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Rialáil Cumarsáide
Commission for
Communications Regulation

ComReg strategy to promote Over-the-Air provisioning

Consultation

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Content

Section Page

Annex

Section Page

Table of Figures

Section Page

1 Executive Summary

Introduction and background

1 Mobile networks provide consumers and businesses with access to connectivity, allowing both people and equipment to communicate, bringing significant benefits to our lives. SIM cards are used in this process to authenticate and authorise access of a phone or machine to an operator's network. SIM cards have evolved substantially over the decades from the credit-card sized SIMs of the 1990s to the nano-SIM standard of today.

2 At present, a SIM card must be removed and replaced in a device in order to switch operators. This is typically followed by 'porting' a number from the old network to the recipient network. Difficulties or delays in this process amount to a barrier to switching and can reduce competitive pressure, and impact the choices made by end-users. In Ireland, however, mobile number porting is amongst the fastest in Europe, with a low number of complaints and ports typically completed in a few minutes (with a requirement of not more than 2 hours).

3 While competition has benefitted significantly from making switching processes as simple as possible, it is not seamless, and users must physically access their device and swap SIM cards, which may act as an impediment to switching. This is particularly true of machines that require connectivity to communicate with one another (e.g., sensors, telemetry, meters, vending machines) that are widely dispersed across the country and may not be easily accessible, which reduces the ability and incentive to switch.

4 A recent innovation is the remotely provisioned embedded SIM ("eSIM")[1] that enables over the air ("OTA") provisioning of network operator credentials and the ability to switch operator without the need to replace SIM cards. If properly implemented, OTA provisioning opens up possibilities for further simplifying the switching process for consumers and business alike as well as the deployment of new and innovative services. Furthermore, an eSIM can store multiple profiles or numbers on a single device, which may be useful for certain use cases (e.g., accessing local rates while travelling abroad). Machine-to-Machine ("M2M") use cases will benefit from the removal of the SIM card, with simpler manufacturing and distribution of devices pre-equipped with connectivity and switching enabled via connectivity being "pushed" OTA to the devices by the new provider (common with companies managing their own devices e.g. utilities / smart meters).

[1] eSIM is a form of reprogrammable SIM that is embedded directly into a device.

Table 1: Summary of differences between traditional SIMS and eSIMs

Traditional SIMs	eSIMs
Carrier specific & contains only one carrier profile	Operator or OEM specific but can support multiple carrier profiles
Carrier profile cannot be replaced remotely	Remote download & management of additional carrier profiles
Physical SIM swap is required to change carriers	Eliminates physical SIM swaps. Over-the-air profile management
Different SIM for each carrier	One SIM for multiple carrier

eSIM availability and growth

5 eSIM device penetration in Ireland is currently low for consumer use cases ("Consumer") such as smartphones and smartwatches, although likely higher than other European countries due to Ireland's high reliance on leading handset manufacturers. Notwithstanding, Irish MNOs have been slow to support eSIM to date, with only Vodafone making it available for certain smartphones (but not secondary devices such as smartwatches).

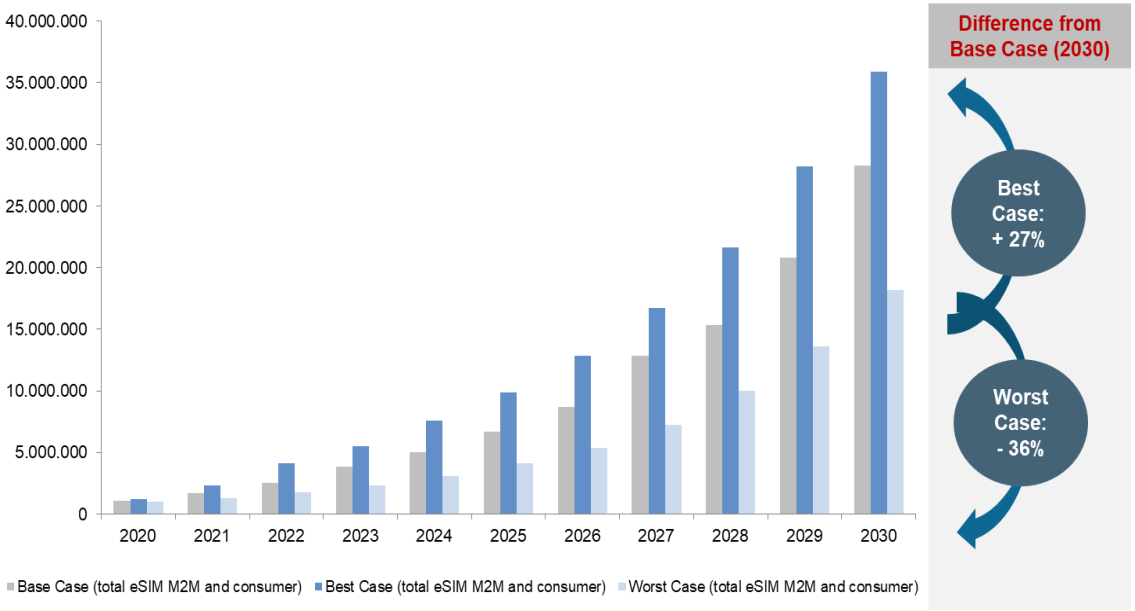
6 In contrast, eSIM device penetration is more advanced for leading M2M use cases, as a result of the progress in the rollout of eSIM in smart meters (where Three provides connectivity) and connected cars. eSIM support is more advanced for M2M use cases, with Three and Vodafone (which collectively account for 99% of M2M subscriptions) offering eSIM support across domestic and international use cases (e.g., smart meters and connected cars).

7 Significant growth of eSIM compatible devices is expected for both Consumer and M2M. For example, WIK have estimated that:

- 15% of smartphones are eSIM-compatible, and this is forecast to increase to 35% by 2025 and 75% by 2030.
- 40% of consumer IOT devices are eSIM-compatible, and this is forecast to increase to 55% by 2025 and 75% by 2030.
- 40% of M2M devices are eSIM-Compatible and, this is forecast to increase to 55% by 2025 and 75% by 2030.

8 Under WIKs base case scenario, around 28.3 million devices in Ireland will be equipped with eSIM in 2030, and 27 million will have been activated. This is a 1.4% share of all eSIM devices in the EU and anticipated rates of growth above the EU average (from the current low base).

Figure 1: Total number of eSIM devices in Ireland (2020-2030)



Benefits of OTA provisioning

9 OTA provisioning allows for seamless switching across operators without the need for any physical action by the consumer or operator. This will facilitate faster and easier switching between connectivity providers, improve competition between providers and increase connectivity through enabling greater IoT deployment. Such benefits will become all the more relevant as thousands of new consumer devices (phones, wearables, trackers) that require connectivity are launched every year. Consumers are also likely to have an increased requirement for secondary services (e.g. multiple numbers per handset).

10 Switching is more complex for M2M than for consumer applications and is currently project-based rather than relying on standardised procedures. OTA provisioning provides the opportunity for industrial customers to purchase devices without connectivity pre-installed and to provision them in the field, as well as presenting an opportunity for switching, which would not be possible without a field visit or the recall of devices in the current physical SIM environment.

11 eSIM/OTA provisioning also makes good business sense for mobile operators who would be able to digitise the process of providing consumers with a wide range of connectivity requirements:

- **First**, eSIM can contribute to lower costs because a fully digitised process can reduce the need for physical processes (e.g., retail space and/or customer support), as well as eliminating the need for physical mail-outs of SIM cards when ordered online.

- **Second**, OTA provides opportunities for operators to increase revenues and/or target market share by opening up new approaches to pricing and bundling of services, which are required for the ever-increasing range of connected devices and could be provided under one or more subscriptions.

12 Further, with the advancement of the Internet of Things (IoT), machines are becoming ever more connected which opens up significant opportunities for mobile operators to compete for M2M/IoT subscriptions in ways previously not possible. For example, the new use cases enabled by eSIM should provide an opportunity for operators to engage in the growing markets for M2M connectivity and applications, and secondary services.

13 The use of eSIM and OTA provisioning is also more sustainable as it replaces physical production of plastic SIM cards and removes the logistical footprint of transporting SIM cards across the world. Around, 4.5 billion SIM cards are produced globally, involving 20,000 tons of polymers. The carbon footprint of plastic from SIM cards and the associated housing has been estimated at 35g of CO2 per card. Such usage will be reduced in line with further rollout and uptake of eSIM and OTA provisioning.

Challenges to implementation of OTA

14 In recognition of these benefits the European Electronic Communications Code (EECC) [2] requires each Member State to promote OTA provisioning to facilitate switching and also gives discretion to NRAs to define switching processes that utilise OTA provisioning.

15 However, there are a number of challenges to overcome in order to successfully and appropriately implement this new technology. These challenges create the risk that a future OTA provisioning process would not function effectively, and the benefits of OTA would not be fully unlocked. Such challenges include:

- A lack of eSIM support by mobile service providers and/or insufficient choice of providers hindering competition and choice, with implications for innovation, price and quality;

[2] European Electronic Communications EECC is an EU directive, which regulates electronic communications networks and services. EECC was adopted in December 2018 and consolidated and reformed the existing regulation framework.

- Potential lack of a user-friendly OTA provisioning and/or switching options which create unnecessary frictions in the switching processes, hindering competition and choice;

- Poor awareness of OTA which results in a failure to embrace new services and technologies, undermining the business case for eSIM rollout and support;

- Limited eSIM/OTA support in industrial sectors (other than utilities and automotive sectors) and potential challenges to M2M switching;

- International challenges including lack of standards to support multiple companion devices and potential to use multiple profiles simultaneously; and

- A lack of information about developments in the market makes it difficult for market participants and the regulator to monitor developments in real time, and where necessary identify inefficiencies in the roll out of OTA.

ComReg strategy and actions to promote OTA

16 ComReg is of the view that an overarching strategy is required in order to overcome such challenges and provide all stakeholders the opportunity to make best use of OTA provisioning in the future. In that regard, the main objective of this paper is to inform ComReg's development of a strategy to promote OTA provisioning to facilitate switching between mobile service providers, for both Consumer mobile and for M2M/IoT .

17 To advise on the development of a strategy, ComReg engaged WIK-Consult GmbH ("WIK") to conduct a study. As part of the study, ComReg and WIK engaged with mobile service providers at local and group level and with other key stakeholders in the eSIM/OTA value chain. WIK's analysis framework initially identified the OTA provisioning needs for a number of discrete Consumer and M2M use cases and developed a vision for the ideal future outcomes OTA provisioning could enable for these use cases.

18 In this consultation, ComReg sets out its proposed strategy for implementing a fit for purpose OTA regime in Ireland. As part of its strategy, ComReg proposes to finalise a set of actions ("the Action Plan") that address the various challenges outlined and are designed to promote and improve the adoption of OTA provisioning for consumer mobile and M2M services.

19 With that in mind, ComReg proposes the following actions which may be amended or supplemented following stakeholder engagement.

- **Action 1**: **Require fully-digital Over-the Air customer journeys for consumer mobile.**

This action, if adopted, would mandate MNOs to provide fully digital consumer activation, switching and porting journeys for eSIM-enabled smartphones within 12 months of ComReg publishing its response to consultation, the Action Plan and any supporting Decision(s);

- **Action 2**: **Develop guidance on OTA provisioning**[3] **for Consumer Mobile**

  ComReg would develop guidance ("Guidance for OTA provisioning for Consumer Mobile") regarding the design and implementation of an optimised OTA product and processes to support fully-digital consumer journeys.

- **Action 3: Requiring the industry MNP Committee to review existing MNP processes**.

  This review would consider whether any improvements and changes are required to support OTA provisioning and to improve the porting process in general but in particular for the purposes of OTA provisioning, within 6 months of any Decision.

- **Action 4: Develop guidelines/ rules on minimum contractual conditions to better facilitate M2M switching processes.**

  OTA may simplify M2M switching, enabling greater competition in M2M. ComReg considers that clear contractual terms may empower M2M customers to switch. Furthermore, internationally standardised OTA switching processes for M2M could be beneficial.

- **Action 5: ComReg to launch an awareness campaign promoting eSIM to industry, organisations and consumers.**

  ComReg would launch an awareness campaign concerning the benefits of eSIM for industrial, consumer and public sector.

- **Action 6: Monitor engagement between MVNOs and their hosts concerning eSIM support.**

  This action will be conducted in line with ComReg's ongoing monitoring of the competitive dynamics in the Irish mobile market, as specified in Information Notice 21/101[4].

- **Action 7: ComReg to gather information and data on eSIM adoption and activation**

  ComReg does not currently gather data relating to OTA device deployment and activation. Further information regarding eSIM deployment or activation would facilitate monitoring of the market and the evaluation of ComReg's' action plan.

[3] Specifically, Over-the-Air activation, switching and porting for consumer mobile.
[4] The role of MVNOs in evolving mobile markets: Report from WIK Consult, published 13 October 2021, https://www.comreg.ie/media/2021/10/ComReg-21101.pdf

- **Action 8: Promote consideration of OTA by BEREC/CEPT**

  ComReg considers it appropriate to promote the report and its key findings (specifically those outlined above) to international regulatory bodies such as CEPT and BEREC and discuss how such bodies could further assist in overcoming potential challenges (e.g., oversight of multinational M2M operators).

- **Action 9: Future review and evaluation of developments in OTA provisioning.**

  In order to promote OTA provisioning, ComReg considers it appropriate to review and evaluate developments in OTA as it deems necessary (but no later than 2026).

20 Table 2 below provides a high level summary of the challenges, the actions proposed to address those challenges and the impacted user groups.

Table 2: Summary of challenges and proposed actions

Challenges	Proposed actions	User Group
Delayed eSIM support by Irish MNOs for consumer mobile	Action 1	Consumer
Potentially sub-optimal OTA processes	Action 2 and Action 3	Consumer
Poor awareness of eSIM and/or OTA	Action 5 and 7	M2M and Consumer
M2M contractual terms potentially inhibiting OTA switching	Action 4 and Action 7	M2M
MVNO barriers to compete	Action 6 and Action 7	M2M and Consumer
Future or international challenges	Action 7 and Action 8	M2M
Lack of information about developments in market	Action 7 and Action 9	M2M and Consumer

21 This consultation also necessarily discusses potential existing barriers that could reduce the effectiveness of OTA switching (e.g., handset locking) and also seeks feedback on how these could be effectively addressed. Such issues may be addressed in separate future workstreams.

Next Steps

22 ComReg invites feedback on the proposals in this consultation document. ComReg lists a number of questions for interested parties at the end of each Chapter. Respondents should provide clear explanation for their answers and any point of disagreement (e.g., the reason for disagreement and their preferred approach). Supporting evidence for any position taken would be welcome. The consultation period will run until 17 December 2021.

23 ComReg's response to consultation, to include ComReg's final strategy and action plan and any supporting decision instruments, is planned for completion by Q2 2022 at the latest. The project overview and envisaged timelines are outlined in Figure 1 below.

Figure 2: Provisional timeline for the OTA Project

2 Introduction

24 The Commission for Communications Regulation ("ComReg") is the statutory body responsible for the regulation of the electronic communications (telecommunications, radiocommunication and broadcasting networks), postal and premium rate sectors in Ireland in accordance with European Union ("EU") and Irish Law.

25 ComReg also manages the national numbering resource, among other responsibilities. Within the EECC Articles on 'Numbering Resources', Article 93(6) requires Member States to promote OTA provisioning to facilitate switching between service providers. Article 106(6) of the EECC states that NRAs may establish the details of the switching and porting processes, including requiring operators to provide porting services via OTA provisioning, where technically feasible.

26 A Subscriber Identification Module ("SIM") card is an integrated circuit that securely stores the International Mobile Subscriber Identity ("IMSI") number and its related authentication key, within mobile telephony devices (such as mobile phones and tablets). The traditional SIM card must be removed and replaced in a device in order to switch provider. The primary purpose of the SIM and IMSI is to identify and authenticate subscribers on mobile networks.

27 OTA provisioning relies on 'embedded' SIM (eSIM) technology. An eSIM[5] is effectively a SIM card that is embedded directly into a device, which can allow for remote or OTA provisioning, using software (the "eUICC").[6] An eSIM can be provisioned remotely; end-users can add or remove operators without the need to physically swap a SIM from the device. The most widely used eSIM standard is the GSMA 'eSIM standard' ("GSMA eSIM Standard"). The GSMA defines eSIM as "*a global specification by the GSMA which enables remote SIM provisioning of any mobile device*"[7].

28 In its Electronic Communications Strategy Statement for 2021 to 2023 (ComReg Document 21/70[8]), ComReg set out its intention to:

[5] eSIM is not the sole technology that enables OTA, for example other new embedded SIM technologies such as iSIM or nuSIM can facilitate OTA. In its analysis ComReg and WIK refer to eSIM which is the embedded SIM technology with the greatest market penetration at present.
[6] eSIM and eUICC are often used seemingly interchangeably, even though there is a difference between the two: the eSIM is the hardware component of the SIM and a physical form that can be soldered into a solution. The eUICC (Universal Integrated Circuit Card) is the software component that allows the remote SIM provisioning of multiple network profiles. For clarity, ComReg will use eSIM to refer to reprogrammable SIMs throughout this Consultation.
[7] www.gsma.com/esim.
[8] ComReg Document 21/70 Electronic Communications Strategy Statement 2021-2023

- commission an expert study in early 2021 to support the development of a strategy for the promotion of OTA provisioning in Ireland;
- engage with both national and international stakeholders as part of this study; and
- develop an action plan for promoting OTA provisioning.

29 This Consultation aims to consider and identify what actions are required to promote OTA provisioning and to ensure that Irish mobile service providers deliver the best possible customer activation, switching and number porting experiences, in accordance with ComReg's statutory functions and objectives and with the requirements in Articles 96(3) and 106 of the EECC. This Consultation document undertakes an assessment of:

- the legal and technical elements relevant to ComReg's requirement to promote OTA provisioning to facilitate switching under the EECC;
- the potential benefits and impacts of OTA provisioning on consumers and competition;
- the barrier and challenges that currently exist and prevent stakeholders from unlocking the full benefits of OTA; and
- the potential actions for ComReg to overcome those challenges and promote OTA provisioning and strategy.

30 ComReg commissioned WIK to assist in conducting market and economic research, data gathering and the development of a vision and strategy for the promotion of the OTA in line with both the EECC and ComReg's objectives. ComReg has published WIK's report (Document 21/114a) (the "WIK Report")[9] alongside this consultation paper. WIK's Report was informed by information gathered from, amongst other sources:

- Interviews conducted by WIK and ComReg with stakeholders including MNOs, MNO Groups, Industry Associations, eSIM solution providers and eSIM manufacturers (the "Stakeholder Interviews");
- Responses received from 22 NRAs to an Request for Information ("RFI") sent by ComReg issued in March 2021 to members of the Independent Regulators Group[10] ("IRG") (the "IRG RFI"): and

[9] ComReg 21/114A - WIK Consult GMBH - ""Strategies to promote Over-the-Air provisioning"" "
[10] The Independent Regulators Group ("IRG") is a group of European National Telecommunications Regulatory Authorities (NRAs) that functions as a forum for exchange of best practices and discussions on regulatory challenges in communications between NRAs.

- Analysis of relevant data including ComReg's Market Intelligence and customer complaints; and
- WIKs forecast for eSIM deployment and activation in Ireland.

31 ComReg seeks and welcomes the views of interested parties on all aspects of the preliminary findings set out herein which will be used to inform ComReg's future development of a strategy for the promotion of OTA. In particular, ComReg sets out a series of questions for interested parties on the preliminary views outlined at the end of each chapter.

The structure of this report

32 This document is laid out as follows:

- **Chapter 3:** Background information on OTA provisioning;
- **Chapter 4:** Potential benefits and impacts of OTA provisioning on consumers and competition;
- **Chapter 5:** ComReg's proposed strategy for promoting OTA provisioning;
- **Chapter 6:** Details on how to submit comments and the next steps in the process.
- **Annex 1:** Provides information on ComReg's Legal Framework and Statutory Objectives.

3 Background

33 This Chapter provides some background information relevant to the consultation, including:

- Statutory objectives and duties – Section 3.1.
- Background on eSIM and OTA – Section 3.2.
- Relevant work of ComReg on switching in ECS - Section 3.3; and
- Relevant work of other NRAs relating to OTA provisioning - Section 3.4.

3.1 Statutory objectives and duties

34 Article 93(6) of the EECC requires Member States to promote OTA provisioning to facilitate switching between service providers:

> *"Without prejudice to Article 106, Member States shall promote over the-air provisioning, where technically feasible, to facilitate switching of providers of electronic communications networks or services by end-users, in particular providers and end-users of machine-to-machine services."*

35 The European Commission has clarified that promotion could mean either binding measures or adopting a "soft law" approach (e.g. publishing best practice guidelines):[11]

> "*The obligation in Article 93(6) ("promote") leaves a wide margin of flexibility to Member States when transposing and implementing Art. 93(6). As such, this provision does not require transposition in their national legislation or via secondary technical provisions. However, Member States are required to take measures to promote "OTA provisioning". This may imply the adoption of measures encouraging such use, either through binding measure or through soft law (e.g. publishing best practice, policy orientations) with the stated aim to "promote" OTA.*"

36 Article 106(6) of the EECC states that NRAs may establish the details of the switching and porting processes, including requiring operators to provide porting services via OTA provisioning, where technically feasible:

[11] European Commission (2020) "Questions and Answers on the EECC"

"National regulatory authorities may establish the details of the switching and porting processes, taking into account national provisions on contracts, technical feasibility and the need to maintain continuity of service to the end-users. This shall include, where technically feasible, a requirement for the porting to be completed through OTA provisioning, unless an end-user requests otherwise".

37 It is noteworthy that Article 93(6) and 106(6) are conditional on OTA provisioning being "*technically feasible*" as distinct from economically feasible. Crucially, ComReg notes WIK's finding that ***OTA provisioning is technically feasible for both Consumer and M2M use cases***[12] and that there were no factors unique to Ireland that invalidate this finding.

38 ComReg's relevant statutory objectives are set out in Annex 1. These include for the purposes of this consultation:

- Ensuring that users derive maximum benefit in terms of choice, price and quality;
- Ensuring that there is no distortion or restriction of competition in the electronic communications sector;
- Contributing to the development of the internal market; and
- Promoting the interest of EU citizens.

39 The promotion of OTA provisioning is consistent with these objectives for a number of reasons, including the following.

- In relation to ***end-users' rights and consumer protection***, the ability to switch and port are end-user rights and the introduction of OTA switching and porting necessarily increases support for consumer end rights and abilities.
- In relation to ***protecting and promoting competition***, the research and evidence in the WIK report demonstrates that OTA provisioning will increase competition in mobile markets, primarily through increasing switching for Consumer and M2M use cases but also through facilitating entry by new providers and services.
- In relation to ***connectivity***, OTA provisioning will enhance connectivity through increasing the number and types of mobile devices and improving their ease of use, for M2M use cases in particular.

[12] WIK Report page 74.

- In relation to ***contributing to the development of the internal market*** and ***promoting the interest of EU citizens***, it is in the interests of users to be able to switch easily between operators and to have choice as to which operator they use wherever they travel. Furthermore, this supports a core aims of the European Commission's digital strategy for the EU by removing barriers to the functioning of the EU's digital single market[13].

40 Therefore, it is appropriate and timely to promote OTA provisioning for the purposes of OTA switching and porting processes and recalling once again that standards-based OTA customer signup and switching journeys have already been introduced in most European and global markets, except Ireland.

3.2 Background on eSIM and OTA

41 This section provides some relevant background on:

I. eSIM and OTA use cases;

II. The developing eSIM and OTA ecosystem; and

III. The deployment of eSIM and OTA in Ireland.

I. eSIM and OTA use cases

42 OTA and eSIM have many potential use cases, being used in wide array of devices. WIK developed a typology for eSIM use cases in order to understand and simplify eSIM use cases in terms of their provisioning requirements. These use cases are:

- Consumer Mobile (e.g., smartphones);
- Secondary Devices (e.g., smartwatches);
- Consumer International Mobile (e.g., roaming);
- M2M National (e.g., smart meters); and
- M2M International (e.g., automotive).

[13] European Parliament, "*Report on shaping the digital future of Europe: removing barriers to the functioning of the digital single market and improving the use of AI for European consumers*" (2020/2216(INI))

43 For the reasons set out in Section 4.1 of the WIK Report, ComReg is of the preliminary view that the potential use case groupings set out above are appropriate and any measures taken by ComReg or Industry should provide support for same.

44 Further, WIK found that OTA is technically feasible for all use cases identified[14]. ComReg refers readers to Section 3 of the WIK Report for more detailed information on the technical aspects to eSIM and OTA.

II. The developing eSIM and OTA ecosystem

45 OTA provisioning is now ready for wider adoption internationally, following a number of years of ecosystem development. In particular:

- OTA standards continue to develop;
- eSIM devices have become far more widespread;
- MNOs support for eSIM is improving; and
- Consumer awareness of OTA provisioning is however low.

Relevant OTA standards continue to develop

46 WIK found that the leading eSIM standard, the GSMA's eSIM, is well developed with numerous provisions and accreditation for security and has become the de-facto eSIM standard for Consumer use cases. WIK note that this standard continues to be developed to meet industry requirements[15]. ComReg notes that other technologies that enable OTA are in earlier stages of development, in particular for M2M (e.g., NuSIM, iSIM).

eSIM Consumer devices have become more widespread

47 Since the publication of the eSIM standards by the GSMA in 2016, device manufacturers have introduced an increasing number of mobile handsets and other devices (e.g., wearables) with eSIM support. For example, eSIM support is now standard in at least the leading manufacturers' flagship handset models (e.g., Apple, Samsung, Google). eSIM supported devices for M2M have similarly become more widespread in recent years, especially among leading use cases such as automotive.[16] A large increase in the number of eSIM and its relative share of SIMs is forecasted.[17]

[14] WIK Report pages 74.
[15] WIK Report Table 5-1.
[16] For example, since 2018 all cars sold in Europe must support eCall which is typically done via an eSIM-enabled communications module in the car.
[17] Based on stakeholder interviews and publicly available sources, see WIK Report Section 7.5.

MNO support for eSIM is improving

48 In June 2020, GSMA illustrated eSIM support among MNOs internationally (See Figure 2) which eSIM support in 64 countries, with Ireland lagging peers in Europe and the Americas[18]. By December 2020, eSIM-enabled services were commercially available from 175 mobile service providers (MNO, MVNO and global connectivity providers such as Truphone or SIM Local) in at least 69 countries.

Figure 3: GSMA map of eSIM support by MNOs internationally

Source: GSMA. Presence of eSIM as of May 2021 support shown in blue

49 In the stakeholder interviews conducted by ComReg and WIK, MNOs noted that a decision of key OEMs, specifically Apple, to launch eSIM-only models would mark an inflection point whereby all MNOs would require eSIM support to remain competitive in key customer segments. In response to a GSMA survey in March 2021, 40% of MNOs expect the transition to eSIM-only smartphones for a majority of manufacturers (e.g., Apple and Samsung) to occur by 2023[19].

50 Traditionally, SIM manufacturers have offered some additional SIM management functions. However, SIM manufacturers may play a more integral role in the eSIM ecosystem, by not only manufacturing eSIMs for installation in devices but also providing eSIM management solutions and hosted services. ComReg understands that the majority of MNOs that adopt eSIM support do so through partnering with such eSIM solutions providers.

Consumer awareness is low

[18] Mobile World Live - "Enterprise eSIM Device Management"
[19] GSMA Intelligence "*eSIM: State of the consumer market and the road ahead*"

51 Consumer awareness of eSIM remains low despite extensive availability and improving MNO support. A survey by GSMA found that only 20% of consumers are aware of eSIM, with awareness higher amongst 25–34-year-old consumers[20].

III. eSIM and OTA in Irish markets

Consumer

52 ComReg notes WIK's findings that "*Irish mobile subscribers are relatively well equipped with eSIM capable smartphones compared with other countries*"[21] with a likely greater share of eSIM supporting devices, given the higher reliance on Samsung and Apple brands and high rate of adoption of new models in Ireland[22].

53 WIK estimate that at least 15% of iPhone and 6% of smartphones support eSIM and this figure will be in the region of 15%-40% of smartphones by the end of 2022[23]. WIK notes that the number of eSIM activations will ultimately depend on the timing of eSIM support offered by MNOs[24].

54 ComReg is cognisant that Ireland is lagging comparable countries in the deployment of OTA provisioning for Consumer use cases. For example:

- In March 2021, the IRG RFI[25], confirmed Ireland was among a minority of EU MS that had no eSIM support for either Consumer Mobile or Secondary Devices[26]; and
- In May 2021, GSMA Intelligence published a map of eSIM support among MNOs internationally that showed that Irish MNOs were behind not only MNOs in Europe but also internationally (see Figure 2).

55 In April and May, and over the course of several interviews, ComReg and WIK engaged in discussions with MNOs to understand the reasons for this delay and their plans regarding eSIM deployment and OTA provisioning.

[20] GSMA Intelligence "*eSIM: State of the consumer market and the road ahead*"
[21] WIK Report, page 115.
[22] WIK Report, Figure 7-2.
[23] WIK Report, Figure 10-4.
[24] WIK Report, page 122.
[25] 21 NRAs provided a response.
[26] 3 of the 21 EU MS had no MNO offering eSIM support for consumer mobile.

56 In June 2021, Vodafone announced via a press release[27] its intention to launch eSIM for Consumer Mobile. Three have an eSim provisioning platform already in place providing eSIM support for M2M use cases and have announced publicly that it will be in a position to offer eSims to consumers over the coming months.[28]

57 At the time of publication, eSIM support is available for the following use cases in Ireland:[29]

- **Only** Vodafone offers eSIM support for Consumer Mobile (e.g., smartphones);
- **No** MNO offers eSIM support for Secondary Device (e.g., smart watches);
- MNOs offer eSIM support for Travel and Roaming (e.g., Truphone);
- MNOs offer eSIM support for National M2M (e.g., ESB smart meters); and
- MNOs offer eSIM support for International M2M (e.g., connected cars)

58 Consequently, Ireland is still lagging in terms of eSIM deployment, with most European countries having multiple MNOs providing eSIM support for both Consumer Mobile and Secondary Devices. The lack of MNO support denies Irish consumers the benefits of OTA provisioning, with such foregone benefits increasing over time as eSIM supporting devices become more widespread.

M2M

59 ComReg notes WIKs findings that "*Ireland is relatively advanced compared with other European countries as regards the penetration of IoT devices"* as a result of Ireland greater share of newer car models (eCall[30] is a requirement since 2018[31]) and the ESB's National Smart Metering Programme, which will install 2.3 Million eSIM equipped smart meters by the end of 2024.

[27] Vodafone Ireland's Network Now 100% Powered By Electricity From Renewable Sources
[28] https://www.independent.ie/business/technology/mobileesim-cards-are-coming-to-irish-phones-but-not-apple-watches-40577327.html
[29] To aid analysis WIK developed groupings for use cases, which were Consumer Mobile; Secondary Devices; Travel, Domestic M2M; and International M2M.
[30] eCall is an automatic emergency calling capability being fitted in all new cars sold in the EU since 31 March 2018, See https://ec.europa.eu/transport/themes/its/road/action_plan/ecall_en
[31] WIK Report, pages VII.

60 WIK estimates that at least 40% of M2M devices support eSIM and that this estimate will be in the region of 40%-60% of such devices by the end of 2022. WIK notes that the number of eSIM activations will depend on eSIM support offered by MNOs.

61 MNOs eSIM support for M2M is more advanced for the leading M2M use cases. For example:

- eSIM support is provided by Three and Vodafone, which account for almost all M2M subscriptions (>99%)[32]; and
- a large number of devices for leading use cases are already activated (e.g., cars and approximately 750,000 smart meters as of 2021).

3.3 Relevant ComReg work on switching in mobile markets.

Mobile Number Portability

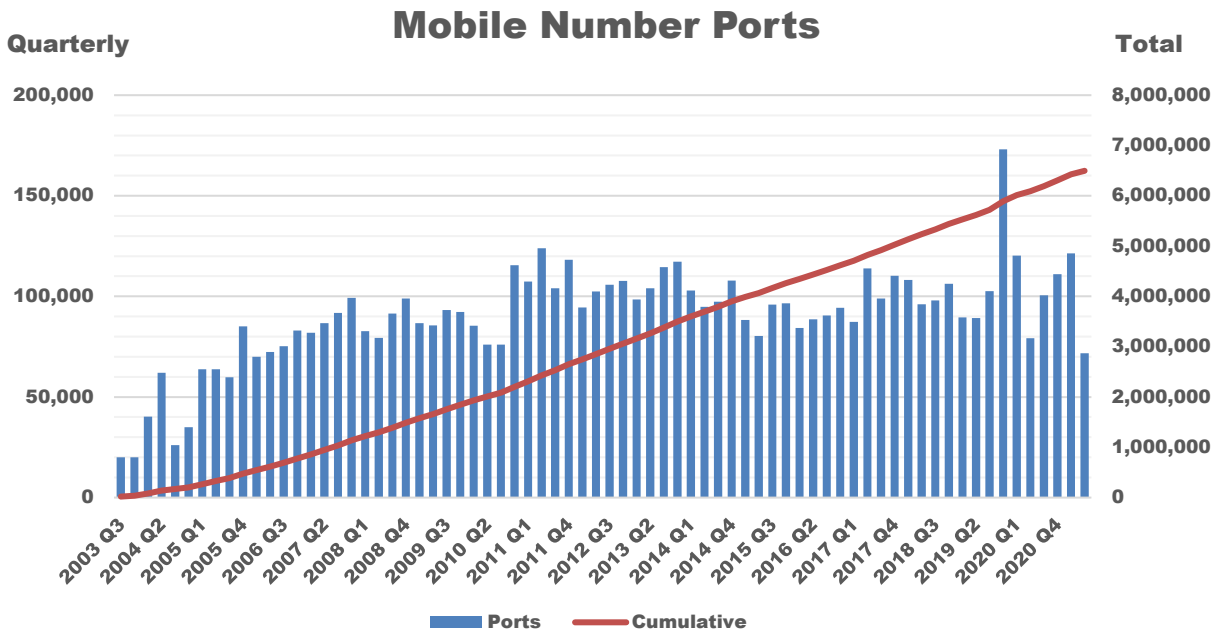
62 MNOs and MVNOs have an obligation to provide Mobile Number Portability ("MNP") under Regulation 25(1) of the Universal Services Regulations.[33] The port is initiated by the customer, who makes a request to the new operator, then automatically confirmed by SMS or a voice call using a code. Generally, mobile number portability in Ireland is considered to be a simple and rapid process, that normally completes within a few minutes.

[32] ComReg Quarterly Key Data Report, Q2 2021.
33 S.I. No. 337/2011 - European Communities (Electronic Communications Networks and Services) (Universal Service and Users' Rights) Regulations 20112011.

63 MNP was first introduced in Ireland in 2003[34] with a 2 hour[35] target for completion of single-line users ports, and the majority of such ports being completed within minutes. This is faster than the 1 working day required under European Law since 2011[36]. Whilst ComReg was heavily involved in facilitating the development of a fit for purpose and consumer friendly MNP process prior to launch[37], the process is now governed by the MNOs themselves and the independent central database needed for MNP is currently managed by an Irish company, Ward Solutions[38]. The MNP Service Establishment Group ("MNP SEG") meets as required to coordinate an inter-operator testing program to allow a new MNO or MVNO to provide MNP.

64 As shown in Figure 4 below, the total number of mobile numbers ported since 2003 is approximately 6.5 Million, with annual porting of approximately 400,000 numbers.

Figure 4: Mobile Number Ports Q3 2003-Q2 2021



Source: ComReg Quarterly data reports.

[34] ComReg Media Release- 25th July 2003 "*Mobile Number Portability available from today onwards*".
[35] Mobile Number Portability Process Manual Issue 6.01 – Q1 2012.
[36] Under Regulation 25(4) of the European Communities (Electronic Communications Networks and Services) (Universal Service and Users' Rights) Regulations 2011 ("the Universal Service Regulations") which provides that: "*25. (4) Undertakings referred to in paragraph (1) shall ensure that – (a) the porting of numbers and their subsequent activation shall be carried out within the shortest possible time, (b) in the case where a subscriber has concluded an agreement to port a number to a new undertaking, that number shall be activated within one working day, and (c) loss of service during the porting process shall not exceed one working day*."
[37] ODTR 01/56 "*Implementing Full Mobile Number Portability in Ireland*"

M2M service provider switching

65 In 2018 ComReg carried out a review of mobile numbering in which it consulted[39] on the processes for M2M switching, noting that Service Provider Switching must be provided for, since it is both a pro-competition measure and a legislative requirement. ComReg examined a number of potential solutions to facilitate M2M switching including: MNP; Block Assignment; and OTA provisioning. ComReg also noted[40] that NRAs may be required to mandate such OTA provisioning:

> "*If the facility is not introduced in a timely manner, then NRAs may need to consider the need to become active in the work, or to introduce regulatory mechanisms or incentives to foster OTA provisioning. It may even require the consideration of a statutory obligation to introduce OTA provisioning within a certain time period.*"

66 In its response to consultation[41], ComReg noted that there was broad support among respondent operators for OTA provisioning as a means of M2M switching. However ComReg also noted that these operators also submitted that ComReg should not propose specific national regulatory requirements for M2M switching at that stage.

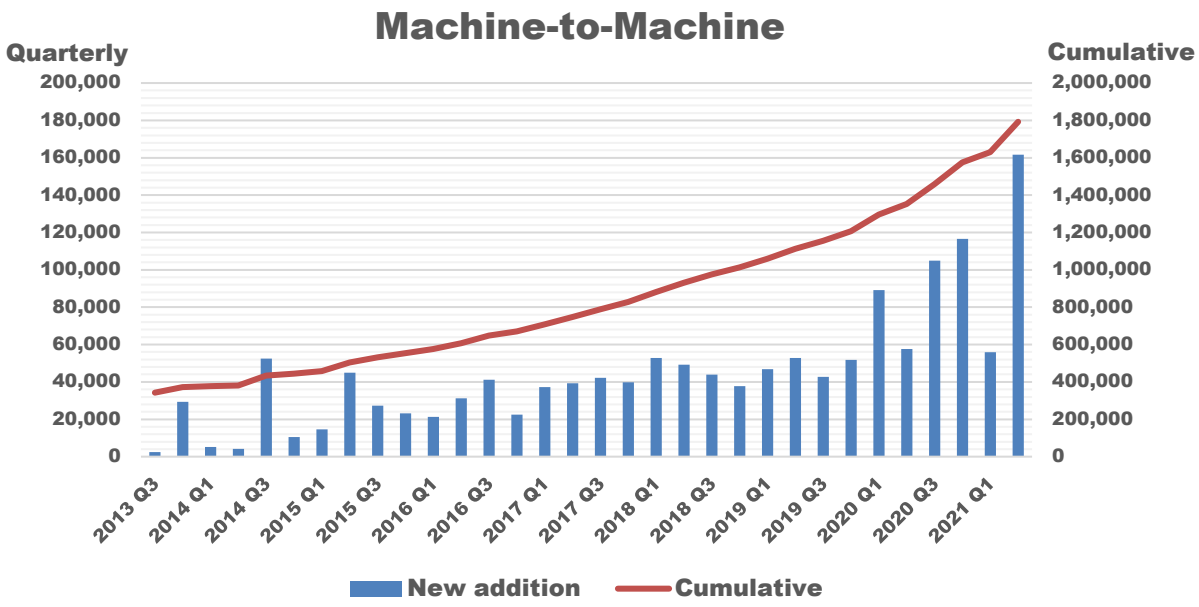
> "*In summary, there was broad support for the use of OTA as an option when switching provider. There was less support for other mechanisms …. Vodafone and Three see a role for OTA (Over the Air) in facilitating switching*"

67 In Document 18/46, ComReg decided not to impose a specific M2M switching process at that time and, while noting the broad support from operators for OTA, indicated that it would further consult on M2M switching and OTA provisioning in due course.

68 As of Q3 2021, there are approximately 1.8 Million M2M subscriptions, accounting for 25% of total mobile subscriptions. As shown in Figure 5 below, M2M subscriptions are increasing rapidly with gross additions of 160,000 in Q2 2021 and year-on-year growth rate of 33%.[42]

[39] ComReg 18/03 "Review of Mobile Numbering – Promoting Innovation and Facilitating New Services" – Consultation – Section 6 (Switching between Service Providers)
[40] ComReg 18/03 – Section 6.5 paragraph 270
[41] ComReg 18/46 and D06/18 -"Review of Mobile Numbering Promoting Innovation and Facilitating New Services" – Response to Consultation and Decision – See https://www.comreg.ie/publication-download/review-of-mobile-numbering-response-to-consultation-and-decision. See Section 6 on switching. It may also be useful to review the relevant sections of consultation document ComReg 18/03 and the Submissions to Consultation, provided in ComReg 18/47.
[42] ComReg began to publish information on SIMs used for M2M communications which then accounted for 6.3% of all mobile subscriptions.

Figure 5: M2M subscriptions Q3 2013-Q2 2021



Source: ComReg Quarterly data reports

Guidance on Internet Access Switching

69 ComReg recently published a guidance document[43] that is focused on appropriate inter-operator processes to facilitate the end-user's right to exercise choice and change provider of Internet Access Switching[44] ("IAS"), which includes mobile networks, in accordance with Article 106 (1) of the EECC.

70 The contents of this Consultation and WIKs Report are without prejudice to ComReg's guidance relating to internet access switching. Noting that, ComReg's *Guidance on OTA provisioning for Consumer Mobile* in Section 5.3 sits atop this guidance, relating specifically and only to OTA provisioning for mobile services and neither supplants nor overwrites the guidance contained in Document 21/107R.

3.4 Relevant work of other NRAs on OTA Provisioning and

[43] ComReg 21/107R – "Regulatory Guidance on Title III: End-User Rights of the European Electronic Communications Code; Inter-operator processes – principles to facilitate end-user rights to switch internet access services" – Information Notice – See https://www.comreg.ie/publication/regulatory-guidance-on-title-iii-end-user-rights-of-the-european-electronic-communications-code.

[44] As noted in Section 1.6.3 a) of ComReg Document 20/111R, "IAS" are defined by reference to Article 2 of Regulation EU 2015/2120 as "a publicly available electronic communications service that provides access to the internet, and thereby connectivity to virtually all end points of the internet, irrespective of the network technology and terminal equipment used."

switching in Mobile ECS.

71 The IRG RFI confirmed that ComReg was among the first NRAs to examine the practicalities of implementation of Article 93(6) and Article 106(6) in the context of OTA. Since then, the Communications Regulatory Authority of the Republic of Lithuania ("RRT")[45] has also been examining how to promote OTA provisioning and ComReg has liaised with the RRT in that regard. NRAs in Japan, Australia, and Singapore have also examined OTA provisioning in other contexts, which ComReg briefly summarises below.

72 In April 2018, the Australian Competition and Consumer Commission ("ACCC") released its final report[46] for the communications sector market study, in which the ACCC determined to further examine potential competition issues it had identified regarding eSIMs. In December 2019, the ACCC published its assessment of such competition concerns relating to eSIMs.[47] Ultimately, the ACCC adopted a monitoring brief on eSIM, finding that:

- MNO support for eSIM had improved since the initial report;
- eSIM support for MVNOs was expected to improve in time; and
- benefits of eSIM would be facilitated by the absence of locked handsets ("Handset Lock" also known as "SIM Lock"[48]) and the evolution toward more seamless processes[49].

73 Japan's Ministry of Internal Affairs and Communications ("MIC") examined switching in the Japanese ECS markets in response to a report published by the Ministry of Internal Affairs and Communications Experts Meeting in May 2021 titled "*Switching Facilitation Task Force*". In August 2021, MIC published two determinations to ban Handset Locking and that MNOs must promote OTA provisioning, which also stipulated the MNOs provide eSIM support. Further, the MIC provided guidelines on how MNOs should promote eSIM, including a requirement to consider: Enhancements to customer support; ensuring security; and MVNO access to host eSIM services.

[45] Communications Regulatory Authority of the Republic of Lithuania (RRT) is a national institution regulating the electronic communications, postal, rail markets under the European Union directives and the laws of the Republic of Lithuania.
[46] ACCC - Communications sector market study -Final Report – See https://www.accc.gov.au/publications/communications-sector-market-study-final-report t
[47] ACCC –"ACCC assessment of competition concerns relating to e-SIMs" - December 2019 - See https://www.accc.gov.au/system/files/ACCC%20assessment%20of%20competition%20concerns%20relating%20to%20e-SIMs.pdf.
[48] Mobile handsets are sometimes 'locked' to the network from which the handset is purchased. This means the handset will usually only work when used with that particular provider.
[49] The ACCC noted the deficiencies with QR based eSIM and the expected evolution toward app-based eSIM processes.

74 In June 2018, Singapore's Infocomm Media Development Authority ("IMDA") commenced a public consultation exercise to seek public feedback on the preliminary views and assessment of the impact of eSIM technology in the Singapore context. The IMDA's response or decision regarding the public consultation has not yet been published. The consultation paper on eSIM technology discussed issues such as: applying a 'No SIM-lock policy' to consumer devices; the adoption of GSMA specifications for eSIM devices; and the licensing and regulation of eSIM devices and services.[50]

Chapter 3 Consultation Questions

Technical Background

Q1: Does the technical background described and outlined by WIK capture all technical matters relevant and material to ComReg's promotion of Over-the-Air provisioning? What, if anything, should be included?

Use Cases

Q2: Do the Use Case groupings described and outlined by WIK capture all use cases relevant and material to ComReg's promotion of Over-the-Air provisioning? What use cases, if any, should be included?

eSIM deployment and activation in Ireland

Q3: Is there a reason for the lagging MNO support for eSIM have a reason of which we are not aware of from discussions with MNOs? Any technical barrier to its feasibility?

Q4: Is the deployment and activation of eSIM for M2M use cases in Ireland ahead of that in comparable countries? Why/why not?

Forecasts

Q5: Do the forecasts of eSIM deployment and activation appear sensible and to have identified the appropriate and most important drivers? What factors, if any, should be included?

[50] It is worth highlighting that in the United States the Department of Justice there while noting that most major operators in the United States voluntarily committed to agreeing to unlock consumers' smartphones upon request under certain circumstances, the Department stated "…*Although the Department fully expects such commitments would apply to eSIM features that allow an eSIM to be locked to a particular operator, these commitments are insufficient to alleviate the Department's concerns*", https://www.justice.gov/opa/press-release/file/1221181/download

4 Potential impacts of OTA provisioning

75 This chapter provides information and analysis on the deployment of eSIM and OTA support both internationally and in the State and is laid out as follows:

- First, ComReg describes the impact of OTA on customer journeys;
- Second, ComReg describes the benefits of OTA to competition; and
- Third, ComReg describes other benefits of eSIM and OTA, specifically security and the environment.

4.1 The impact of OTA on customer journeys

76 OTA provisioning enables easier and faster consumer activation and switching journeys. This is the primary benefit of OTA provisioning and key to unlocking other benefits that promote competition.

4.1.1 Improved consumer use case journeys

77 OTA provisioning can improve consumer journeys by removing the need to procure a physical SIM card. This typically arises in two scenarios[51].

I. A consumer activating a new subscription in a new handset will need a SIM card to insert in their handset[52].

II. A consumer switching mobile providers will require a SIM card from the new operator to swap with the old SIM card.[53]

78 In either case, the consumer must obtain a SIM card, which will require visiting a physical retail outlet or requesting delivery of a SIM card. OTA reduces the steps necessary to sign-up to an operator by downloading the eSIM profile, the operator uses (e.g., QR Code).

79 This not only simplifies activation and switching, but it also makes matters significantly faster, removing either the time spent to pick-up or deliver a physical SIM card. With OTA, the acquisition of a SIM card will no longer constrain switching speeds, which will now be as fast as customer on-boarding and associated processes allow (e.g., porting).

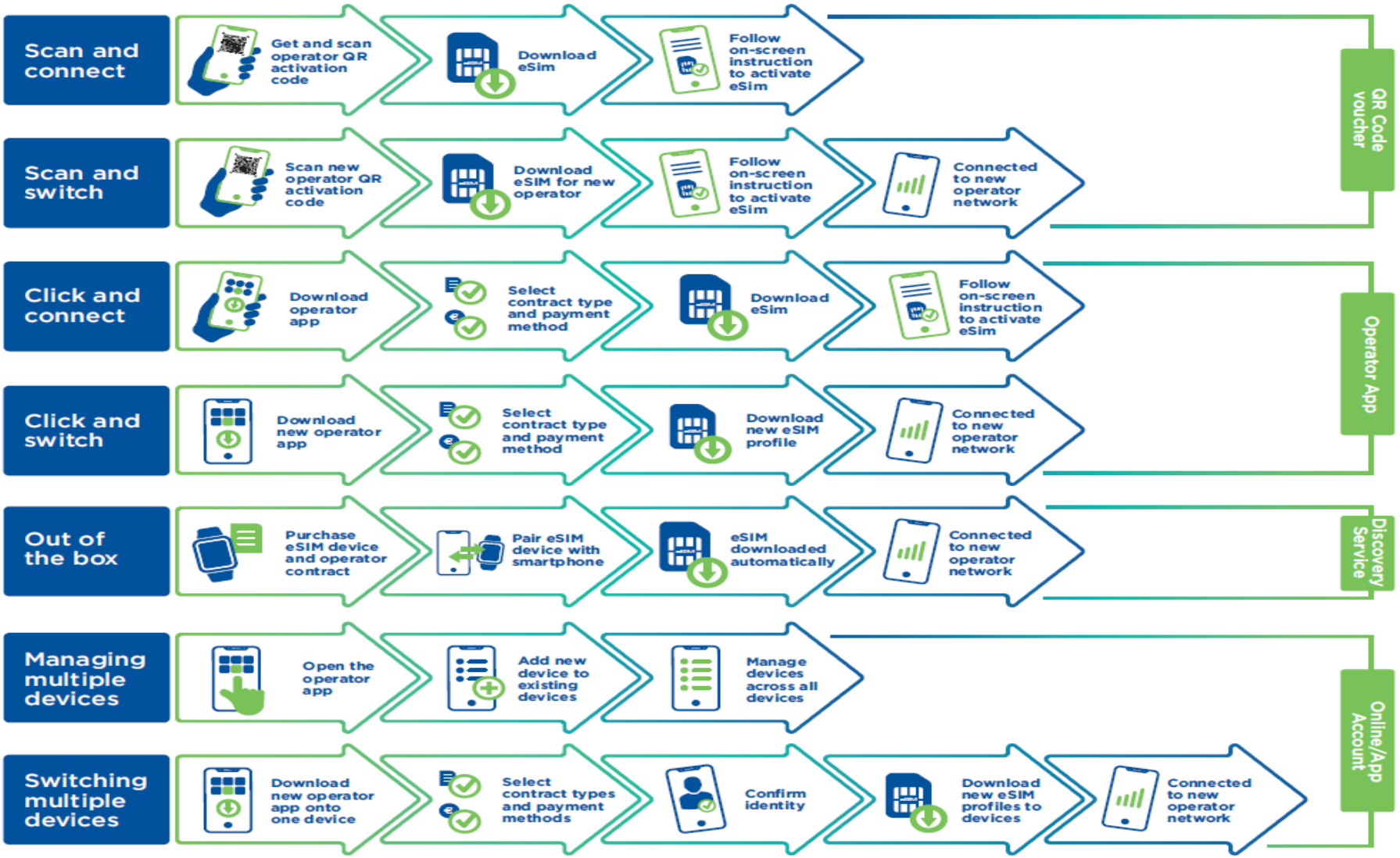
[51] This simple scenario excludes instances in which a handset has a Handset Lock, which would impede switching. This is covered separately in Section 5.3.
[52] Except where the consumer is also buying the handset from the provider.
[53] Data from the Mobile Consumer Experience survey 2019 indicates that most consumers change handset when switching operator. In response to Question 28 “Did you keep the mobile phone handset when you switched operator?” 58% of consumers that had previously switched answered no.

80 Presently, even with next-day delivery, it is at least a day before a consumer can insert their new SIM card and begin to switch provider[54]. In contrast, OTA switching processes can take minutes[55] and MNOs report that porting typically completes in minutes. OTA provisioning can therefore reduce the speed of the typical switch from two days to a few minutes[56].

81 Operators' processes should ensure the realisation of full benefits of OTA provisioning. ComReg's *Guidance on OTA provisioning for Consumer Mobile* in Section 5.3 outlines how this can be achieved. The diagram below shows the different methods by which consumers are expected to be able to connect digitally to a new provider and switch between providers on their smartphone, or companion devices such as smartwatches or tablets. For further information, see Section 8.1 in the accompanying WIK report, where the steps of the envisaged Consumer journeys are described in greater detail[57].

[54] Most Irish MNOs and MVNOs offer next working day delivery, therefore delivery of a SIM is often next day if prior to a weekend.
[55] Please see Section 5.3
[56] WIK Report, pages 31, 137 & 147.
[57] Such journeys are illustrative of an ideal simplified digital journey and not prescriptive and are intended to highlight simplified consumer journeys Over-the-Air may enable.

Figure 6: Envisaged consumer journeys developed by WIK and ComReg



4.1.2 Improved M2M use case journeys

82 OTA provisioning will improve M2M customer journeys by removing the need to acquire a physical card. In certain use cases, it is not feasible to swap out a SIM card due to the prohibitive scale, cost and/or complexity of same. Similar to the consumer journey this typically arises in two scenarios.

I. A M2M customer activating a mobile subscription must insert a SIM card in their M2M device(s) during production or distribution process. This can be costly, particularly where a large number of M2M devices are deployed.

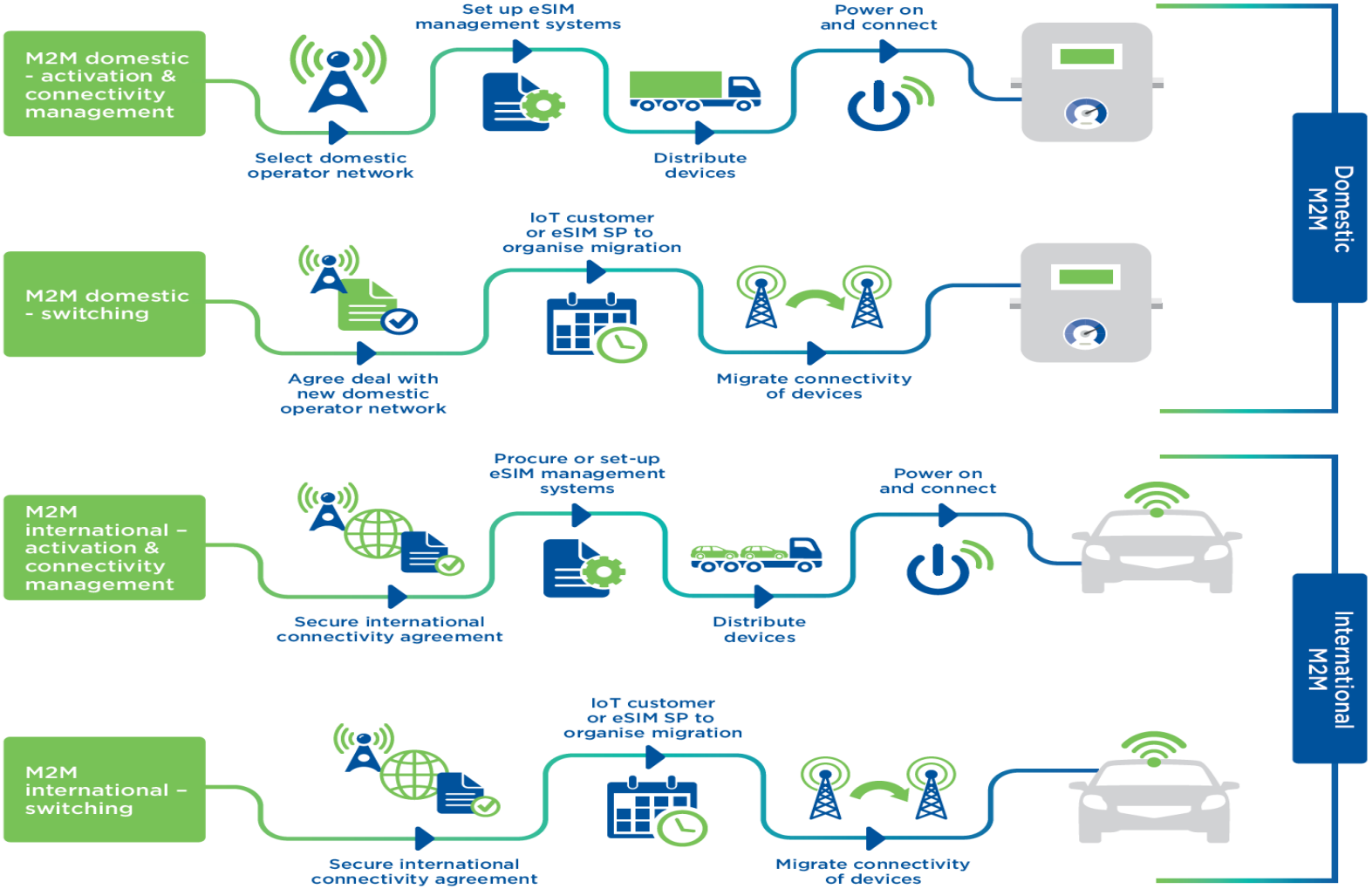
II. A M2M customer switching subscriptions must procure new SIM cards, to swap with the SIM cards in their existing devices. This can be costly, especially where devices are located in inaccessible or remote areas (e.g., an offshore windfarm) or spread over a wide area (e.g., cars or smart meters).

83 OTA provisioning reduces the steps necessary for an operator to replace existing eSIM profile(s) in its install-base. This not only simplifies activation and switching but also makes such transitions significantly faster by removing the time to distribute and insert the physical SIM card.

84 The diagram below illustrates the various methods by which M2M customers, domestic or international, can connect their devices to a new provider and switch between providers[58]. For further information, see the WIK report which examines M2M switching and the idealised M2M customer journey in detail.

[58] These journeys are indicative and not prescriptive and are intended to highlight simplified consumer journeys Over-the-Air may enable.

Figure 7: Envisaged M2M customer journeys developed by WIK and ComReg



4.2 The impact of OTA provisioning on competition

85 ComReg notes WIK's findings that OTA provisioning will increase competition in the consumer segments of mobile markets in the following ways:

- Increased competition between MNOs as a result of improved switching processes[59];
- The potential creation of new entrants with different business models compared to traditional MNOs (e.g., manufacturers or verticals offering "out-of-the-box" connectivity to end users)[60];
- Lowering barriers to entry in the retail market through the simplification of supply chains and reducing the need for a physical retail presence[61];
- MNOs reacting to any of the new competitive pressures outlined above[62].
- Opportunities for new or existing MVNOs to either increase market share or provide new or differentiated services[63];
- Greater wholesale competition, as MVNOs benefit from greater bargaining power, being more easily able to switch host MNO[64];

86 ComReg also notes WIKs findings that OTA provisioning will increase competition in the M2M segments of mobile markets in the following ways.

- Facilitating greater switching in M2M markets compared to the traditional SIM[65]; and
- Increased competition between MNOs as a result of improved switching[66].

[59] WIK Report, page 75 & 76.
[60] WIK Report, page 80, & 84.
[61] WIK Report, page 83 & 84.
[62] WIK Report, page 75 & 76.
[63] WIK Report, page 85.
[64] WIK Report, page 84.
[65] WIK Report, page 80-82.
[66] WIK Report, page 80-82.

87 OTA switching benefits consumers and M2M customers not only through easier switching but also through increasing competition between mobile providers more generally. A key benefit of OTA provisioning to consumers is that increased switching should increase competition, thereby lowering prices. ComReg considers that OTA should increase competition on price through two channels.

88 First, OTA provisioning will increase the ease of switching and is therefore expected to further incentivise MNOs to compete on price[67]. Where consumers can more easily switch in response to a better offer, suppliers have a greater incentive to make more attractive offers. ComReg notes research by the Economic Social Research Institute which found that the introduction of MNP had precisely this effect, leading to greater churn and reduced mobile prices, with the greatest reductions in countries which opted for porting times of 2 hours or less[68]. Given the complexity of switching for many M2M use cases, ComReg considers that OTA switching may result in significant competitive benefits and lower prices.

89 ComReg notes that even a small increase in the intensity of competition could lead to large consumer benefits. Noting that retail mobile services account for €382 Million in revenues[69] per annum, even a hypothetical 1% decrease in prices could lead to several million euros in benefits to Irish consumers and businesses each year.[70]

90 Second, OTA provisioning may give MNOs greater scope to reduce prices to attract customers through reducing their cost base[71]. OTA should reduce a number of fixed distribution costs (e.g., reduced retail/storage space) and generally incurs lower marginal costs(e.g., SIM cards, P&P etc) [72]. In that regard, ComReg notes that Irish MNOs typically charge a month's fee for initiating connectivity on a new device, known as a "*SIM activation charges*". For example, ComReg notes that:

- Eir charges an activation fee of one month's subscription fees on many plans (e.g., Eir Mobile €9.99 and GoMo at €14.99) [73];

[67] ComReg notes that increased competition could result in a reduction of prices greater than the savings, where MNOs offer plans with increasingly more competitive prices.
[68] ESRI - Sean Lyons (2010) - "Measuring the Effects of Mobile Number Portability on Service Prices"
[69] Quarterly Key Data Report Q2 2021. This figure relates to Total Mobile Retail Revenues, and therefore includes mobile broadband and Machine-to-Machine.
[70] WIK make a similar point in page 76 of the WIK Report.
[71] ComReg notes that lower costs may be achieved once economies of scale are achieved for Over-the-Air provisioning, which may take time. Indeed in the short run eSIM may be more expensive on a per unit basis, given the initial investments required.
[72] This is true even if the pricing plans of eSIM solutions providers initially rely on pricing per eSIM.
[73] E.g., https://www.eir.ie/opencms/export/sites/default/.content/pdf/terms/SIM_Only_Plans

- Three charges an activation fee on certain plans (e.g., €10 on BeFree[74]) but 48 advertises its lack of such a connection fee[75]; and

- Vodafone's sub-brand Clear Mobile charges a SIM activation fee[76] of €12.99[77].

91 Such activation fees may be lower for eSIM plans[78], reflecting the lower marginal cost of distribution and activation[79]. While activation or "*download*" fees are applied in some instances for eSIM subscription, these appear lower than the "*SIM activation fees*" charged by Irish MNOs. For example, EE in the UK charges £1.50 (c. €1.75) as a download fee while many operators do not charge any download fee. MNOs may even apply differential activation fees, as appear to be applied by T-Mobile in the United States which does not charge an activation fee for eSIM plans[80] but does charge an activation fee for comparable SIM plans.[81]

92 Activation fees effectively raise the financial cost incurred by a consumer when switching. ComReg estimates that activation fees alone may cost as much as €4 million annually to consumers[82]. Therefore, reducing such fees would effectively reduce the financial cost of switching, thereby further lowering barriers to switching.

93 In relation to MVNOs, ComReg agrees with WIK's view that, at present, no action is required to ensure eSIM support be provided by MNOs to MVNOS as eSIM support is not yet required to effectively compete in the market (noting eSIM only devices are not yet widespread)[83]. This should ideally be delivered by commercial negotiations between MNOs and MVNOs[84], noting that MVNOs have already received access to eSIM support in a number of countries[85].

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[74] https://www.three.ie/web/uploads/pdfs/terms/consumer/Three_BeFree_Price_Plan_Rules.pdf
[75] https://48.ie/
[76] https://clearmobile.ie/
[77] Notably, Clear Mobile did not charge a SIM activation fee upon its launch for the first 25,000 customers. https://www.telecompaper.com/news/vodafone-ireland-announces-new-clear-mobile-low-cost-sim-only-brand--1368711
[78] Once economies of scale are achieved, this also depends on the payment model of eSIM solutions providers (e.g., per eSIM would add to the marginal cost).
[79] E.g., SIM card, post & packaging, organisational effort.
[80] https://www.t-mobile.com/support/plans-features/t-mobile-esim-app
[81] https://prepaid.t-mobile.com/prepaid-plans/connect
[82] Conservatively assuming a €10 average activation fee and 400,000 activations, based on the annual number of ports per year.
[83] WIK Report page 136.
[84] As per Action 6, ComReg reserves its right to review this matter in the future should it deem it necessary to safeguard competition.
[85] For example in Italy, Spusu and Very Mobile utilise eSIM via their host network WindTRE.

4.3 Further impacts of OTA provisioning

4.3.1 Security

94 Consumer end-rights and consumer protection are a statutory objective of ComReg's.[86] ComReg also has a role under the EECC of maintaining the security of networks and services and ensuring a high level of protection for end-users.[87] Operators are reminded of their existing security obligations and of changes to these obligations pursuant to Articles 40 and 41 of the EECC.

95 eSIM may potentially improve the security of mobile provisioning. eSIM, in contrast to physical SIM cards, cannot be misplaced, damaged, or lost, although it may be deleted. As an eSIM cannot be removed without accessing a device (which may have privacy downsides) it also means that phone thieves cannot easily hide the location of a stolen phone. Additionally, eliminating physical SIM cards gives users better control of their digital identity and service authorization.

96 Such benefits however are subject to the responsible implementation of eSIM and OTA processes, given that eSIM and OTA may give rise

97 ComReg notes WIKs findings that the GSMA standard for OTA provisioning, (i.e. Security Accreditation Scheme[88]), appears to work well to date where it has been put into effect. Nevertheless, ComReg considers that OTA provisioning may solve some existing security issues with traditional SIMs (e.g., SIM-swap fraud) but might also give rise to new security issues such as new forms of fraud. Therefore, operators will need to be vigilant in ensuring that their eSIM systems (whether own or hosted by third parties) remain up to date with the latest accreditation to ensure the highest level of security possible.

[86] ComReg Document 21/70 Electronic Communications Strategy Statement 2021-2023
[87] Article 3(2)d EECC
[88] Brief line or two on how this works.

4.3.2 Environmental Impact

98 In 2020, the telecommunications industry contributed 2.6% to global carbon dioxide emissions, according to the European Telecommunications Network Operators' (ETNO) Association[89]. The United Nations estimates that around 40 million tons of electronic waste is generated annually, and 80% of this goes to landfills[90]. ComReg notes WIKs findings that OTA provisioning will lead to significant environmental benefits in the following ways:

- 4.5 billion SIM cards are produced globally requiring 20,000 tons of plastic[91];
- Each SIM card needs to be punched out of a credit-card sized plastic sheet, which is then disposed of[92];
- For each tonne of plastic, 15 tonnes of carbon dioxide is saved[93]; and
- eSIMs have a smaller environmental footprint through reduced packaging, logistics and sales activities and through enabling smaller device sizes[94].

99 Therefore, supporting fully digital processes for provisioning and switching could also serve to support environmental objectives of the Irish government as outlined under the European Green Deal.[95]

100 While Ireland accounts for a small share of total SIMs, eSIM adoption should in time reduce the plastic consumption and carbon emissions of Irish Mobile Networks. As Vodafone noted in its announcement regarding the launch of the eSIM[96]:

[89] ETNO, https://etno.eu//downloads/reports/connectivity%20and%20beyond.pdf
[90] United Nations https://www.unep.org/news-and-stories/press-release/un-report-time-seize-opportunity-tackle-challenge-e-waste
[91] Giseke+Devrient "The greenest SIM is the eSIM | G+D Spotlight (gi-de.com)"
[92] Giseke+Devrient "The greenest SIM is the eSIM | G+D Spotlight (gi-de.com)"
[93] Vodafone have calculated that every 1 tonnes of plastic saved result in a reduction of 15 tonnes of CO2 https://bbj.hu/business/tech/telco/vodafones-small-size-sim-cards-saved-1-6-tonnes-of-plastic-in-2020
[94] Giseke+Devrient "The greenest SIM is the eSIM | G+D Spotlight (gi-de.com)"
[95] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en
[96] See https://n.vodafone.ie/aboutus/press/vodafone-ireland-s-network-now-100--powered-by-electricity-from-.html

> *"This **significant move in becoming a Green Network**…. eSIMs are virtual SIM cards that provide the same service as a physical SIM card, but with the data stored in a few lines of EECC on a dedicated chip in a phone rather than on a plastic SIM. **This eliminates the need to manufacture and ship the associated plastic, thereby reducing carbon emissions**.*

101 While noting the advent of smaller SIMs and SIMs made from recycled, "circular" or non-virgin plastic, in our preliminary opinion at this point the environmental impact of eSIMs still compares more favourably to even smaller or partly "dematerialised" plastic SIMs (given that the need for physical components is eliminated with e SIMs). After disposal of a SIM card it is not necessarily the case that the SIM card elements are even recyclable (it is labour intensive and complicated to re-extract any precious metals used in SIM cards and it is thought there is a significant loss entirely of scarce raw materials, such as gold used in SIM cards).

102 Therefore, ComReg considers that OTA provisioning will have positive net impact on carbon emissions in particular through reducing the plastics required in the manufacture of physical SIM cards (and in the associated postage and packaging used in SIM distribution)[97].

[97] SIM cards are typically delivered in SIM packs, plastic or cardboard packaging containing paper instructions for installation and use.

Chapter 4 Consultation Questions

Competition

Q6: Do you agree with the analysis of the competitive effects of eSIM and Over-the-Air on competition in mobile markets? If not, how do your views differ?

Q7: Does the description of the competitive effects of eSIM and Over-the-Air consider all relevant impacts? If not, what should be included?

Environment

Q8: Do you agree with the analysis of the environmental effects of eSIM and Over-the-Air?

Q9: Does the description of the environmental effects of eSIM and Over-the-Air consider all relevant environmental impacts?

Security

Q10: Do you agree with the analysis of the security of eSIM and Over-the-Air provisioning standards and processes?

Q11: Does the analysis of the security of eSIM and Over-the-Air provisioning standards and processes?

5 ComReg's proposed strategy for promoting OTA provisioning

103 This Chapter provides an outline of ComReg's proposed strategy for promoting OTA provisioning and is laid out as follows.

- First, ComReg describes its vision for the envisaged future state of OTA provisioning in Ireland over a 5 year period (the "Vision");
- Second, ComReg assesses the identified potential barriers and challenges to the realisation of the Vision (the "Potential Barriers") and assesses actions for overcoming the Potential Barriers; and
- Third; ComReg provides Guidance for operators in designing their OTA provisioning processes for Consumer Mobile.

5.1 The Vision for OTA provisioning for Consumer and M2M

5.1.1 The approach to developing an action plan for ComReg

104 Identifying the most appropriate strategy to maximise benefits to consumers from a new technology necessarily requires regulators to evaluate the benefit arising from potential future scenarios. A vision-based approach enables a regulator to assess what potential outcomes may best serve consumers. This approach allows ComReg to identify potential challenges and assess actions that may need to be taken to overcome such challenges.

105 ComReg agrees with WIK's approach of taking a consumer-centric approach and identifying what actions are needed to ensure the benefits of Over-the-Air are realised by consumers[98]. Indeed, as outlined in Section 8.1 of the WIK Report, the Vision is based upon ComReg's statutory objectives and strategic intents in the ECSS.

5.1.2 The Vision for OTA provisioning

106 WIK identifies eight principles each of which would need to be fulfilled in order to unlock the benefits of OTA provisioning to society. These eight principles define ComReg's vision for OTA provisioning and its proposed action plan and guidance is designed to achieve this over-arching vision.

[98] WIK and ComReg focus on areas where identifiable challenges exist.

1. Consumers and M2M customers should have the ability to use OTA, for mobile activation, switching and porting.

2. OTA activation and switching for mobile devices should be as fast and as easy as possible.

3. Consumers should be provided with all information necessary to complete a successful switch, supported by clear contractual terms in the case of M2M customers.

4. Switching[99] should continue to be recipient-led for consumer use cases, while collaboration will often be needed between the transferring and recipient provider in M2M OTA switching.

5. Consumers should have the ability to use MNP in conjunction with OTA, including:

    - The principles for Porting via OTA should extend to any amended version of the MNP (e.g., maximum 2 hours)

    - Need to retain porting by SIM

6. OTA provisioning should be safe and secure.

7. OTA provisioning should enable new business models and not foreclose existing business models (e.g., MVNOs).

8. OTA provisioning should enable new forms of eSIM devices and a greater number of devices.

107 Furthermore, ComReg considers that the envisaged OTA consumer and M2M journeys illustrate the potential for OTA to deliver fully-digital mobile consumer provisioning

5.2 Overcoming the challenges to the OTA in Ireland

108 WIK identified a list of potential challenges to the realisation of the Vision identified above. ComReg considers the barriers to the realisation of this Vision could potentially lead to the delay or elimination of some or all of the benefits of OTA provisioning to Irish consumers and M2M customers.

[99] Switching implies the termination of the previously held contract and if desired, the porting of the number. It should be noted that due to the potential for eSIM to hold multiple profiles, consumers may choose to maintain multiple providers rather than switch

109 WIK identifies a number of actions that ComReg could take to overcome the potential challenges to enable the full benefits of the broader Vison for OTA[100]. ComReg outlines its reasons for supporting each of these actions below, and why in its view such steps are objectively justified, transparent, non-discriminatory and proportionate in relation to their intended purpose and take into account the objectives of ComReg as set out in Section 12 of the 2002 Act and Regulation 16 of the Framework Regulations.

Table 3: Summary of proposed actions

Challenges	Proposed actions	User Group
Delayed eSIM support by Irish MNOs for consumer mobile	Action 1	Consumer
Potentially sub-optimal OTA processes	Action 2 and Action 3	Consumer
Low consumer awareness of eSIM and/or OTA	Action 5 and 7	M2M and Consumer
Barriers to M2M OTA switching should contracts not adequately enable switching	Action 4 and Action 7	M2M
MVNO barriers to compete	Action 6 and Action 7	M2M and Consumer
Future or international challenges	Action 7 and Action 8	M2M
Lack of information about developments in market	Action 7 and Action 9	M2M and Consumer

5.2.1 Assessment of Actions

Action 1: Require fully digital Over-the Air customer journeys for consumer mobile within 12 months of ComReg's finalised Action Plan

Rationale

110 A key barrier to the realisation of the Vision (and the benefits of OTA) is the lack of eSIM support by Irish MNOs. ComReg is mindful that the Irish market is behind its peers in the deployment of eSIM and notes that Ireland remains among the few European countries lacking widespread eSIM support among MNOs.

[100] For the purpose of this Consultation, ComReg only examines the challenges evident in the Irish market and actions relevant to ComReg in addressing these challenges.

111 This situation risks the delay or elimination of some or all of the benefits of OTA provisioning to Irish consumers as OTA is only available to consumers activating or switching to Vodafone. This does not enable full OTA switching except among consumers that wish to switch to Vodafone, which would account for only a portion of the total number of subscribers, switchers and ports.

112 A requirement for MNOs to support OTA provisioning for consumer mobile would make available significant benefits to the majority of the 5.2 million mobile customers in the State. As previously set out in Section 4.2, OTA provisioning should impact competition in mobile markets primarily through enhancing the ease of switching between mobile providers, which could bring consumer benefits in the region of several million euro annually.

113 In relation to costs, eSIM support entails investment by MNOs in, among other things, relevant equipment (if an in-house solution is adopted) and in updating internal processes and staff training. The cost is likely to vary by operator depending on how far their existing processes would need to be modified and on whether the choice is made to invest in an in-house solution (involving capex and personnel), or eSIM-management is outsourced to a specialist provider (involving operational expenditure). ComReg notes such expenditure seems inevitable given the expected growth in the use of eSIM for provisioning for smartphones, and that consequently this cost is merely brought forward by any such mandate (e.g., eSIM is likely to be adopted in any relevant counterfactual)[101]. Furthermore, it should be noted that OTA provisioning is expected to result in some offsetting reductions in costs, albeit over a longer timeframe.

114 Therefore, ComReg is minded to require that MNOs provide eSIM support for consumer mobile to enable fully digital consumer journeys for consumer mobile. Fully-digital OTA consumer journeys involve MNOs offering the following.

- OTA activation (e.g., sign-up); and
- OTA switching processes; and
- OTA MNP.

[101] The cost attributable to this action is therefore only that which is incurred as a result of changes in operator's implementation of eSIM support.

115 MNOs should implement Action 1 in line with the five design principles ComReg's outlines in its *Guidance on OTA provisioning for Consumer Mobile*, in Section 5.3, below.

116 Article 106 empowers NRAs, such as ComReg to require porting to be completed through OTA provisioning, where technically feasible. As described in the WIK Report, OTA porting requires eSIM support to enable OTA switching, otherwise porting necessarily requires the use of a physical SIM[102]. ComReg agrees with the views of its technical advisors on this matter, WIK, that there is no reason that OTA porting or switching (including eSIM support) is not technically feasible in Ireland, noting that:

- eSIM support is now widespread globally among MNOs;
- Vodafone offers eSIM support as of July 2021;
- the sister companies of Irish MNOs offer eSIM support in other European countries; and
- In interviews with ComReg, Irish MNOs described the Irish MNP process as "OTA-ready".

117 ComReg considers that this action is further supported by Article 93 of the EECC, which empowers Member States to promote OTA provisioning, where technically feasible, to facilitate switching, noting that the European Commission clarified that this could mean hard measures such as binding measures to promote OTA[103].

118 The benefits of OTA provisioning are dependent not only on the presence of eSIM support, but also on the design of the processes. Therefore, it is critical that MNOs processes ensure the realisation of full benefits of OTA provisioning to consumers. MNOs should implement Action 1 in line with the design principles ComReg's outlines in its *Guidance on OTA provisioning for Consumer Mobile*, in Section 5.3, below.

Scope

119 ComReg notes the reasons provided by WIK that it considers that secondary devices should not be included in the mandate at present as doing so would require "*require investments in bespoke equipment such as entitlement servers*"[104]. ComReg agrees with WIK on this point as:

[102] WIK Report, pages 137.
[103] European Commission (2020) "Questions and Answers on the EECC"
[104] WIK Report, pages 137.

- Similar SIM based devices are presently available;
- the benefits from OTA for such devices are smaller at present given the smaller size of this market segment; and
- the benefits from switching for such devices are limited given that processes for switching Secondary Devices are still developing.

120 Nevertheless, ComReg notes that no Irish MNO currently offers eSIM support to Secondary Devices, such as wearables, despite this being widespread in comparable countries. While ComReg is not minded to included Secondary Devices in the scope of any requirement at present, this may change depending on the responses to this Consultation.

121 ComReg may consider whether a statutory obligation to introduce OTA provisioning for Secondary Devices, in the event that eSIM support for such devices is unduly delayed. ComReg notes that WIK support this considering that "*requirements to support OTA provisioning and switching for such devices could be made at a later stage*"[105]

122 In Document 18/46, ComReg noted operators' agreement that OTA provisioning is relevant to facilitating M2M switching and was of the view that industry is best placed to decide on the appropriate technological solution to develop for switching. However, ComReg did note NRAs may be required to act to mandate OTA provisioning in the event that support was lagging for M2M use cases:

> *"Over-the Air provisioning is an appealing solution, provided that it is designed in an open, transparent and non-discriminatory matter … and ComReg will continue to monitor and participate in international discussions… If the facility is not introduced in a timely manner, then NRAs may need to consider the need to become active in the work, or to introduce regulatory mechanisms or incentives to foster OTA provisioning. It may even require the consideration of a statutory obligation to introduce OTA provisioning within a certain time period."*

123 In line with WIK's recommendations, ComReg does not consider it necessary to require support for OTA provisioning for M2M use case as:

[105] WIK Report, pages 137.

- The two MNOs that account for the majority (>99%)[106] of M2M subscriptions offer eSIM support for domestic and international M2M use cases[107]; and

- International use cases (e.g., connected cars) are catered for and are subject to international connectivity agreements.

124 While ComReg remains broadly of the view that industry was best placed to decide on the appropriate technological solution to develop for switching, ComReg has identified certain aspects of OTA switching for M2M that it considers operators should take in relation to their OTA switching processes (e.g., contractual terms). This is outlined in Action 4.

Timelines

125 Noting that outsourced eSIM solutions are available which permit relatively fast implementation of OTA processes, ComReg considers that the target date of 12 months following a decision on the Action Plan to be appropriate for MNOs to support fully digital Over-the Air customer journeys for consumer mobile[108]. ComReg considers that this date balances the potential consumer benefits which grow with increased eSIM device penetration, against the potential lead in times for MNOs to implement eSIM solutions noting WIKs views[109]. ComReg's preliminary view is that a later date risks delaying the benefits from OTA without any objective benefit. ComReg also considers that such a requirement is proportionate, noting that:

- eSIM support is widespread among MNOs in comparable markets[110];

- Irish MNOs own parent companies have introduced OTA support in comparable markets; and

- MNOs expect eSIM-only flagship devices to be introduced soon, at which point eSIM support will be key to meeting the needs of the higher value customer segment.

- As outlined above, any additional costs to MNOs are likely to be outweighed by the likely competitive benefits to consumers.

[106] ComReg published Quarterly Data, Q2 2021.
[107] Therefore a far greater share of potential M2M customers may avail of eSIM support than for Consumer mobile.
[108] Noting the finalisation of ComReg's action plan and any Decision is scheduled for Q2 2022.
[109] WIK Report, footnote 209.
[110] See Section 3.2.

126 To monitor progress on this requirement, ComReg will set a deadline for reporting by MNOs to ComReg on their progress six months following the decision. This progress report should include an update on MNOs research, procurement and tendering efforts, any planned pre-launch testing[111], as well planned changes to internal OSS/BSS, if any.

Action 2: ComReg to develop Guidance on OTA switching for Consumer Mobile

Rationale

127 Poorly designed OTA provisioning processes could negate the benefits to Irish consumers of OTA provisioning in terms of improved consumer journeys (e.g., easier and faster activation and switching).

128 Therefore, ComReg has developed its proposed Guidance on OTA switching for Consumer Mobile (See Section 5.3). This information will guide operators in designing their OTA provisioning processes to ensure the realisation of the full benefits of OTA to consumers.

Timelines

129 Under Action 1, OTA will be supported by Irish MNOs as of 12 months from any Decision. ComReg considers that operators processes should meet the Guidance on OTA switching for Consumer Mobile issued by ComReg, as of that same date.

Action 3: MNP Committee to conduct MNP Review within 6 months of the ComReg's finalised Action Plan.

130 Irish MNOs consider the Irish MNP process to be "*OTA-ready*" with no barrier to its support for porting via OTA once OTA switching is supported by MNOs. The views of international stakeholders and WIK corroborate this[112].

Rationale

[111] ComReg notes operators in other markets have experienced issues with initial implementation of OTA journeys, in some cases even withdrawing eSIM support temporarily. Operators must attempt to reduce such the likelihood of such issues occurring through rigorous pre-launch testing.
[112] WIK Report page II.

131 ComReg will request the MNP Committee to examine whether the MNP process and its associated implementation manual would require any updating in light of OTA switching. ComReg considers this necessary to ensure that no unanticipated issues prevent OTA porting upon the deadline for Action 1[113]. ComReg has identified the following as the key questions for the MNP Review:

- what efficiencies, if any, can OTA switching bring to the Irish MNP process?
- what forms of consumer detriment could MNP solve (e.g., loss of physical SIM)?;
- what new forms of consumer detriment could MNP give rise to (e.g., accidental deletion of eSIM)?;
- how well is Irish MNP working at present; and[114]
- what improvements, if any, can be made to the Irish MNP process to improve customer satisfaction (e.g., speed, reduced non-completed ports) bearing in mind Irish MNP was designed over 20 years ago[115].

132 One stakeholder requested that ComReg attend such MNP Committee meetings as an observer to facilitate such inter-operator discussions. ComReg is amenable to this.

Timelines

[113] ComReg notes WIK's finding that Irish MNP had no potential synergies with the Over-the-Air switching, as there was no overlap in the processes. WIK also examined whether more general improvements could be made to the Irish MNP process, which was introduced in 2003, but found that Irish MNP is fast and leads to little consumer detriment. For these reasons, neither WIK nor ComReg has to date identified any changes to the MNP process, to ensure it meets its mandated performance targets when adapted to Over-the-Air.

[114] MNP Committee could provide data on a) what percentage of ports are completed in the 2 hour window b) what are the leading causes of ports exceeding the 2 hour window, c) what is the median time for ports, with and without issues.

[115] Specifically, ComReg wishes to understand a) what factors currently limit the speed of a standard port to 2 hours, b) whether there are any other process bottlenecks that could be improved upon, and c) whether there is any potential to improve the process to be even easier for consumers.

133 Under Action 1, OTA switching will be supported by Irish MNOs as of 12 months post-decision, a later date risks delaying the benefits from OTA in the event of any unforeseen issues with OTA Porting without any objective benefit. Therefore ComReg considers that all aspects of the MNP review must be completed in advance of this date. ComReg considers that 6 months should be sufficient time to conduct such a review, and this would precede the deadline for OTA support among MNOs.

134 ComReg will be seeking a report on the review, which may be subject to audit by process experts appointed by ComReg. To monitor progress on this requirement, ComReg will set a deadline for reporting by MNOs on their progress of six months following the publication of ComReg's Action Plan. This progress report would include an update on the research conducted as part of the MNP review, as well as the necessary changes to MNOs internal OSS/BSS, if any. In addition, ComReg could attend industry meetings as an observer, if that would facilitate discussion.

Action 4: Potential actions for NRAs to facilitate M2M switching

Rationale

135 ComReg notes that OTA may enable NRAs to strengthen M2M switching by a number of means. This could involve NRAs either specifying the OTA switching processes for M2M or by strengthening M2M contracts. ComReg therefore wishes to receive the views of interested parties on the following:

- Standardised process for M2M OTA switching; and
- Minimum provisions in M2M contracts to strengthen OTA switching.

Standardised process for M2M OTA switching

136 No standardised process exists for OTA M2M switching, or M2M switching more generally. This may add to the complexity of switching for M2M, as M2M switching is typically conducted on a project basis.

137 In 2018, in response to ComReg's Consultation on M2M numbering MNOs argued that ComReg should not propose specific national regulatory requirements for M2M switching at that stage. In Document 18/46, ComReg decided not to impose a specific M2M switching process at that time and, while noting the broad support from operators for OTA.

138 OTA provisioning may provide an opportunity for NRAs to propose specific national regulatory requirements for M2M switching, through reducing the complexity of designing such a process to account for the less uniform provisioning needs of M2M use cases. This could potentially reduce the complexity of M2M switching, fostering competition in ECS for M2M use cases.

139 ComReg wishes to know whether the existing eSIM standards (e.g., GSMA) provide a sufficiently seamless OTA switching for M2M, or whether NRAs may facilitate M2M switching by proposing specific regulatory requirements for M2M switching. Such specific requirements could include defining the parameters of M2M switching (e.g., recipient-led process, actions if any required of the transferring provider, speeds, etc.).

140 As M2M use cases are international in scope, any such process would require an international coordination among NRAs and therefore ComReg will take responses on this matter to international fora for further consideration (e.g., BEREC and CEPT).

Minimum provisions in M2M contracts regarding OTA switching

141 Similarly, ComReg could seek to strengthen the ability of M2M providers to switch service providers through strengthening the provisions for switching in contracts with M2M customers with OTA (e.g., using technology such as eSIM which enable OTA provisioning). ComReg notes WIK's finding that M2M switching may be improved by international regulators developing guidelines or recommendations for industry (and especially SMEs) around fair contractual conditions for switching including associated charges[116].

142 ComReg notes that M2M use cases are business-to-business ("B2B") services, that switching is typically conducted on a project basis and subject to contractual terms. Therefore, the full realisation of the benefits of OTA provisioning to M2M customers and end-consumers depends not only MNOs OTA provisioning processes and associated M2M customer journey. It also depends on how clear, effective and enforceable contractual provisions are, in order to ensure successful and timely M2M switching is achieved. At present, there is no minimum criteria for the contractual provisions relating to switching in M2M contracts. This situation risks the delay or elimination of some or all of the full benefits of OTA provisioning to M2M customers of OTA provisioning.

[116] WIK Report page 140.

143 Therefore, ComReg considers it may be beneficial for NRAs to require MNOs to provide a minimum level of information on the procedure for M2M customers using OTA provisioning to initiate a successful and timely OTA switch which should be clearly defined in the terms of the contract, including but not limited to the following:

1. The actions to be taken by parties (customers, transferring and donor provider) in the event of a switch.
2. The “best efforts” expected of the donor or transferring provider.
3. An estimate of the duration of switching.
4. An estimate of the cost, if any, of switching.

144 This information would enable M2M customers to switch in a timely and cost-effective manner, enhancing switching in M2M market segments. This further increases the bargaining power of M2M customers. ComReg considers that this action comes at little or no discernible cost. ComReg notes that any efforts on the part of MNOs to provide estimates of the duration or cost of switching would be required in the event of a switch.

Timelines

145 In relation to minimum standards for OTA switching for M2M, ComReg will consider the Consultation responses, before advancing its findings in international regulatory fora. ComReg cannot estimate the duration for such reviews (which depend on international NRAs), and therefore will not set a deadline for this at this time. This matter will be advanced under Action 8 below.

146 ComReg’s is not aware of any reason why minimum provisions for switching in M2M contracts with OTA cannot be introduced following the following publication of its Final Action Plan. Therefore, ComReg is of the preliminary view that such provisions should be included in M2M contracts with OTA as of the publication of its Final Action Plan.

Action 5: Launch an awareness campaign promoting the benefits of eSIM to industry and consumers.

Rationale

147 As a concrete measure to implement Article 93(6) EECC, which specifically refers to the promotion of OTA M2M switching, ComReg could, in conjunction with entities representing industry and the digitisation of public services, launch an awareness campaign concerning the benefits of eSIM for industrial and public sector use cases. Stakeholder engagement could include briefings and information gathering with a number of organisations including.

- The Office of the Government Chief Information Officer (OGCIO) which has the leadership role for the digital agenda across Government. OGCIO also works in collaboration with organisations across the Civil and Public Service and has growing involvement in supporting sectoral digital development.

- IBEC Medtec and Engineering which represents the medical technology and engineering sectors and recently revealed that six in ten business leaders intend to invest in connected factories and the Internet of Things and more than two thirds of those surveyed are already implementing automation.[117]

- Other industry representative bodies (e.g. Food & Drink Ireland, Small Firms Association who promote the digitisation of other industrial sectors).

148 More generally, poor awareness by consumers of the benefits of OTA could result in a failure to embrace new services and devices, undermining the business case for eSIM rollout and support. ComReg notes the GSMA has argued that low consumer awareness does not necessarily constitute a strong barrier to adoption and in any event is remedied by promotion of OTA provisioning to consumers by MNOs, and ComReg concurs that MNOs can and should actively promote OTA to consumers.

149 Nonetheless, ComReg may promote OTA provisioning directly to consumers or to M2M customers, which may aid consumers seeking impartial information on OTA provisioning. Furthermore, ComReg already provides a significant amount of information on end-consumers rights such as switching and porting. Therefore, ComReg may produce consumer friendly materials describing the benefits of OTA provisioning and how consumers may avail of OTA activation and switching.

[117] https://www.ibec.ie/-/media/documents/media-press-release/the-race-to-embrace-digital-manufacturing.pdf

150 ComReg welcomes interested parties' views on what further information could be provided or what actions by ComReg or MNOs may be useful in promoting awareness of OTA among consumers/M2M customers and the timing of such information/actions (e.g., to follow provision of OTA by all MNOs). Such actions could include:

- Providing information for consumer on the ComReg website, including reporting on the devices for which different mobile service providers provide eSIM support.; and
- Actively promoting OTA to consumers (e.g., promotion campaign).

Timelines

151 In relation to OTA M2M switching, ComReg considers any active promotion should coincide with Action 1 (i.e. 12 months following any Decision).

152 Any active promotion in relation to consumer OTA would depend on the deployment of OTA but would likely take place after promotion in relation to OTA M2M switching. The timing of promotion of consumer OTA would also be informed by other information ComReg would gather under Action 7.

Action 6: Monitor MVNO access to OTA provisioning

Rationale

153 In early 2020, ComReg commenced a project to help understand the role of Mobile Virtual Network Operators ('MVNOs') in evolving mobile markets. ComReg subsequently engaged WIK Consult to prepare a report (the 'WIK Report') [118] on the issue. In particular, the high-level objectives of the report were:

- To inform ComReg's understanding of the evolving role that MVNOs play in mobile markets, particularly in the Irish mobile market;
- To provide ComReg with insight into how MVNOs can affect the competitive dynamic of mobile markets; and
- To describe the experience of MVNOs internationally.

[118] "The role of MVNOs in evolving mobile markets: Report from WIK Consult", published 13 October 2021.https://www.comreg.ie/media/2021/10/ComReg-21101.pdf

154 As part of the project, WIK Consult was tasked with undertaking a review of key literature on the various MVNO business models and various developments that will likely impact the evolution of the mobile markets. In addition, a series of interviews with stakeholders in the Irish mobile market formed a central part of the analysis of the Irish market, including interviews with ComReg, Mobile Network Operators ('MNOs'), MVNOs and potential entrants.

155 WIK Consult presented its report to ComReg in Q3 2021, which considered, among other things, the potential impact of OTA on the competitive role of MVNOs. In response to its findings ComReg committed to "*continue to monitor the competitive dynamics in the Irish mobile market, in keeping with its statutory functions and objectives.*"[119]

156 As part of this watching brief, ComReg will monitor the access by MVNOs to future technologies necessary to compete effectively in mobile markets, including OTA provisioning[120]. This is consistent with WIKs views that while no action is required at this time such an action could be required in the future, in particular were eSIM only devices to play a greater role in mobile markets. This watching brief would include gathering data on OTA (per Action 7), assessing the development of OTA in mobile markets, and discussing such matters with MVNOs, as required.

Timelines

157 ComReg will monitor this matter on an on-going basis. The necessity of any action depends on market developments (e.g., MVNO access to OTA, the role of OTA in the Irish market). Therefore, ComReg will not commit to any timeline for such an action (which may not be required).

Action 7: ComReg to gather data on eSIM adoption and activation

Rationale

158 ComReg does not currently gather data relating to OTA device penetration or activation. Further information regarding eSIM deployment or activation would facilitate monitoring of the market and the evaluation of ComReg's' action plan.

[119] ComReg 21/101, page 6.
[120] WIK Report page 138.

159 WIK advise that ComReg should incorporate into its regular survey and data gathering exercises questions related to device availability, subscriptions, consumer awareness and devices for which different mobile service providers provide eSIM support. This exercise is necessary to track progress in eSIM availability, support and adoption and monitor the effectiveness of measures to promote OTA processes and facilitate switching.

160 ComReg has included questions in the upcoming Mobile Consumer Survey which target eSIM device penetration. ComReg will also consider gathering data to inform any future research or decisions ComReg may undertake in this area. For example:

- Commissioning additional market research on the following.
    - business and consumer awareness of eSIM/OTA.
    - business and consumer experience of OTA services and
    - M2M research on requirement for OTA services and intention to rollout same.
- Information from operators either as an individual information requests or on an ongoing basis as part of its Quarterly Data Reports.
    - Consumer IoT and M2M subscriptions.
    - eSIM compatible M2M subscriptions.
    - distinguishing new subscriptions from subscriptions involving a migration and potentially MNP; and
    - type of eSIM-enabled consumer devices (including smartphones and secondary devices such as smartwatches) being offered to consumers.
- Desk research to track updates from equipment manufacturers of the availability of eSIM.

161 The information collected will facilitate ComReg's monitoring of developments and inform any future review of ComReg's plan to promote OTA provisioning.

Timelines

162 ComReg is considering this at present and will identify the most appropriate methods and source for such collection before developing an indicative timeline.

Action 8: Promote consideration of OTA by BEREC/CEPT

Rationale

163 In its report, WIK has identified a list of potential challenges to OTA provisioning and action NRAs may take to remedy these challenges. WIK also identified a number of issues of an international nature which require attention (e.g., best practice for M2M switching). Therefore, in order to promote OTA provisioning, ComReg considers it appropriate to promote the report and its key findings (specifically those outlined above) to international regulatory bodies such as CEPT and BEREC and discuss how such bodies could further assist in overcoming potential challenges.

164 For example, WIK advise of following actions in respect of CEPT and BEREC:

- CEPT and BEREC could usefully encourage the development of and adherence to industry standards for device entitlement servers, especially by larger device manufacturers.
- BEREC and / CEPT could consider appropriate mechanisms to ensure appropriate oversight for multi-national M2M providers, alongside developing guidelines on the extra-territorial use of numbers in order that OTA provisioning and switching can be effectively addressed in the case of cross-border M2M.

Timelines

165 ComReg is minded to begin this following publication of its Final Action Plan.

Action 9: Future review of issues

166 As noted above, in its report WIK has identified a number of issues on which neither WIK nor ComReg can take a view or action at present given the early stage of development of the eSIM ecosystem, including but not limited to:

- Switching / OTA support for Secondary Devices and consumer M2M;
- Transparency around connectivity terms and switching possibilities for devices which are active “out of the box”;
- Guidelines for M2M switching; and
- MVNO access to eSIM support / OTA.

167 Therefore, in order to promote OTA provisioning, ComReg considers it appropriate to return and examine such issues, as required. ComReg reserves its right to revisit these issues and others as it deems necessary.

Timelines

168 ComReg considers 5 years as an indicative date for review of this action plan but notes that this may naturally change as a result of technological and/or market developments. This does not preclude ComReg from returning in the interim to review specific aspects, where necessary.

5.2.2 Summary of the Proposed Actions

169 Under the proposed Action Plan, ComReg would establish a target, no later than 12 months post-decision for MNOs to support eSIM together with fully digital provisioning and switching processes for consumer devices. Therefore, no later than 12 months post-decision MNOs would have completed Actions 1-3, and their sub-actions, implementing:

- fully digital OTA customer journeys; and
- a review of MNP processes through the MNP Committee

170 In the interim, under the proposed Action Plan, ComReg would:

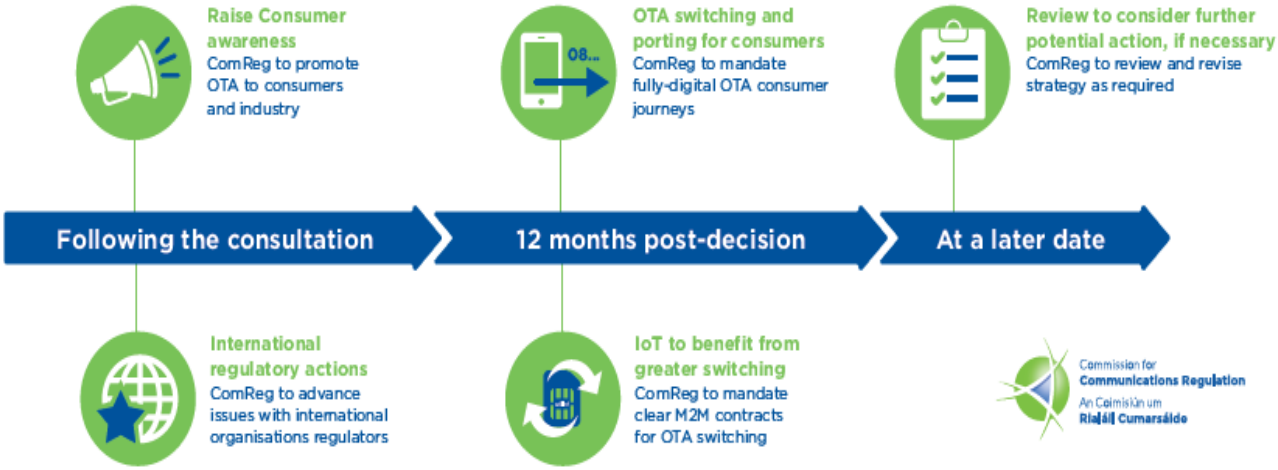
- raise awareness amongst consumers and industry regarding the direct benefits of eSIM and OTA provisioning to the market and consumers; and
- engage with international and European regulatory bodies to encourage monitoring of eSIM deployment and take-up including cross-border IoT.

171 Finally, ComReg may review its strategy as required in the future and examine matters on which it cannot reasonably take a view or action at present. ComReg sets an indicative date of 2026 for this, for the purpose of guiding stakeholders as to when this may be. The topics for such a review would include what topics ComReg deem appropriate at the time of the review, but this could include:

- MVNO access to OTA;
- Switching for Secondary Devices;
- OTA support for Secondary Devices and/or M2M; and

- Best practice for NRAs to support OTA switching for M2M.

Figure 8: Proposed timeline ComReg strategy



5.3 Draft Guidance on OTA provisioning for Consumer Mobile

172 Under Action 2, ComReg commits to developing Guidance for OTA provisioning for Consumer Mobile. This section outlines ComReg's preliminary views on this guidance and the principles for ensuring the efficiency and simplicity of the switching process. These principles relate primarily to ComReg's Actions 1-3. These draft principles are without prejudice to and do not supplant operators' legal obligations with regard to mobile switching or mobile number portability more generally.

173 The full realisation of the benefits of OTA provisioning to consumers will depend on how MNOs implement and design their processes and enable the "fully-digital" consumer journey. Accordingly, based on the Vision, ComReg has identified five broad principles it views as consistent with the obligation for a simple and efficient switching process to ensure end-users' rights.

1. Consumers should be able to avail of seamless end-to end fully-digital OTA customer journeys.

2. OTA activation and switching should be as fast as possible.

3. Clear and sufficient information should be provided to complete seamless OTA customer journeys.

4. OTA switching shall be recipient-led.

5. OTA provisioning should be safe and secure.

1. Consumers should be able to avail of seamless fully digital OTA customer journeys

Basis

174 Article 106(6) of the EECC states that NRAs may establish the details of the switching and porting processes, including requiring operators to provide porting services via OTA provisioning, where technically feasible.

175 Over-the Air provisioning enables a "fully-digital" consumer journey. ComReg notes WIKs expert view that OTA provisioning in Ireland is technically feasible. This is because, *inter alia,* Ireland's MNP process is "OTA-ready" and switching or activating a mobile subscription does not require any physical action. Seamless fully digital OTA journeys would enhance the benefits from OTA provisioning, both in terms of consumer journeys (e.g., convenience and speed) and competition (e.g., new services, greater competition).

176 Therefore, ComReg is minded to adopt this as a principle. Below, ComReg outlines what this means for both Consumer OTA processes and explains its views.

Guidance

177 ComReg has identified a number of issues which operators should consider in the design and implementation of their fully digital consumer journeys[121], which are:

a) The activation/switching process; and

b) The technology.

a) The activation/switching process

178 Fully digital OTA consumer journeys should involve as few steps as possible on the part of the consumer.[122] It should also enable consumers to take complementary actions (e.g., ability to cancel a previous subscription and/or port a number). Specifically, in relation to OTA switching with a number port[123], the two processes should work in conjunction with one another to provide a seamless experience for the end-user[124] and that in the event of any changes in the existing MNP process:

- The design principles for Porting via OTA should extend to any amended version of the MNP industry process manual (e.g., maximum 2 hours)[125]; and
- The pre-existing ability to port by SIM card needs to be retained.

[121] Under Action 1, Irish consumers would be able to benefit from widespread support for fully-digital Over-the-Air activation and switching, no later than 12 months post-decision.
[122] As demonstrated in the indicative consumer journeys in Figures 5 and 6.
[123] MNP is of key importance to switching for consumer mobile and therefore critical to realising the full benefits of Over-the-Air switching that such processes integrate seamlessly with MNP processes
[124] As noted in Action 1, Irish MNOs and WIK consider that Irish MNP processes are "OTA-ready". Therefore, ComReg considers that consumers should have the ability to use MNP in conjunction with OTA, as per Action 1, no later than 12 months post-decision.
[125] Mobile Number Portability Process Manual Issue 6.01 – Q1 2012.

b) The underlying technology

179 ComReg notes there are a number of technologies that support OTA consumer journeys for mobile, namely QR codes[126] and Mobile Apps.[127] QR codes are the technology most MNOs use initially to support OTA provisioning. QR codes must be distributed to consumers and this may be done by email, download, via MNOs website, or via post. In practice, MNOs have adopted a variety of approaches to QR code distribution, for example:

- **Three**, UK – A customer receives a paper voucher with a printed QR code[128];
- **Vodafone**, Qatar – A customer generates the QR code in-app and is required to send it to another device[129];
- **Vodafone,** Hungary – A customer must request an eSIM in-store[130];
- **Circles. Life**, Singapore– A customer receives an email with a QR code upon plan creation[131] within 10 minutes[132].

180 The distribution of QR codes by post or in-store does not meet ComReg's criteria as it does not constitute a "fully-digital" consumer journey. Furthermore, postal distribution or in-store purchase or collection limits the speed of switching/activation to the speed of delivery[133]. Therefore, operators' wishing to use QR codes should distribute such QR codes digitally (e.g., by email or download).[134] ComReg does not consider this an overly onerous obligation, and notes that many MNOs distribute QR codes for OTA digitally[135].

[126] Which requires the consumer to scan a QR code on their mobile device to activate the eSIM.
[127] Which requires the user download the operators' mobile app, to builds their subscription plan and activate their eSIM.
[128] https://www.youtube.com/watch?v=cn3fFzJYclQ
[129] https://www.youtube.com/watch?v=52dKQQ8FIME
[130] https://www.vodafone.hu/esim
[131] https://www.youtube.com/watch?v=TjsUe-BeC70&t=66s
[132] eSim | Circles.Life
[133] Likely next day delivery in the best case scenario.
[134] This does not prevent operators from allowing consumers to request or receive QR codes by post or in store also.
[135] ComReg is not aware of any benefit remedied by postal distribution (e.g., security or fraud), that cannot also be remedied by other methods of QR code distribution.

181 QR codes may not be as seamless as possible, requiring the consumer to take additional steps and use a second device (e.g., laptop or phone)[136]. Mobile App based processes enable consumers to activate their eSIM profile following inputting their details, after which the profile is installed and ready for use. This removes the need for the user to receive the QR code, display the QR code on a separate device and scan the QR code - which typically requires visual explanations and step-by-step instructions[137]. ComReg therefore considers that Mobile App based OTA processes are likely to be superior in terms of consumer experience.

182 ComReg understands from the interviews that QR codes are considered a faster and cost-effective means for MNOs to begin providing OTA provisioning for consumer mobile. Therefore, ComReg is not minded to require Mobile App based OTA at present, as this may further delay the deployment of OTA in Irish markets. Nevertheless, ComReg may revisit this issue in time if that Mobile-App based OTA proves to provide better consumer experiences. This will not be necessary if mobile operators can address the aforementioned issues with QR codes based OTA through the design of consumer journeys (e.g., avoiding requiring a second device, simple processes) and/or by addressing this at a later date (e.g., migrating to Mobile App based OTA in time).

2. OTA activation, switching and porting should be as fast as possible

Basis

183 Article 106 (1) requires that, when switching between IAS providers, the receiving provider shall ensure that the activation of the internet access service occurs within the shortest possible time on the date and within the timeframe expressly agreed with the end-user.

[136] For example, Vodafone Qatar distribute QR codes digitally, via the Vodafone app, but this requires the user send this QR code to another device to be scanned.
[137] For an example of how simple Mobile App provisioning can be, see the following on-boarding videos from Mobilise: eSIM as a Service - White-label eSIM app for MNOs and MVNOs (mobiliseglobal.com) and NetLync White-label eSIM app solutions for mobile operators (netlync.com)

184 OTA provisioning enables faster customer journeys, removing the need to request or otherwise acquire a SIM card. Faster fully digital customer journeys enhance the benefits from OTA provisioning, both in terms of consumer journeys (e.g., convenience and speed) and competition (e.g., new services, greater competition). Therefore, ComReg is minded to adopt this as a principle. Below, ComReg outlines what this means for both Consumer and M2M OTA processes and explains its views.

Guidance

185 In OTA provisioning the binding constraint on switching times will shift from securing of the physical SIM (i.e., two days[138]) to the duration of OTA processes (i.e., minutes) and porting (i.e., typically minutes but no more than two hours)[139].

186 There is little published on potential speeds for OTA activation or switching, but it appears from examples internationally and advertised eSIM solutions[140], using the GSMA eSIM standard, that neither activation nor switching should take more than a few minutes. ComReg and WIK are not aware of any reason that OTA customer journeys for OTA should take longer than this. Therefore, ComReg considers that operators should ensure that consumer journeys for:

- OTA activation and switching should not exceed 5 minutes from start to finish[141]; and
- Porting should be available as an option, integrated in the OTA customer journey.[142]

187 Switching times for OTA provisioning for Consumer use cases are potentially impacted by, or dependent on, a number of related processes. Operators must ensure that such processes do not undermine the realisation of faster switching times and delay the time required to complete OTA switching or porting. ComReg has identified four such processes which should not unnecessarily limit or reduce the benefits of OTA.:

- Interactions with MNP;

[138] Assuming next day delivery of the SIM card.
[139] Operators report that the vast majority of Ports occur well within the two hour window required by law.
[140] For an example of how fast Mobile App provisioning can be, see the following on-boarding videos from Mobilise: eSIM as a Service - White-label eSIM app for MNOs and MVNOs (mobiliseglobal.com).
[141] Assuming the consumer completes all necessary steps in a timely and efficient manner.
[142] Which should still not exceed 5 minutes from start to finish. For the avoidance of doubt, it is the customer journey that that should not exceed 5 minutes, noting that porting itself may take longer.

- Interactions with OEMs;
- Handset swap policies; and
- Handset Locking policies.

188 **ComReg wishes to seek the views of operators on the merits of further examining the impact of these processes on OTA switching or switching more generally (e.g., ComReg to review of impact of mobile handset locking on switching).**

Interactions with MNP

189 Under OTA provisioning, MNP will become the binding constraint on the duration of a switch for a typical mobile consumer. Therefore, fast reliable MNP processes are important to maximising the benefits of OTA through reduced switching times.

190 ComReg agrees with WIK's finding that Irish MNP is largely fit for purpose. Interviews with stakeholders indicate that Irish MNP is fast with most ports being completed in minutes not hours. Further, MNP has low levels of loss of service or failed ports and compares favourably to international MNP processes on both speed and ease of use. This is corroborated by WIKs analysis of ComReg's customer complaints data which shows a low level of unsuccessful ports (which may in any event be caused by consumer error).

Interactions with OEMs

191 In certain circumstances, consumers may be required to provide information to the handset's manufacturer or manufacturer's processes. If such a step is required, providers should ensure and that consumers receive all the necessary instruction to complete this step to ensure that this does not unduly delay the OTA activation or switching.

Handset swapping policies

192 One clear disadvantage of an eSIM compared to a physical SIM is where a consumer wishes to switch a subscription between devices (e.g., when upgrading). This is simple and straightforward in the case of a SIM card[143], with a customer simply removing the SIM card from the old and inserting it in the new device. This is more complicated for eSIM, and the exact process may depend on the provider or handset manufacturer144. Multiple steps on the part of the consumer may over complicate switching handsets. This could be exacerbated by mistakes made by consumers due to confusion (e.g., mistaken profile deletion).

193 Difficulties switching eSIM between handsets could hamper OTA activation and switching, through reducing eSIM adoption or where a consumer wishes to switch both their mobile provider and their handset. ComReg considers that service providers should provide simple, clear instruction on their website for consumers wishing to:

- transfer an eSIM between handsets while retaining their subscription; or
- switching providers and receive a new phone.

Handset locking policies

194 In the event that a handset is locked, a consumer attempting to switch must first contact their provider to request an unlock code, typically by filling an online form. The mobile provider may then provide the code (if in its possession) or request the code from the relevant manufacturer, which have varying turnaround times for such requests. Based on MNO's websites, it appears Handset Locking could add between 3 days to 3 weeks to a consumer switching experience, depending on the make and model. Operators provide the following guidance on unlocking times:

- **Vodafone**: 7 days for iPhones, up to 20 days for other brands[145]
- **Eir**: Up to 10 days, with a further 15 for an OEM request[146]

[143] Noting that it may be complicated due to differences in SIM Card formats (mini, micro, nano SIM).
[144] For example, transferring an eSIM across iPhones can be relatively straightforward but is only possible for certain models. Transfer a SIM from your previous iPhone to eSIM on your new iPhone - Apple Support (IN)
[145] https://n.vodafone.ie/forms/consumer/nac.html
[146] https://www.eir.ie/support/mobile/unlocking-code-00001/

- **Three**: typically within 3 days[147], but as much as 20 days where the manufacturer must be contacted[148]

- **Tesco**: 3 -21 days[149] depending on the make and model.

195 Handset Locking can evidently increase the length of any switch, and therefore diminish or negate the benefits of OTA switching for many consumers. Furthermore, in certain cases the customer is only eligible to unlock the phone following a minimum spend or having completed a defined minimum contract term. This renders devices which have been unused for periods effectively ineligible for switching, in particular where a consumer has a new primary device (e.g., following an upgrade). ComReg does not currently have data on the percentage of consumers that purchase locked handsets but consider that this may be a significant share of total Irish mobile consumers noting:

- handset Locking is prevalent in the Irish market; and

- the high reliance on Apple and Samsung, which appear to have longer code requests.

196 The large number of third parties providing SIM unlocking services in Ireland[150] is evidence that a large number of consumers find unlocking SIMs via MNOs to be prohibitively inconvenient. Third party providers advertise faster unlocking times:

- 1 day for iPhones[151] (RRP €30-€125[152]); and

- 30 minutes to 1 day for most other models (RRP €10-€20).

197 Therefore, ComReg has concerns that Handset Locking could diminish the benefits of eSIM, by hindering or dissuading consumers from switching mobile provider. ComReg notes that several other NRAs have examined the interplay between eSIM support and Handset Locking (e.g., MIC, IMDA and the ACCC) and in certain instances have determined that sales of locked handsets be banned[153].

[147] https://www.three.ie/legal/policies/unlocking-policy.html
[148] https://www.three.ie/web/uploads/PSPDF/UnlockcodeTimeframes.pdf
[149] https://www.tescomobile.ie/help-centre/your-phone/unlocking-your-phone#
[150] For example Unlock.ie, Chris-IT, MobileUnlocked.com, MobileUnlockCodes.co.UK.
[151] Turnaround time as reported by MobileUnlocked.co.uk.
[152] Prices as reported by 48.ie. https://48.ie/unlock-your-phone/provider/details/unlock-ie
[153] For example, the United Kingdom's Office of Communications ("Ofcom") which banned the sale of locked handsets in order to enhance mobile consumers ability to switch providers.

3. Clear and sufficient information should be provided to complete seamless OTA customer journeys

Basis

198 Article 106 (1) requires that, when switching between IAS providers, end-users are given adequate information before and during the switching process. The onus is on mobile providers to determine the 'adequate information' required as part of the switching process.

199 To benefit from seamless fully digital OTA customer journeys, consumers must be provided with clear information to take all necessary steps. The provision of such information enhances the benefits from OTA provisioning, both in terms of consumer journeys (e.g., convenience and speed) and competition (e.g., new services, greater competition). Therefore, ComReg is minded to adopt this as a principle.

Guidance

200 ComReg considers that consumers should be provided with all information necessary to complete a successful activation or switch, such information should be communicated in clear and simple terms and this should be provided in a timely and efficient manner (i.e., when needed).

201 Operators should provide clear instructions for each model that offers eSIM support[154]. Such processes may require the cooperation of third parties (e.g., OEMs such as Apple, or other providers). In such cases, the information provided to, and requested from consumers should be streamlined in so far as is possible, in order to simplify the actions required of the consumer.

4. OTA switching and porting should be recipient-led

Basis

202 Article 106 (6) of the EECC provides that: "*The receiving provider shall lead the switching and porting processes set out in paragraph 1 and 5 and both the receiving and transferring providers shall co-operate in good faith*." As with other mobile switching processes, it remains the case that the legislation continues to require that the receiving provider shall take the lead and manage the OTA switch request on behalf of the end-user.

[154] See for example Vodafone Irelands instructions for each supported device. Apple iPhone 12 mini - Activate eSIM | Vodafone Ireland

203 Recipient-led switching processes can enable faster and more efficient switching[155]. Recipient-led OTA customer journeys would enhance the benefits from OTA provisioning, both in terms of consumer journeys (e.g., convenience and speed) and competition (e.g., greater competition). Therefore, ComReg is minded to adopt this as a principle except where the end-user wishes to maintain multiple service providers.

Guidance

204 ComReg considers that OTA switching can and should be recipient-led where switching involves MNP or in other cases where the consumer indicates that it wishes to terminate a previous primary connectivity contract when purchasing connectivity from a new provider and notes that this is possible under the GSMA standard, as shown from the GSMA eSIM Whitepaper[156] .

5. OTA provisioning should be safe and secure

Basis

205 It is clear that without sufficient confidence in the security of OTA, consumers will not unlock the other benefits of OTA provisioning both direct (e.g., convenience and speed) and indirect (e.g., greater competition), as that fears over security resilience may be a barrier to consumer take-up.

206 Previous iterations of current Article 106 of the EECC already highlighted the need for consumers to be adequately "protected" from manipulation throughout the switching and porting processes. The new EECC has more emphasis on security integrity and resilience and on cybersecurity. OTA provisioning must be as safe as possible having regard to the state of the art best practice (e.g. ENISA, ISO or other recognised standards), This is required in order to gain consumer trust and for consumers in turn to realise the full benefits of OTA provisioning, switching and porting.

207 ComReg considers that providers should ensure that their systems and solutions providers have the requisite accreditation for their chosen eSIM standard. As ComReg noted in 18/03 "*The OTA switching process should be transparent and non-discriminatory – it should facilitate competition yet safeguard security.*"[157]

[155] For example, the EECC specifies that a customer wishing to switch provider or port their number contact the new network (the recipient), which then sends the number portability request (NPR) to the current network (the donor).
[156] GSMA "*eSIM Whitepaper The what and how of Remote SIM Provisioning"* March 2018
[157] Paragraph 265

Guidance

208 ComReg notes that OTA provisioning may both be a remedy to certain traditional security issues with SIMs (e.g., SIM swap) but may give rise to new security issues, such as new forms of fraud. Operators will need to ensure, as a baseline, that their systems remain up to date with the latest accreditation to ensure the highest level of security possible and that their OTA offering has an in-built resilient and robust security system that can be strengthened as required from time to time having regard to the state of the art.

209 At a minimum, and for the purposes of Article 40 and Article 41 of the EECC, the personal details and credentials of the end-user *and* the device need to have in-built robust and resilient security features. Industry will also be expected to comply with such guidance as may issue from ENISA, ComReg, the DPC or the NCSC in Ireland or any other relevant security and cyber security authority in Ireland and within the EU. Industry should also take a pro-active approach in awareness raising and education in order to truly achieve consumer protection as against cyber security incidents in particular.

Chapter 5 Consultation Questions

Vision

Q12: Do you agree with the Vision for Over-the-Air provisioning proposed by ComReg?

Q13: Do you consider the 8 factors to be well specified?

Q14: Are there further factors ComReg should consider in its Vision for Over-the-Air provisioning?

Challenges

Q15: Do you agree with the potential challenges identified to the realisation of the Vision identified by WIK? Are there any further challenges which should be considered?

Q16: Do you consider the 8 factors to be well specified? If not, please explain how your views differ.

Q17: Are there further factors ComReg should consider in its Vision for Over-the-Air provisioning?

Actions

Q18: Do you agree with each of the Actions proposed by WIK which ComReg is minded to adopt?

Q19: Do you agree with the justification given by ComReg for each of the Actions proposed by WIK which ComReg is minded to adopt?

Q20: Do you agree with the envisaged timeline for each of the Actions proposed by WIK which ComReg is minded to adopt?

Q21: Are there further actions which ComReg should consider?

Guidance

Q22: Do you agree with the Guidance for Over-the-Air provisioning proposed by ComReg?

Q22: Are there any additional matters relating to Over-the-Air switching which ComReg

6 Submitting Comments and Next Steps

6.1 Submitting Comments

210 All input and comments are welcome. However, it would make the tasks analysing responses easier if comments were referenced to the relevant section / paragraph number in each chapter and annex in this document.

211 Please also set out your reasoning and all supporting information for any views expressed.

212 The consultation period will run until 17:00 on Monday 17 December during which time ComReg welcomes written comments on any issues raised in this paper.

213 Responses must be submitted in written form (email) to the following recipient, clearly marked – Submissions to ComReg 20/114:

Mr. Donnacha Hennessy

Commission for Communications Regulation

Email: marketframeworkconsult@comreg.ie

214 Electronic submissions should be submitted in an unprotected format so that they may be readily included in the ComReg submissions document for electronic publication.

215 ComReg appreciates that respondents may wish to provide confidential information if their comments are to be meaningful. In order to promote openness and transparency, ComReg will publish all respondents' submissions to this notice, as well as all substantive correspondence on matters relating to this document, subject to the provisions of ComReg's guidelines on the treatment of confidential information (Document 05/24).

216 In this regard, respondents should submit views in accordance with the instructions set out below. When submitting a response to this notification that contains confidential information, respondents must choose one of the following options:

A. Preferably, submit both a non-confidential version and a confidential version of the response. The confidential version must have all confidential information clearly marked and highlighted in accordance with the instruction set out below and include the reasons as to why they consider any particular material to be confidential. The separate

non-confidential version must have actually redacted all items that were marked and highlighted in the confidential version.

OR

B. Submit only a confidential version including the reasons as to why they consider any particular material to be confidential and ComReg will perform the required redaction to create a non-confidential version for publication. With this option, respondents must ensure that confidential information has been marked and highlighted in accordance with the instructions set out below. Where confidential information have not been marked as per our instructions below, then ComReg will not create the non-confidential redacted version and the respondent will have to provide the redacted non-confidential version in accordance with option A above.

217 For ComReg to perform the redactions under Option B above, respondents must mark and highlight all confidential information in their submission as follows:

a. Confidential information contained within a paragraph must be highlighted with a chosen particular colour,

b. Square brackets must be included around the confidential text (one at the start and one at the end of the relevant highlighted confidential information),

c. A Scissors symbol (Symbol Code: Wingdings 2:38) must be included after the first square bracket.

218 For example, "*Redtelecom has a market share of [✂25%].*"

6.2 Next Steps

219 When it has concluded its review of all submissions received and other relevant material, ComReg's intention would be to publish a response to consultation, a further consultation and a further consultant's report follow by a draft decision as appropriate.

Annex 1: Legal Framework and Statutory Objectives

A 1.1 On 20 December 2018, Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications EECC ("EECC") entered into force. While the date for the transposition of the EECC passed on 21 December 2020 ComReg has taken account of the EECC in this preliminary consultation in considering OTA provisioning for the purposes of this preliminary consultation document, and Articles 93 and 106 of the EECC in particular (detailed further below in this Annex).

A 1.2 The Communications Regulation Act 2002 (as amended by the Communications Regulation (Amendment) Act 2007) (the "2002 Act"), the EU Common Regulatory Framework set out, amongst other things, ComReg's functions and objectives that are relevant to the management of numbering resources, number portability, switching, and the provision of electronic communications and services in Ireland (and which are largely continued under the EECC in addition).

A 1.3 This annex is intended as a general guide as to ComReg's role in this area, and not as a definitive or exhaustive legal exposition of that role. Further, this annex restricts itself to consideration of those functions, objectives powers, and duties of ComReg that appear most relevant to the matters at hand and generally excludes those not considered relevant (for example, in relation to postal services or premium rate services and other areas). For the avoidance of doubt, however, the inclusion of particular material in this annex does not necessarily mean that ComReg considers same to be of specific relevance to the matters at hand.

A 1.4 All references in this annex to enactments are to the enactment as amended at the date hereof unless the context otherwise requires.

A1.1 Primary Functions and Objectives and Regulatory Principles under the 2002 Act and Common Regulatory Framework

A 1.5 ComReg's relevant functions pursuant to Section 10 of the Communications Regulation Act 2002 as amended include:

(a) to ensure compliance by undertakings with obligations in relation to the supply of and access to electronic communications services, electronic

communications networks and associated facilities and the transmission of such services on such networks;

(b) to manage the radio frequency spectrum and the national numbering resource, in accordance with a direction under section 13,;

(e) to ensure compliance, as appropriate, by persons in relation to the placing on the market of communications equipment and the placing on the market and putting into service of radio equipment.

It's primary objectives in carrying out its statutory functions in the context of electronic communications, pursuant to Section12 of the Primary Act are:

(a) in relation to the provision of electronic communications networks, electronic communications services and associated facilities—

(i) to promote competition,

(ii) to contribute to the development of the internal market, and

(iii) to promote the interests of users within the Community,

(b) to ensure the efficient management and use of the radio frequency spectrum and numbers from the national numbering scheme in the State in accordance with a direction under section 13.

A1.1.2 Promotion of Competition

A 1.6 Section 12(2)(a) of the 2002 Act requires ComReg to take all reasonable measures which are aimed at the promotion of competition, including:

- encouraging efficient use and ensuring the effective management of radio frequencies and numbering resources;
- ensuring that there is no distortion or restriction of competition in the electronic communications sector; and
- ensuring that users, including disabled users, derive maximum benefit in terms of choice, price and quality.[158]

[158] In so far as the promotion of competition is concerned, Regulation 16(1)(b) of the Framework Regulations also requires ComReg to: ensure that elderly users and users with special social needs derive maximum benefit in terms of choice, price and quality

A1.1.3 Contributing to the Development of the Internal Market

A 1.7 Section 12(2)(b) of the 2002 Act requires ComReg to take all reasonable measures which are aimed at contributing to the development of the internal market, including:

- removing remaining obstacles to the provision of ECN, ECS and associated facilities at Community level;
- encouraging the establishment and development of trans-European networks and the interoperability of transnational services and end-to-end connectivity; and
- co-operating with electronic communications national regulatory authorities in other Member States of the Community and with the Commission of the Community in a transparent manner to ensure the development of consistent regulatory practice and the consistent application of Community law in this field[159].

A1.1.4 Promotion of Interests of Users

A 1.8 Section 12(2)(c) of the 2002 Act requires ComReg, when exercising its functions in relation to the provision of electronic communications networks and services, to take all reasonable measures which are aimed at the promotion of the interests of users within the Community, including:

- ensuring that all users have access to a universal service;
- ensuring a high level of protection for consumers in their dealings with suppliers, in particular by ensuring the availability of simple and inexpensive dispute resolution procedures carried out by a body that is independent of the parties involved;
- contributing to ensuring a high level of protection of personal data and privacy;
- promoting the provision of clear information, in particular requiring transparency of tariffs and conditions for using publicly available ECS;

[159] In so far as contributing to the development of the internal market is concerned, Regulation 16(1)(c) of the Framework Regulations also requires ComReg to co-operate with the Body of European Regulators for Electronic Communications ("BEREC") in a transparent manner to ensure the development of consistent regulatory practice and the consistent application of EU law in the field of electronic communications.

- encouraging access to the internet at reasonable cost to users;
- addressing the needs of specific social groups, in particular disabled users; and
- ensuring that the integrity and security of public communications networks are maintained.

A 1.9 In so far as promotion of the interests of users within the EU is concerned, Regulation 16(1)(d) of the Framework Regulations also requires ComReg to:

- address the needs of specific social groups, in particular, elderly users and users with special social needs, and
- promote the ability of end-users to access and distribute information or use applications and services of their choice.

A1.1.5 Technological Neutrality

A 1.10 Unless otherwise provided for in Regulation 17 of the Framework Regulations, take the utmost account of the desirability of technological neutrality in complying with the requirements of the Specific Regulations in particular those designed to ensure effective competition.

A1.1.6 Regulatory Principles

A 1.11 In pursuit of its objectives under Regulation 16(1) of the Framework Regulations and section 12 of the 2002 Act, ComReg must apply objective, transparent, non-discriminatory and proportionate regulatory principles by, amongst other things:

- promoting regulatory predictability by ensuring a consistent regulatory approach over appropriate review periods;
- ensuring that, in similar circumstances, there is no discrimination in the treatment of undertakings providing ECN and ECS;
- safeguarding competition to the benefit of consumers and promoting, where appropriate, infrastructure-based competition;
- promoting efficient investment and innovation in new and enhanced infrastructures, including by ensuring that any access obligation takes appropriate account of the risk incurred by the investing undertakings and by permitting various cooperative arrangements between investors and parties seeking access to diversify the risk of investment, while

ensuring that competition in the market and the principle of non-discrimination are preserved;

- taking due account of the variety of conditions relating to competition and consumers that exist in the various geographic areas within the State; and

- imposing ex-ante regulatory obligations only where there is no effective and sustainable competition and relaxing or lifting such obligations as soon as that condition is fulfilled.

A1.1.7 BEREC

A 1.12 Under Regulation 16(1)(3) of the Framework Regulations, ComReg must:

- having regard to its objectives under section 12 of the 2002 Act and its functions under the Specific Regulations, actively support the goals of BEREC of promoting greater regulatory co-ordination and coherence; and

- take the utmost account of opinions and common positions adopted by BEREC when adopting decisions for the national market.

A1.1.8 Other Obligations under the 2002 Act

A 1.13 In carrying out its functions, ComReg is required, amongst other things, to:

- seek to ensure that any measures taken by it are proportionate having regard to the objectives set out in section 12 of the 2002 Act.[160]

Regulation 25 Universal Service Regulations

Regulation 25 of the Universal Service Regulations *Facilitating change of service provider* sets out as follows (emphasis added).

25. (1) "*Undertakings shall ensure that a subscriber with a number from the national numbering scheme can,* ***upon request, retain his or her number*** *independently of the undertaking providing the service— (a) in the case of geographic numbers, at a specific location, and (b) in the case of non-geographic numbers, at any location. This paragraph does not apply to the porting of numbers between networks providing services at a fixed location and mobile networks.*

(2) Undertakings to which paragraph (1) relates shall ensure that pricing between

[160] Section 12(3) of the 2002 Act.

operators or service providers related to the provision of number portability as provided for in paragraph (1) is ***cost oriented*** *and that* ***direct charges to subscribers, if any, do not act as a disincentive*** *for subscribers changing service provider.*

(3) The Regulator shall ensure that undertakings comply with their obligations under paragraph (2) and the ***Regulator may issue directions*** *to an undertaking to which paragraph (2) relates to require that there shall be no direct charges to subscribers for number portability. Where retail tariffs for porting of numbers are permitted, the Regulator shall ensure that such tariffs may not be imposed in a manner that would* ***distort competition*** *and for this purpose may specify obligations to be complied with by an undertaking.*

(4) Undertakings referred to in paragraph (1) shall ensure that—

(a) the porting of numbers and their subsequent activation shall be carried out within the ***shortest possib****le time, (b) in the case where a subscriber has concluded an agreement to port a number to a new undertaking, that number shall be activated* ***within one working day,*** *and (c) loss of service during the porting process* ***shall not exceed one working day.***

(5) Without prejudice to paragraph (4), the ***Regulator may establish the global process*** *of porting of numbers, taking into account provisions on contracts, technical feasibility and the need to maintain continuity of service to the subscriber. These procedures shall specify that loss of service during the process shall not exceed one working day in accordance with paragraph (4). The Regulator shall also take into account, where necessary, measures ensuring that subscribers are protected throughout the switching process and not switched against their will.*

(6) (a) An undertaking providing electronic communications services shall ***not conclude contracts with consumers which mandate an initial commitment period that exceeds 24 months*** *and shall offer users the possibility to subscribe to a contract with a maximum duration of 12 months. (b) Without prejudice to any minimum contractual period the undertaking shall ensure that conditions and procedures for contract* ***termination do not act as a disincentive*** *to a consumer to changing service provider.*

(7) The obligations referred to in this Regulation apply to all undertakings with a role in facilitating change of provider, including the operator to which the subscriber is porting and the operator from which the subscriber is porting and any wholesale operator with involvement in the process.

(8) An undertaking that fails to comply with— (a) the requirements of paragraph (1), (b) a direction of the Regulator under paragraph (3), or (c) the requirements of

paragraph (2), (4) or (6) commits an offence.

(9) In proceedings for an offence under paragraph (8) it is a defence to establish that— (a) reasonable steps were taken to comply with the relevant requirement or direction, or (b) it was not possible to comply with the relevant requirement or direction.

(10) Undertakings shall ***compensate subscribers in case of delay in porting or abuse*** *of porting by them or on their behalf. The Regulator may specify requirements to be complied with by undertakings in relation to this obligation including, but not limited to, arrangements for the payment of compensation to subscribers. Any dispute in relation to compensation payable under this paragraph shall be subject to Regulation 27."*

Article 93 of the EECC

A 1.14 Article 93 (6) *Numbering Resources,* provides as follows (emphasis added) "*Without prejudice to Article 106,* ***Member States shall promote OTA provisioning, where technically feasible, to facilitate switchin****g of providers of electronic communications networks or services by end-users, in particular providers and end-users of machine-to-machine services.*"

Article 105 of the EECC

A 1.15 Article 105 of the EECC "*Contract duration and termination*" provides (emphasis added)

A 1.16 1. *Member States shall ensure that conditions and procedures for* ***contract termination do not act as a disincentive*** *to changing service provider and that contracts concluded between consumers and providers of publicly available electronic communications services other than number-independent interpersonal communications services and other than transmission services used for the provision of machine-to-machine services,* ***do not mandate a commitment period longer than 24 months.*** *Member States may adopt or maintain provisions which mandate shorter maximum contractual commitment periods. This paragraph shall not apply to the duration of an instalment contract where the consumer has agreed in a separate contract to instalment payments exclusively for deployment of a physical connection, in particular to very high capacity networks. An instalment contract for the deployment of a physical connection shall not include terminal equipment, such as a router or modem, and shall not preclude consumers from exercising their rights under this Article.*

A 1.172. Paragraph 1 shall also apply to end-users that are microenterprises, small enterprises or not-for-profit organisations, unless they have explicitly agreed to waive those provisions.

A 1.18 3. Where a contract or national law provides for automatic prolongation of a fixed duration contract for electronic communications services other than number-independent interpersonal communications services and other than transmission services used for the provision of machine-to-machine services, Member States shall ensure that, after such prolongation, end-users are entitled to ***terminate the contract at any time with a maximum one-month notice period****, as determined by Member States, and* ***without incurring any costs except*** *the charges for receiving the service during the notice period. Before the contract is automatically prolonged, providers shall inform end-users, in a prominent and timely manner and on a durable medium, of the end of the contractual commitment and of the means by which to terminate the contract. In addition, and at the same time, providers shall give end-users best tariff advice relating to their services. Providers shall provide end-users with best tariff information at least annually.*

A 1.194. End-users shall have the right to terminate their contract without incurring any further costs upon notice of changes in the contractual conditions proposed by the provider of publicly available electronic communications services other than number-independent interpersonal communications services, unless the proposed changes are exclusively to the benefit of the end-user, are of a purely administrative nature and have no negative effect on the end-user, or are directly imposed by Union or national law. Providers shall notify end-users at least one month in advance of any change in the contractual conditions and shall simultaneously inform them of their right to terminate the contract without incurring any further costs if they do not accept the new conditions. The right to terminate the contract shall be exercisable within one month after notification. Member States may extend that period by up to three months. Member States shall ensure that notification is made in a clear and comprehensible manner on a durable medium.

A 1.205. Any significant continued or frequently recurring discrepancy between the actual performance of an electronic communications service, other than an internet access service or a number-independent interpersonal communications service, and the performance indicated in the contract shall be considered to be a basis for triggering the remedies available to the consumer in accordance with national law, including the right to terminate the contract free of cost. 6. Where an end-user has the right to terminate a contract for a publicly available electronic communications service, other than a number-independent interpersonal communications service, before the end of the agreed contract period pursuant to this Directive or to other provisions of Union or national law, no compensation shall be due by the end-user other than for retained subsidised terminal equipment. Where the end-user chooses to ***retain terminal equipment bundled*** *at the moment of the contract conclusion, any compensation due shall not exceed its pro rata temporis value as agreed at the moment of the conclusion of the contract or the remaining part of the service fee until the end of the contract, whichever is the smaller. Member States may determine other methods to calculate the compensation rate, provided that such methods do not result in a level of compensation exceeding that calculated in accordance with the second subparagraph. The provider shall lift any condition on the use of that terminal equipment on other networks free of charge at a time specified by Member States and at the latest upon payment of the compensation.*

A 1.217. As far as transmission services used for machine-to-machine services are concerned, the rights mentioned in paragraphs 4 and 6 shall benefit only end-users that are consumers, microenterprises, small enterprises or not-for-profit organisations.

Article106 of the EECC

A 1.22 Article 106 *Provider switching and number portability,* provides as follows (emphasis added)

A 1.231. In the case of switching between providers of internet access services, the providers concerned shall provide the end user with ***adequate information before and during the switching process and ensure continuity*** *of the internet access service, unless technically not feasible. The receiving provider shall ensure that the activation of the internet access service occurs within the* ***shortest possible time*** *on the date and within the timeframe expressly agreed with the end-user. The transferring provider shall continue to provide its internet access service on the same terms until the receiving provider activates its internet access service.* ***Loss of service during the switching process shall not exceed one working da****y.* ***National regulatory authorities shall ensure the efficiency and simplicity*** *of the switching process for the end-user.*

A 1.242. Member States shall ensure that all end-users with numbers from the national numbering plan have the ***right to retain their numbers, upon request****, independently of the undertaking providing the service, in accordance with Part C of Annex VI.*

A 1.253. Where an end-user terminates a contract, Member States shall ensure that the end-user can retain the right to port a number from the national numbering plan to another provider ***for a minimum of one month after*** *the date of termination, unless that right is renounced by the end-user.*

A 1.264. National regulatory authorities shall ensure that pricing among providers related to the provision of ***number portability is cost-oriented****, and that* ***no direct charges*** *are applied to end-users.*

A 1.275. The ***porting of numbers and their subsequent activation shall be carried out within the shortest possible time*** *on the date explicitly agreed with the end-user. In any case, end-users who have concluded an agreement to port a number to a new provider shall have that number a****ctivated within one working day fr****om the date agreed with the end-user. In the case of failure of the porting process, the transferring provider shall reactivate the number and related services of the end-user until the porting is successful. The transferring provider shall continue to provide its services on the same terms and conditions until the services of the receiving provider are activated. In any event, the loss of service during the process of provider switching and the porting of numbers* ***shall not exceed one working day.*** *Operators whose access networks or facilities are used by either the transferring or the receiving provider, or both, shall ensure that there is no loss of service that would delay the switching and porting process.*

A 1.28 *6. The **receiving provider shall lead the switching and porting processes** set out in paragraphs 1 and 5 and both the receiving and transferring providers shall **cooperate in good faith**. They shall **not delay or abuse** the switching and porting processes, nor shall they port numbers or switch end-users without the end-users' **explicit consent**. The end-users' contracts with the transferring provider shall be terminated automatically upon conclusion of the switching process. **National regulatory authorities may establish the details of the switching and porting processes,** taking into account national provisions on contracts, technical feasibility and the need to maintain continuity of service to the end-users. This shall include, where technically feasible, a requirement for the **porting to be completed through OTA provisioning, unless an end-user requests otherwise.** National regulatory authorities shall also take appropriate measures ensuring that end-users are adequately informed and protected throughout the switching and porting processes and are not switched to another provider without their consent. Transferring providers shall refund, upon request, any remaining credit to the consumers using pre-paid services. Refund may be subject to a fee only if provided for in the contract. Any such fee shall be proportionate and commensurate with the actual costs incurred by the transferring provider in offering the refund.*

A 1.29 *7. Member States shall lay down rules on penalties in the case of the failure of a provider to comply with the obligations laid down in this Article, including delays in, or abuses of, porting by, or on behalf of, a provider.*

A 1.30 *8. Member States shall lay down rules on the compensation of end-users by their providers in an easy and timely manner in the case of the failure of a provider to comply with the obligations laid down in this Article, as well as in the case of delays in, or abuses of, porting and switching processes, and missed service and installation appointments*

A 1.31 *. 9. In addition to the information required under Annex VIII, Member States shall ensure that end-users are adequately informed about the existence of the rights to compensation referred to in paragraphs 7 and 8*Article 105 of the EECC

Article 107 of the EECC

A 1.32 Article 107 *Bundled offers,* provides as follows (emphasis added)

A 1.33 *1. If a bundle of services or a bundle of services and terminal equipment offered to a consumer comprises at least an internet access service or a publicly available number-based interpersonal communications service, Article 102(3), Article 103(1**), Article 105 and Article 106(1)** shall apply to all elements of the bundle including, **mutatis mutandis**, those not otherwise covered by those provisions.*

A 1.342. Where the consumer has, under Union law, or national law in accordance with Union law, a right to terminate any element of the bundle as referred to in paragraph 1 before the end of the agreed contract term because of a lack of conformity with the contract or a failure to supply, Member States shall provide that the consumer ***has the right to terminate the contract with respect to all elements of the bundle****.*

A 1.353. Any subscription to additional services or terminal equipment provided or distributed by the same provider of internet access services or of publicly available number-based interpersonal communications services shall not extend the original duration of the contract to which such services or terminal equipment are added, unless the consumer expressly agrees otherwise when subscribing to the additional services or terminal equipment.

A 1.364. Paragraphs 1 and 3 shall also apply to end-users that are microenterprises, small enterprises, or not-for-profit organisations, unless they have explicitly agreed to waive all or parts of those provisions.

A 1.37 5. Member States may also apply paragraph 1 as regards other provisions laid down in this Title".

Other Relevant Legislation and Policy Instruments

A1.1.7 Policy Directions

A 1.38 Section 12(4) of the 2002 Act provides that, in carrying out its functions, ComReg must have appropriate regard to policy statements, published by or on behalf of the Government or a Minister of the Government and notified to the Commission, in relation to the economic and social development of the State. Section 13(1) of the 2002 Act requires ComReg to comply with any policy direction given to ComReg by the Minister for Communications, Energy and Natural Resources ("the Minister") as he or she considers appropriate.

A 1.39 The Policy Directions which are most relevant in this regard include the following:

Policy Direction No.3 on Broadband Electronic Communication

Networks

A 1.40 ComReg shall in the exercise of its functions, take into account the national objective regarding broadband rollout, viz, the Government wishes to ensure the widespread availability of open-access, affordable, always-on broadband infrastructure and services for businesses and citizens on a balanced regional basis within three years, on the basis of utilisation of a range of existing and emerging technologies and broadband speeds appropriate to specific categories of service and customers.

Policy Direction No.4 on Industry Sustainability

A 1.41 ComReg shall ensure that in making regulatory decisions in relation to the electronic communications market, it takes account of the state of the industry and in particular the industry's position in the business cycle and the impact of such decisions on the sustainability of the business of undertakings affected.

Policy Direction No.5 on Regulation only where necessary

A 1.42 Where ComReg has discretion as to whether to impose regulatory obligations, it shall, before deciding to impose such regulatory obligations on undertakings, examine whether the objectives of such regulatory obligations would be better achieved by forbearance from imposition of such obligations and reliance instead on market forces.

Policy Direction No.6 on Regulatory Impact Assessment

A 1.43 ComReg, before deciding to impose regulatory obligations on undertakings in the market for electronic communications shall conduct a Regulatory Impact Assessment in accordance with European and International best practice and otherwise in accordance with measures that may be adopted under the Government's Better Regulation programme.

Policy Direction No.7 on Consistency with other Member States

A 1.44 ComReg shall ensure that, where market circumstances are equivalent, the regulatory obligations imposed on undertakings in the electronic communications market in Ireland should be equivalent to those imposed on undertakings in equivalent positions in other Member States of the European Community.

A 1.45 .

General Policy Direction No.1 on Competition (2004)

A 1.46 ComReg shall focus on the promotion of competition as a key objective. Where necessary, ComReg shall implement remedies which counteract or remove barriers to market entry and shall support entry by new players to the market and entry into new sectors by existing players. ComReg shall have a particular focus on:

market share of new entrants;

ensuring that the applicable margin attributable to a product at the wholesale level is sufficient to promote and sustain competition;

price level to the end user;

competition in the fixed and mobile markets; and

the potential of alternative technology delivery platforms to support competition.