex mechanism on higher bands: irrespective of spectrum bands (other than 800Mhz, there is a national coverage of 20% of population by year 2 and 40% by year 4. However, MNOs must commit during the tender process to coverage areas, and are then imposed a 2600Mhz obligation on these areas: these locations must be covered at least half by 2600 MHz, and the remainder may be covered using the other frequencies for broadband use at 900, 1800 and 2100 MHz. All geographical areas included in the tender application must be fully covered using the 2600 MHz band by Year 11.

### **Bandwidth related obligations**

Only a few countries have imposed bandwidth minima as part of their obligations. The reasoning seems to be that the regulator doesn't care how the bandwidth is delivered (using which spectrum bands or technology) but that it is delivered at all.

- The strictest of those obligations is seen in Spain, with a minimum bandwidth of 30Mbps imposed on underserved area coverage (where, presumably, mobile broadband might be the only broadband available). CMT freely admits though that this particular requirement has not yet been measured and is in the process of designing a method to test it.
- Sweden also has a bandwidth obligation although it applies more specifically to fixed broadband substitution: when 800Mhz is used for fixed broadband substitution, an obligation of 1Mbps of minimal throughput is imposed nationwide.

### **Indoor coverage obligations**

One of the challenges of measuring coverage obligations is to know where the measurement happens. With higher spectrum bands being less effective indoors, a coverage that meets obligations outdoors does not necessarily translate into mobile users who are satisfied with their service when inside their (or someone else's) homes. Some regulators therefore are looking into specific obligations regarding indoor coverage.

The only current example of this approach is the UK, where all coverage obligations are measured indoors. The regulator states that when imposing a 98% obligation indoor it expects the equivalent to be 99% outdoor. In addition, the 90% obligation for each nation in the UK is also measured indoor.

### **Transport axes obligations**

One key aspect of population coverage obligations is that they are measured in a way that doesn't account for user mobility. As a consequence, users frequently express frustration at mobile coverage when traveling. This mostly applies to roads and rail lines where coverage is often patchy (at best) even if coverage obligations are otherwise met. France is the only country that has expressed explicit obligations regarding roads and rail as part of its 2018 obligation renegotiation. Key axes were identified in each département for priority coverage by operators.

## Regulatory Strategies regarding obligations

Not all regulators approach coverage obligations in the same way. Various strategies seem to have been implemented, which are worth expanding on briefly.

### Obligations to all licensees

The dominant approach regarding obligations seems to be that they be applied identically to each license holder, at least in the 800Mhz spectrum band where they seem to be prevalent. An interesting exception to this seems to be the UK's Ofcom that applied obligations only to a single license (won by Telefonica/O2 in 2012). The reasoning, presumably, is that the obligations would make the license less attractive, and therefore cheaper, balancing the needs for deeper coverage in the business model. The risk of course could have been that it resulted in a local monopoly in some of the more remote areas, but that does not seem to have been the case since Ofcom announced recently that all operators in the UK had comparable coverage to that of O2. Another exception is Italy, as discussed above, where the local obligations are different for each license in order to ensure coverage at the possible detriment of competition in underserved areas.

### Obligations to specific spectrum blocks

In most cases, coverage obligations are attached to low spectrum bands (800Mhz predominantly, and 700Mhz where it has been made available) but more rarely in the higher bands. The reasoning behind this approach most likely is a focus on service availability rather than higher speeds as higher spectrum bands allow for more throughput over shorter distances. There are however a number of countries where obligations have been imposed on 2600Mhz spectrum blocks:

- France imposes obligations on both 800Mhz and 2600Mhz bands, although the population coverage of the latter is significantly lower than that of the former.
- Italy also imposes some obligations on 2600Mhz forcing targeted underserved areas to be served at least in part with higher spectrum bands in early years, and fully in later years. This presumably to ensure that underserved areas don't get perfunctory coverage to simply tick a box, but get decent quality of service down the line.

### Renegotiating obligations

The French regulator has come to the conclusion in early 2018 that although the initial coverage obligations were met by all license holders (except Free who came late to the party), 4G mobile coverage wasn't necessarily good enough. It therefore entered a round of renegotiation with the license holders who agreed to increased coverage commitments in white spots, transport axes and a commitment to fully transition 2G/3G cell-sites to 4G by 2020.

The counterpart from the regulator's side was too good: first of all, the government agreed to waive off the renewal fees of 10 year licenses due for renewal in 2021-2023. Secondly, the regulator confirmed that it would not attribute new spectrum blocks (for 5G) through an auction process. All in all, this was perceived by experts as a very generous deal favouring operators.

Other regulators have not as of yet entered similar renegotiations of obligations although Ofcom has announced that the upcoming 700Mhz spectrum attributions would be associated with stringer underserved coverage obligations<sup>2</sup>.

### Limitations of coverage obligations?

It should be stressed that factors other than operators' willingness or financial ability to deploy mobile networks broadly may impact coverage including spectrum pricing, the degree to which infrastructure is shared; site acquisition complexity, geography and competitive pressure.

Imposing coverage obligations is one thing, but measuring how they are met can be more challenging than it sounds. Obviously, the more complex or structured the obligations, the more complex the measurement will be. While most

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<sup>2</sup> <https://www.techradar.com/news/ofcom-plans-new-rural-coverage-obligations-for-700mhz-spectrum>

regulators in Europe agree today that obligations they imposed have been met, there's a lot of room for improvement even when that is the case. Coverage for example rarely takes into account elements such as the speed of services or oversubscription in a given area. Measuring those can be tricky and largely dependent on the measurement protocols chosen by the regulators. In this paper, we use coverage numbers announced either by the regulators or the operators themselves. The former can be trusted to be neutral and will generally be reliable. The latter should be treated with caution even though an operator who wildly overstates coverage would expose himself to regulatory backlash anyway.

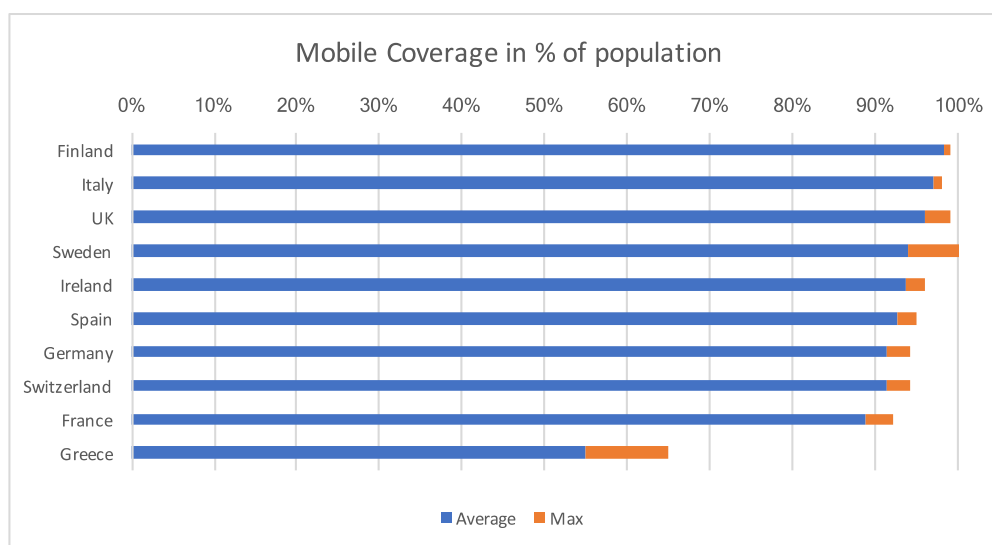
Finally, an important point to remember is that the advent of 4G didn't make previous mobile technologies obsolete overnight. 3G in particular is in most European countries deployed to over 99% of the population and provides decent service in most instances. As a consequence, while it is possible to measure the specific coverage of each spectrum band or even of LTE bands in general, it does not mean that from an end users point of view the service is all or nothing.

The Spanish model of 4G obligations is interesting to consider in this context: it assumes that the end user, ultimately, will not care whether his mobile broadband service is delivered over 3G, 4G (or 5G tomorrow). Of even less importance will be the spectrum band used to deliver the broadband service. What will matter is speed and latency, and these can be measured more easily and consistently. In other words, imposing coverage obligations for mobile broadband rather than for a particular technology may be a more effective means of achieving the state's objectives.

And yet no matter how well crafted the coverage obligations are, one of their major flaws is that the consequences of not meeting the obligations seem non-existent. Apart from a form of public shaming as a result of a regulator stating that a given MNO has not met its obligations, there are no legal or financial consequences to not meeting those. It has been argued (in the case of France) that this absence of tangible consequences associated with unambitious targets might have resulted in coverage achieved being comparatively poor. Governments should consider with the upcoming 5G attributions (as well as some 700Mhz spectrum attributions planned in some countries) what mechanisms to put in place to enforce coverage obligations in order to boost the efficiency of those obligations.

## Assessing the impact of Coverage obligations

As mentioned above, it is hard to prove statistically that coverage obligations result in better coverage. Coverage in our sample varies, as shown below, but 8 out of 10 countries have coverage obligations. And in this sample, the countries with the most stringent (Finland, Sweden, UK) or most targeted obligations (Italy) are clearly leaders in terms of coverage. The two that have no coverage obligations are towards the lower end of the coverage ranks, alongside France who granted very long time horizons to meet its obligations.



Source: Regulators, MNOs, Diffraction Analysis

It certainly seems like the obligations have had an impact on coverage, but the way they are designed and the exact nature of the obligations have an impact as well. In the case of France for example, it's very clear looking at the obligations that they weren't very ambitious from the get go. The population coverage imposed may have been high, but the timeframe given to reach those targets was extremely long (15 years), which may explain why the obligations were not much a constraint. Similarly, Germany has been criticised for forcing operators to work out the market from the least densely populated areas up, which would impact revenue cash flows significantly and therefore could slow down deployment.

Inversely, targeted coverage obligations such as those imposed by Italy and Spain seem to have had a stronger impact on coverage in countries where the economy was (or still is) in turmoil and where geography is not simple and competition is fierce (in the case of Spain at least).



## Conclusions

New Zealand 4G coverage is a little over 95% population coverage with minor differences between MNOs (although it should be noted that one MNO extends coverage through a roaming agreement with another). Considering the challenging geography and low population density, this could be considered normal. That being said, with similar density issues and a very challenging geography as well, Sweden and Finland achieve better coverage. Could more effective coverage obligations help enhance mobile broadband coverage in New Zealand? The question is probably worth addressing.

Over time, it seems that approaches to coverage obligations in Europe have evolved, with the predominant view now being that targeted obligations are more effective in delivering the desired outcomes. The round of renegotiation in France and the upcoming one in the UK as well as the effective approaches of Italy and (to a lesser extent) Spain suggest that this may be the best approach going forward.

In the context of upcoming 5G license attributions, the question of what kind of coverage obligations could be associated with such licenses is interesting to consider. 5G will be much more infrastructure dependent than 4G, which means that deploying 5G in sparsely populated areas will be a lot more challenging for MNOs. The temptation to focus solely on densely populated areas where profitability will be easier to find might be high in the absence of any coverage obligations.

The decision to attach coverage obligations (and the nature of those obligations) to 5G licenses in New Zealand will ultimately be down to policy makers in the context of the policy objectives they set for the country. It is certainly a policy instrument to be considered with attention.

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