

Up to date as at 30 June 2021
Schedule 2.1 – Technical Solution Specification

2.1 TECHNICAL SOLUTION SPECIFICATION

1 INTRODUCTION

1.1 Background information

1.1.1 The technical solution aims to address the Minister’s policy objectives (including those set out in Clause 8 (Policy Objectives)) and is guided by a set of intervention principles that are aligned with the State Aid Guidelines. These principles are:

- (A) technology neutrality;
- (B) provision of affordable access to high quality High Speed Broadband services;
- (C) use of existing infrastructure;
- (D) effective wholesale access;
- (E) step change in broadband availability;
- (F) step change in broadband End User experience;
- (G) future-proofed technology; and
- (H) service affordability.

1.1.2 The principal vehicle to deliver the technical solution requirements of the Project is the establishment of one or more wholesale service providers (referred to as NBPco and, if applicable, Other NBP Supplier) that will provide a portfolio of Passive Wholesale Products and Active Wholesale Products to Service Providers on an open access, non-discriminatory basis. This will allow End Users access to high-quality, highly reliable retail broadband services made available by Service Providers using (directly or indirectly) NBPco’s and, if applicable, the Other NBP Supplier’s respective portfolio of wholesale products in the Intervention Area.

1.1.3 In order to enable Service Providers to provide or support the provision of, as the case may be, high-quality and highly reliable end-to-end retail broadband services, NBPco shall provide:

(A) A portfolio of Wholesale Products which will be used as input by RSPs to provide end-to-end retail services and which Wholesale Products NBPco is required to evolve throughout the Contract Period, in terms of technical characteristics and service features in line with the market. This portfolio may be updated by NBPco during the Contract Period subject to the Wholesale Product Control Procedure in the following ways:

- (1) where NBPco agrees to the development of a new or existing Wholesale Product following a request from a Service Provider in accordance with the Product Development Process set out in Part 2 (Product Development Process) of Appendix 2 (Statement of Requirements and Product Development Processes) of Schedule 2.4 (Operational Performance);

- (2) where NBPco proposes the development of a new or existing Wholesale Product in accordance with the Product Development Process as set out in Part 2 (Product Development Process) of Appendix 2 (Statement of Requirements and Product Development Processes) of Schedule 2.4 (Operational Performance);
- (3) as a result of any changes to the Wholesale Products from time to time required by the Regulator pursuant to Law or any Regulatory Decision;
- (4) to comply with the Wholesale Product Roadmap, Technology Roadmap and Wholesale Product & Coverage Template;
- (5) to ensure that the Minimum Required Wholesale Products and Additional Required Wholesale Products evolve in line with Equivalent Products in the Excluded Area, in accordance with the process set out in Schedule 6.4 (Service, Network and Wholesale Product Compliance and Future Proofing).

This Paragraph 1.1.3 (Background Information) does not limit or affect NBPco's ability to make other changes to the Wholesale Products subject at all times to compliance with the Wholesale Product Control Procedure.

- (B) A portfolio of Wholesale Products which, subject to Clause 19.18 (Wholesale Products), will be used as input by WSPs to provide downstream wholesale products to RSPs to provide end-to-end retail services and which Wholesale Products NBPco is required to evolve in terms of technical characteristics and service features, in line with the market throughout the Contract Period.
- (C) Equivalence of Input platforms and operational systems to enable RSPs to manage the end-to-end broadband End User lifecycle (from ordering service provisioning, operational service support and management to the management of service cessation/service migration) and to enable a WSP to provision, operate and manage their Wholesale Products as well as monitor their performances.
- (D) A physical network which NBPco is required to evolve so that it is able to support the portfolio of Wholesale Products and which NBPco is required to future proof to accommodate the evolution of existing Wholesale Products as well as new Wholesale Products offered throughout the Contract Period.

1.2 Schedule structure

1.2.1 This Schedule 2.1 (Technical Solution Specification) is structured in the following way:

- (A) Paragraph 2 (Service Requirements) describes the mandatory nature of this Schedule.

- (B) Paragraph 3 (Product Requirements, Evolution and Roadmap) sets out the Wholesale Products specifications and requirements as well as product evolution and roadmap requirements, with which NBPco must comply.
- (C) Paragraph 4 (Operational Environment Requirements) sets out the specification and requirements for the Operational Environment with which NBPco must comply.
- (D) Paragraph 5 (Network Requirements for Wholesale Products) sets out the specification and requirements for the Network so that it supports Wholesale Products with which NBPco must comply.

2 SERVICE REQUIREMENTS

- 2.1 NBPco shall, throughout the Contract Period, satisfy and comply with all the requirements and descriptions set out in, and all other aspects of, this Schedule.

3 PRODUCT REQUIREMENTS, EVOLUTION AND ROADMAP

3.1 Introduction

- 3.1.1 In order to meet the Government objectives to provide high quality and future proofed broadband services, a number of Wholesale Products shall be offered by NBPco in the Intervention Area. These Wholesale Products shall be offered by NBPco to RSPs that wish to provide services to End Users (either residential, business or at Strategic Community Points) and, subject to Clause 19.18 (Wholesale Products), to WSPs in respect of the Intervention Area. NBPco shall comply with the specification for each Wholesale Product proposed as part of the NBPco Solution and set out in Schedule 2.2 (Reference Offer Requirements), Paragraph 4.2 (Wholesale Product Specifications).

- 3.1.2 The three different categories of Wholesale Products are:

- (A) Minimum Required Wholesale Products.
- (B) Additional Required Wholesale Products; and
- (C) Other Permitted Wholesale Products

and to the extent NBPco elects to include any Other Permitted Wholesale Products in the NBPco Solution it acknowledges and agrees that those Other Permitted Wholesale Products will then form part of the NBPco Solution and may not be withdrawn or changed in any way unless otherwise permitted under this Agreement.

- 3.1.3 NBPco shall provide all Wholesale Products on an Equivalence of Input basis and, in particular, shall provide all Wholesale Products and associated information and services to all Service Providers (excluding prospective customers of WSPs) and (if applicable) to Associated Service Providers in the same timescales and on the same terms and conditions (including Wholesale Prices and SP Performance Levels) and by means of the same systems and processes.
- 3.1.4 The provisions in this Paragraph 3 (Product Requirements, Evolution and Roadmap) set out the requirements and minimum specifications of each

category of Wholesale Product to be provided by NBPco. Except where stated otherwise in this Schedule, reference to the Wholesale Products includes all three different categories of Wholesale Products (that is Minimum Required Wholesale Products, Additional Required Wholesale Products and Other Permitted Wholesale Products).

3.1.5 Without limiting or affecting Paragraph 3.1.3 (Product Requirements, Evolution and Roadmap), NBPco undertakes that, as at the Commencement Date it has provided, and continuing throughout the Contract Period it shall provide, full details of the specifications for each Wholesale Product in its Reference Offer as required under Schedule 2.3 (Deployment Requirements) and shall comply in full with them.

3.2 Minimum Required Wholesale Products

3.2.1 NBPco is required to provide the following Minimum Required Wholesale Products on an Eol basis:

- (A) Active Access Wholesale Products
 - (1) Minimum Bitstream Wholesale Product; and
 - (2) Minimum Virtual Unbundled Access (VUA) Wholesale Product;
- (B) Passive Access Wholesale Products
 - (1) Duct Access Product;
 - (2) Pole Access Product;
 - (3) Unbundled Fibre Access Product;
 - (4) Dark Fibre Product; and
 - (5) Radio Tower and Mast Access Product
- (C) Active Backhaul Wholesale Products
 - (1) InterConnect Product; and
 - (2) Transmission Product; and
- (D) Passive Backhaul Wholesale Products
 - (1) Duct Access Product;
 - (2) Pole Access Product;
 - (3) Dark Fibre Product;
 - (4) Radio Tower and Mast Access Product; and
 - (5) Building and Cabin Co-Location Product

NBPco shall not be required to provide a product in the above list where NBPco does not own or control the Assets forming part of the Network in the NBPco Solution prohibit its providing such a product.

3.2.2 [Not used].

3.2.3 NBPco may elect, during the Deployment Period, to provide to a specified percentage of the total number of Existing Premises in the Intervention Area an Alternative Bitstream Wholesale Product, through the deployment of an Alternative Technology Solution. The said percentage number may not at any time exceed the Alternative Technology Solution Threshold for Existing Premises. When NBPco elects to provide an Alternative Bitstream Wholesale Product to one or several Existing Premises, NBPco shall notify the Minister as set out in Paragraph 8.2.15 (Network Deployment – Requirements) of Schedule 2.3 (Deployment Requirements). The Product KPIs for the Alternative Bitstream Wholesale Product may be different from the Product KPIs associated with the Minimum Bitstream Wholesale Product as set out in Schedule 2.2 (Reference Offer Requirements), Paragraph 4.2 (Wholesale Product Specifications).

3.2.4 NBPco may elect, after the Deployment Period, to provide to a specified percentage of the total number of New Premises in the Intervention Area an Alternative Bitstream Wholesale Product, through the provision of an Alternative Technology Solution for these New Premises. The said percentage number may not at any time exceed the Alternative Technology Solution Threshold for New Premises. When NBPco elects to provide an Alternative Bitstream Wholesale Product to one or several New Premises, NBPco shall notify the Minister as set out in Paragraph 8.2.15 (Network Deployment – Requirements) of Schedule 2.3 (Deployment Requirements),. The Product KPIs for the agreed Alternative Bitstream Wholesale Product may be different from the Minimum Bitstream Wholesale Product as set out in Paragraph 4.2 (Wholesale Product Specifications) of Schedule 2.2 (Reference Offer Requirements).

3.3 Additional Required Wholesale Products

3.3.1 NBPco shall provide Additional Required Wholesale Products, on an Eol basis, which are suitable for businesses and Strategic Community Points as well as for residential End-Users.

3.3.2 NBPco shall provide Additional Required Wholesale Products with the following characteristics:

- (A) Business Wholesale Products which are equivalent to Active Access Wholesale Products described in Paragraph 3.2.1 (A) (Minimum Required Wholesale Products) but with enhanced Operational KPIs;
- (B) Any other Wholesale Products that, for example, may be suitable for Strategic Community Points; and
- (C) Any other variants of residential Active Wholesale Products that are not Minimum Required Wholesale Products.

3.3.3 NBPco shall provide, to the extent it does not already provide, any Wholesale Product that supports High Speed Broadband services which the Regulator requires NBPco to provide, in accordance with a decision made by the Regulator pursuant to Law other than any Wholesale Product where;

- (A) notice has been given that new Service Providers will not be able to acquire that Wholesale Product; or
- (B) where there is only one existing Service Provider of a Wholesale Product and that Service Provider has agreed to migrate from it; or
- (C) the Wholesale Product uses a legacy technology which will not be provided by NBPco.

3.3.4 Subject to Schedule 5.2 (Wholesale Prices, Price Benchmarking Rules and Wholesale Product Benchmarking Rules) NBPco shall ensure that, through its SOR Process specified in Appendix 2 (Statement of Requirements and Product Development Processes) of Schedule 2.4 (Operational Performance), New Wholesale Products or changes to existing Wholesale Products are only introduced in an open, non-discriminatory and transparent basis.

3.4 Other Permitted Wholesale Products

3.4.1 Where NBPCO elects to provide Other Permitted Wholesale Products in addition to the Wholesale Products described in Paragraph 3.2 (Minimum Required Wholesale Products) and Paragraph 3.3 (Additional Required Wholesale Products), NBPco shall provide the Other Permitted Wholesale Products on an EoI basis.

3.4.2 NBPco is not permitted to offer basic broadband services (that is, Bitstream Products which do not deliver the minimum performance and service specifications set out in Schedule 2.2 (Reference Offer Requirements) over the Network , except to the extent required by Law or any regulatory Decision, but then subject to the Wholesale Product Control Procedure.

3.4.3 The Minister retains the discretion to review market conditions and to allow the provision of new or revised Other Permitted Wholesale Products over the Network at any time during the Contract Period. Any proposed Changes resulting from the Minister's review shall be dealt with subject to, and in accordance with, the Wholesale Product Control Procedure.

3.5 Wholesale Product evolution and Wholesale Product Roadmap

3.5.1 NBPco shall ensure that the product and operational performance of the Minimum Required Wholesale Products and Additional Required Wholesale Products improve in line with Equivalent Products in the Excluded Area throughout the Contract Period.

3.5.2 On and from the Effective Date, NBPco shall develop and publish on its Public Portal a Wholesale Product roadmap which provides information on product testing, product availability and, enhancement of functionality/processes associated with the Universal Wholesale Gateway (UWG), over a rolling ten (10) Contract Year period throughout the Contract Period (the "**Wholesale Product Roadmap**"), in accordance with the following timescales:

- (A) The first 12 month period of the Wholesale Product Roadmap shall include a month-by-month detailed description of new and/or enhanced Wholesale Products and features. NBPco shall update this section of the Wholesale Product Roadmap every Quarter during the Contract Period.

- (B) The subsequent 36 month period of the Wholesale Product Roadmap shall include a Quarter-by-Quarter description of new and/or enhanced Wholesale Products and features. NBPco shall update this section of the Wholesale Product Roadmap every six months during the Contract Period.
 - (C) The subsequent 72 month period of the Wholesale Product Roadmap shall include a Contract Year-by-Contract Year description of new and/or enhanced Wholesale Products and features. NBPco shall update this section of the Wholesale Product Roadmap every 12 months during the Contract Period.
- 3.5.3 NBPco shall develop and publish the Wholesale Product Roadmap in a format which is compliant with the requirements set out in Paragraphs 3.5.4 to 3.5.8 of Schedule 2.1 (Technical Solution Specification). The Minister may change the required format of the Wholesale Product Roadmap at any time during the Contract Period, through the Wholesale Product Control Procedure.
- 3.5.4 NBPco shall categorise each item in the Wholesale Product Roadmap according to whether it is associated with either a Wholesale Product, End User experience, Operational Environment, On-boarding or Testing.
- 3.5.5 For Wholesale Product Roadmap items associated with Wholesale Products, NBPco shall state in the Wholesale Product Roadmap, in respect of each item, at a minimum, the following information:
 - (A) date of testing for each New Wholesale Product;
 - (B) date of commercial availability for each New Wholesale Product(s);
 - (C) date of testing of functionality enhancement associated with existing Wholesale Product;
 - (D) date of availability of functionality enhancement associated with existing Wholesale Products;
 - (E) date of testing of functionality enhancement associated with the UWG; and
 - (F) date of commercial availability of functionality enhancement associated with the UWG.
- 3.5.6 NBPco shall clearly indicate in the Wholesale Product Roadmap in respect of each item:
 - (A) the type of Wholesale Product impacted (for example, Minimum Bitstream Wholesale Product, Minimum VUA Wholesale Product, Duct Access Product, Pole Access Product, Unbundled Fibre Access Product, Dark Fibre Product, Radio Tower and Mast Access Product, Building and Cabin Co-Location Product, InterConnection Product and/or Transmission Product);
 - (B) which target market(s) is impacted (for example, residential, business, Strategic Community Points, or another target market);
 - (C) what impact (if any) there will be on the End User quality of experience;

- (D) any impact on the availability of a Wholesale Product in a geographical area arising from, amongst other things, permitted changes in the Operational Environment or permitted enhancements in a Wholesale Product; and
 - (E) the processes (or category of processes) that are impacted by, amongst other things, permitted changes in the Operational Environment or permitted enhancements in a Wholesale Product (for example, operational readiness, service provisioning, service assurance and billing).
- 3.5.7 NBPco acknowledges and agrees that each new version of the Wholesale Product Roadmap should provide for any improvements, and any enhancements of Wholesale Products or their scope of geographical coverage as may be required from time to time in accordance with this Agreement.
- 3.5.8 Without limiting or affecting its obligations under Schedule 2.4 (Operational Performance) and Schedule 5.2 (Wholesale Prices, Price Benchmarking Rules and Wholesale Product Benchmarking Rules), in order to comply with the Wholesale Product Control Procedure, NBPco shall ensure that all Service Providers are provided with the required advance notice as set out in Schedule 2.4 (Operational Performance) and Schedule 5.2 (Wholesale Prices, Price Benchmarking Rules and Wholesale Product Benchmarking Rules) in respect of all New Wholesale Products, enhancements of existing Wholesale Products and/or changes of functionality/upgrade of the UWG. Where NBPco proposes to make any material enhancement, upgrade or change in respect of the Public and/or Secure Portals, NBPco shall provide a minimum of six (6) months advance written notice to the Minister and all Service Providers of such proposed enhancement, upgrade or change.
- 3.5.9 NBPco shall provide the latest Minimum Bitstream Wholesale Product as indicated in the Wholesale Product Roadmap to Service Providers for all new End Users (including End Users signing up on the day, or any day after that, the new Minimum Bitstream Wholesale Product becomes available). When a new Minimum Bitstream Wholesale Product is made available by NBPco in accordance with the Technology Roadmap, NBPco shall offer the new Minimum Bitstream Wholesale Product to Service Providers for all existing End Users but NBPco is not required to automatically upgrade Service Providers' existing End Users (who use the legacy Minimum Bitstream Wholesale Product) to the new Minimum Bitstream Wholesale Product.
- 3.5.10 If an Alternative Bitstream Wholesale Product is offered, NBPco shall ensure throughout the Contract Period that the Product KPIs of the Alternative Bitstream Wholesale Product, including but not limited to the Download and Upload Speed, proportionally evolve with Product KPIs of the Minimum Bitstream Wholesale Product as proposed by NBPco in its Wholesale Product Roadmap. For example, if the Minimum Bitstream Wholesale Product as at the Commencement Date has a Download Speed of 100 Mbit/s and an Upload Speed of 50 Mbit/s and the Alternative Bitstream Wholesale Product as at the Commencement Date has a Download Speed of 50 Mbit/s and an Upload Speed of 25 Mbit/s then, if in Contract Year X the Minimum Bitstream Wholesale Product has a Download Speed of 300 Mbit/s and an Upload Speed of 150 Mbit/s, then the Alternative Bitstream Wholesale Product in Year X shall have a Download Speed of 150 Mbit/s and an Upload Speed of 75 Mbit/s.

- 3.6.1 If a Service Provider supplies services:
- (A) to both residential and business End Users, NBPco shall require and procure that the Service Provider provides an Anchor Retail Product to both residential and business End Users;
 - (B) only to residential End Users, NBPco shall require and procure that the Service Provider provides an Anchor Residential Retail Product to residential End Users; or
 - (C) only to business End Users, NBPco shall require and procure that the Service Provider provides an Anchor Business Retail Product to business End Users.
- 3.6.2 NBPco shall require and procure that RSPs provide an Anchor Residential Retail Product, based on the Minimum Bitstream Wholesale Product, which meets or exceeds the minimum performance for all specifications set out in Figure 2.1. NBPco shall require, by means of the RSP Terms and WSP Terms (including enforcing those terms where required), that RSPs do not provide any residential broadband retail products whose specifications do not at least meet or exceed the specifications provided in Figure 2.1.

Figure 2.1: Specifications for the Anchor Retail Product

Indicators	Minimum Performance
Minimum Download Speed between retail CPE and the Internet Demarcation Point	30 Mbit/s
Minimum Upload Speed between retail CPE and the Internet Demarcation Point	6 Mbit/s
Maximum Latency (round trip) between the retail CPE and the Internet Demarcation Point	100 ms
Maximum Jitter between the retail CPE and the Internet Demarcation Point	50 ms
Maximum Packet Loss between the retail CPE and the Internet Demarcation Point	0.1%
Minimum end-to-end service availability	99.95%

- 3.6.3 NBPco shall require and procure that RSPs provide an Anchor Business Retail Product, based on the Additional Required Wholesale Product provided by NBPco and which meets or exceeds the minimum performance for all specifications set out in Figure 2.1. NBPco shall require, by means of the RSP Terms and WSP Terms (including enforcing those terms where required), that RSPs do not provide any business broadband retail products whose specifications do not at least meet or exceed the specifications provided in Figure 2.1.
- 3.6.4 NBPco shall ensure that these requirements are included in the Service Provider Terms.

4 OPERATIONAL ENVIRONMENT REQUIREMENTS

4.1 Background

- 4.1.1 The Eol platform is a critical element of the NBPco Solution, as it is necessary in supporting effective wholesale open access. The objective of the Eol platform is to conveniently and cost-effectively allow a broad range of Service Providers to manage the end-to-end broadband End User life-cycle, from pre-order marketing, conditions of supply, service ordering, service provisioning, live service support and management to the cessation of services, or migration of subscribers to alternative services, on an open-access, non-discriminatory basis.
- 4.1.2 NBPco shall implement the Eol platform in the form of a UWG which will interface with OSS/BSS systems used by NBPco when offering Wholesale Products in the Intervention Area.
- 4.1.3 This Paragraph 4 (Operational Environment Requirements) sets out the requirements and technical specification for the Operational Environment.

4.2 General requirements

- 4.2.1 NBPco shall provide all of its Wholesale Products on an Eol basis for all Service Providers (including Associated Service Providers). NBPco shall provide products, services, facilities, and information to all Service Providers (including Associated Service Providers) such that such products, services, facilities, and information are provided within the same timescales, at the same price, (subject to Paragraph 7.1 (Transparency and Non-Discrimination) of Part 1 (Wholesale Pricing Rules) of Schedule 5.2 (Wholesale Prices, Price Benchmarking Rules and Wholesale Product Benchmarking Rules), functionality, service and quality levels and on the same terms and conditions and by means of the same systems and processes. NBPco shall ensure that the systems and processes operate in the same way and with the same degree of reliability and performance for all RSPs (including potential Associated RSPs) and WSPs (including potential Associated WSPs).
- 4.2.2 NBPco shall provide an Operational Environment which is able to, and does, scale to accommodate an increasing number of requests/transactions from Service Providers throughout the Contract Period, without any degradation in performance.
- 4.2.3 NBPco shall provide an Operational Environment whose constituent systems are available for use by Service Providers and the Minister, 24 hours a day 7 days a week 365 days a year and which is compliant with the requirements set out in Appendix 1 (Performance Level Requirements) of Schedule 2.4 (Operational Performance).
- 4.2.4 In designing, maintaining and implementing the Operational Environment, NBPco shall use reasonable endeavours to ensure that the Operational Environment is flexible enough to accommodate all Wholesale Products which are or may be offered by NBPco throughout the Contract Period.
- 4.2.5 NBPco shall provide an Operational Environment which includes the following components:

- (A) a Unified Wholesale Gateway whose minimum specifications meets or exceeds the requirements defined in Paragraph 4.3 (Universal Wholesale Gateway Requirements); and
- (B) OSS/BSS systems whose minimum specifications meets or exceeds the requirements defined in Paragraph 4.4 (OSS/BSS Requirements).

4.3 Universal Wholesale Gateway Requirements

General Scope

- 4.3.1 On and from the Effective Date, NBPco shall provide a UWG which allows Service Providers to manage Wholesale Products and to ensure that Service Providers can at a minimum:
 - (A) determine which Wholesale Products are currently available and when New Wholesale Products will be available at any Premises in the Intervention Area;
 - (B) predict likely service performance of a specific Connection;
 - (C) order Wholesale Products for specific Premises;
 - (D) select engineering appointment slots for Premises installations and service provisioning;
 - (E) manage the provisioning, quality, migration and cessation of services; and
 - (F) monitor faults and service problems and manage their resolution.
- 4.3.2 NBPco shall ensure that the UWG platform is capable of, and does, scale to handle an increasing volume of transactions throughout the Contract Period. In developing and maintaining the UWG systems and associated processes, throughout the Contract Period, NBPco shall align these with Best Industry Practice and an up to date industry standard service management framework acceptable to the Minister (such as, eTOM, ITIL or equivalent as confirmed by the Minister in writing).
- 4.3.3 NBPco shall use reasonable endeavours to facilitate integration of Service Providers' own systems in such a way that it does not present any difficulties from either a technical or financial perspective, and in accordance with the Service Provider Onboarding Process.
- 4.3.4 NBPco shall design, maintain and implement the UWG to meet the Performance Levels specified in Appendix 1 (Performance Level Requirements) of Schedule 2.4 (Operational Performance).
- 4.3.5 NBPco shall, at a minimum, include the following systems and interfaces as part of its UWG solution:
 - (A) access by Service Providers to the Wholesale Product Catalogue; and
 - (B) access channels for Service Providers, which include a B2B interface and a Web Self Service portal for Service Providers to manage the lifecycle of their Wholesale Products.

Wholesale Product Catalogue

- 4.3.6 Throughout the Contract Period, NBPco shall provide a Wholesale Product Catalogue which contains a complete definition of all Wholesale Products that can be ordered by Service Providers through the UWG.
- 4.3.7 The Wholesale Product Catalogue shall include, at a minimum, the following attributes for each Wholesale Product:
- (A) unique product ID;
 - (B) unique product name;
 - (C) mandatory and/or optional parameters;
 - (D) data validation rules for mandatory and/or optional parameters; and
 - (E) preferred layout of those parameters in the Web Self-Service portal.
- 4.3.8 NBPco shall ensure that, throughout the Contract Period, the product attribute definitions for each Wholesale Product contained in the Wholesale Product Catalogue comply with the TMF Shared Information Data Model (or equivalent) for all data types defined in the TMF Shared Information Data Model.
- 4.3.9 The Wholesale Product Catalogue shall also include lifecycle information about each Wholesale Product where applicable (for example, availability date, end of support date, and cessation of supply date).
- 4.3.10 Without limiting or affecting the obligation under Schedule 5.2 (Wholesale Prices, Price Benchmarking Rules and Wholesale Product Benchmarking Rules) to comply with the Wholesale Product Control Procedure, all New Wholesale Products, enhancements to Wholesale Products and changes of functionality to the Operational Environment (“**Advanced Notification Status**”) shall be made available in the Wholesale Product Catalogue in advance of the Wholesale Product being operational, and:
- (A) in respect of the Service Provider Onboarding Process in accordance with advance notification timelines requirements provided in Paragraph 7 (Service Provider Engagement Framework – Requirements) of Schedule 2.3 (Deployment Requirements), for the Service Provider Onboarding Process; and
 - (B) in respect of operation of the Network after completion of the Service Provider Onboarding Process in accordance with Paragraph 11 (Monitoring Deployment – Requirements) of Schedule 2.3 (Deployment Requirements),
- 4.3.11 The Wholesale Product Catalogue shall only include Wholesale Products which have been approved in writing in advance by the Minister.

Access channels for Service Providers: (1) Web Self-Service portal

- 4.3.12 NBPco shall provide a secure web-based self-service portal for Service Providers so that it performs the following high level functionalities:
- (A) place and manage orders;

- (B) report and manage problems;
- (C) view Network status;
- (D) manage performance issues; and
- (E) raise billing inquiries,

(“Web Self Service”).

- 4.3.13 NBPco shall design, maintain and implement the Web Self Service in such a way that it allows Service Providers to determine whether Premises are located in the Intervention Area and what Wholesale Products are available to each Premise. The Wholesale Products available for particular Premises or geographical area shall be determined by the data stored in the UWG, the Premises Database and the Wholesale Product Catalogue.
- 4.3.14 NBPco shall design, maintain and implement the Web Self Service so that it includes, at a minimum, the following security features:
 - (A) role based access control such that administrator users can create, delete and manage access for other users;
 - (B) authentication on a per user level which shall require a user ID, password / PIN and one time security token;
 - (C) user profile management which allows individual users to change their password and update their contact details; and
 - (D) controlled access to information to ensure that one Service Provider does not see or have access to the services or information provided or received by another Service Provider.
- 4.3.15 NBPco shall ensure that all Wholesale Products contained in the Wholesale Product Catalogue shall be available to order through the Web Self Service user interface. Wholesale Products to be included in the Wholesale Products Catalogue shall at least include the following Wholesale Products, provided they are not in Advanced Notification Status: all Minimum Required Wholesale Products, all Additional Required Wholesale Products and, if applicable, all Other Permitted Wholesale Products such as voice products, multicast products, mobile backhaul products and leased lines products. Customer specific bespoke products (such as storage area networks products) may be omitted from the Wholesale Product Catalogue by prior agreement of the Minister.
- 4.3.16 [Not Used].
- 4.3.17 NBPco shall define all parameters associated with a particular Wholesale Product and associated validation rules in the UWG Wholesale Product Catalogue.
- 4.3.18 NBPco shall categorise all Wholesale Product parameters as either mandatory or optional fields.
- 4.3.19 NBPco shall design, maintain and implement its Web Self Service interface to comprise separate areas on the screens for each of the following functionalities:

order management, fault management, performance management and billing inquiries.

- 4.3.20 NBPco shall design, maintain and implement its Web Self Service and associated user interface so that it supports, at a minimum, the following order management features:
- (A) placing new orders;
 - (B) booking and modifying End User installation appointments;
 - (C) modifying and cancelling of orders that have already started to be processed;
 - (D) querying of order status;
 - (E) managing and modifying maintenance service requests; and
 - (F) cancelling of maintenance service requests.
- 4.3.21 NBPco shall design, maintain and implement its Web Self Service and associated user interface so that it supports, at a minimum, the following fault management activities:
- (A) open a new problem or query;
 - (B) view the status of a problem or query;
 - (C) update or add information to an existing problem or query; and
 - (D) close a problem or query once it has been resolved to the satisfaction of the Service Provider.
- 4.3.22 NBPco shall design, maintain and implement its Web Self Service and associated user interface so that it supports, at a minimum, the following performance management information:
- (A) view of status of active services;
 - (B) view of End Users impacted by a performance issue or fault; and
 - (C) view of restoration time estimate as provided by NBPco.
- 4.3.23 NBPco shall design, maintain and implement its Web Self Service and associated user interface so that it supports, at a minimum, the following billing actions:
- (A) open a bill inquiry or dispute;
 - (B) update or add information to a bill inquiry or dispute;
 - (C) close an inquiry; and
 - (D) close a dispute.
- 4.3.24 [Not used].

- 4.3.25 NBPco shall design, maintain and implement its Web Self Service and associated user interface in such a way that it does not allow an order to be submitted or modified if the parameter validation rules implemented by NBPco in the Web Self Service are not satisfied.

Access channels for Service Providers: (2) B2B interface

- 4.3.26 NBPco shall provide a B2B interface to Service Provider systems based on standardised technology such as:

- (A) HTTP as a transport protocol (or equivalent);
- (B) SSL as a security protocol(or equivalent); and
- (C) ebXML/SOAP as the messaging middleware (or equivalent),

where applicable, and, as may be required by Law or pursuant to any Regulatory Decision.

- 4.3.27 NBPco shall design, maintain and implement its B2B interface so that it supports, at a minimum, the following order management features:

- (A) placing new orders for Wholesale Products;
- (B) booking and modifying End User installation appointments;
- (C) modifying and cancelling orders that have already started being processed;
- (D) querying order status;
- (E) managing and modifying orders; and
- (F) cancelling of services.

- 4.3.28 NBPco shall design, maintain and implement its B2B interface in such a way that the B2B interface automatically determines the availability of Wholesale Products for a particular Premises or geographical area by reference to the data stored in the UWG, the Premises Database and in the Wholesale Product Catalogue.

- 4.3.29 NBPco shall design, maintain and implement its B2B interface in such a way that it shall be possible for Service Providers to determine what mandatory and optional parameters are required to order a particular Wholesale Product from the Wholesale Product Catalogue.

- 4.3.30 NBPco shall design, maintain and implement its B2B interface in such a way that it automatically validates the parameters included with order messages from the Service Providers by reference to the parameter validation rules as defined in the UWG Wholesale Product Catalogue.

- 4.3.31 NBPco shall ensure that all Wholesale Products contained in the Wholesale Product Catalogue are available to order through the B2B interface. Wholesale Products to be included in the Wholesale Product Catalogue shall at least include all of the following Wholesale Products, provided they are not in Advanced Notification Status: all Minimum Required Wholesale Products, all Additional Required Wholesale Products and, if applicable, all Other Permitted

Wholesale Products such as voice products, multicast products, mobile backhaul products and leased lines products. Customer specific bespoke products (such as SAN products) may be omitted from the Wholesale Product Catalogue by agreement with the Minister.

Access channels for Service Providers: (3) WSP management

4.3.32 NBPco shall design, maintain and implement its UWG in such a way that it interfaces with its own following systems:

- (A) Order Management and Provisioning Systems;
- (B) Fault Management System;
- (C) Workforce Management System;
- (D) Wholesale Product Catalogue;
- (E) Premises Database;
- (F) Performance Management System; and
- (G) Reporting System.

4.3.33 NBPco shall design, maintain and implement its UWG in such a way that it enables NBPco to update the Wholesale Product Catalogue and Premises Database for Wholesale Products planned and offered in the Intervention Area.

Customer Information Management: (1) Service Provider Authentication

4.3.34 NBPco shall provide as part of its UWG, a Service Provider Information Database to store user credentials and allow Service Providers to log into the UWG platform.

4.3.35 NBPco shall provide, as part of its Service Provider Information Database, an authentication module which shall include user ID, user name and user contact details.

Customer Information Management: (2) Premises Database

4.3.36 NBPco shall provide a Premises Database through the Secure Portal, which shall contain a complete list of all Premises, by Eircodes and buildings, which are located within the Intervention Area.

4.3.37 NBPco shall update the Premises Database when availability of a New Wholesale Product is planned for Premises, in accordance with the processes described in Paragraph 9.5 (Product Management) of Schedule 2.4 (Operational Performance).

4.3.38 NBPco shall use the latest version of GeoDirectory and Eircodes as the source of the information provided in the Premises Database. Following each new release of GeoDirectory, NBPco shall update the Premises Database in accordance with the processes described in Paragraph 9.5 (Product Management) of Schedule 2.4 (Operational Performance).

4.3.39 NBPco shall populate its Premises Database with, at a minimum, the following parameters for each premises, based on GeoDirectory data:

- (A) unique Premises ID;
- (B) Lot location of Premises;
- (C) unique GeoDirectory building ID;
- (D) building flag (for example, vacant, invalid, under construction, derelict, demolished or holiday home);
- (E) total number of postal points for the building;
- (F) number of residential postal points in the building;
- (G) number of commercial postal points in the building;
- (H) Irish Transverse Mercator easting of building;
- (I) Irish Transverse Mercator northing of building;
- (J) County in Ireland in which the building is located;
- (K) address of the building;
- (L) Eircode associated with the Premises;
- (M) Wholesale Products that are available for the Premises;
- (N) Passed/not Passed status; and
- (O) Wholesale Products that shall be made available for the Premises in the next six (6) months.

4.3.40 In designing, maintaining and implementing its Premises Database, NBPCo shall ensure that the "Passed / not Passed status" for each Premises is updated every month during the Deployment Period so that the Premises Database can be queried on a monthly basis regarding the number of Premises Passed for Subsidy Payment purposes.

Reporting System

4.3.41 NBPCo shall design, maintain and implement its UWG to include a Reporting System and processes described in Paragraph 11 (Reporting and Auditing) of Schedule 2.4 (Operational Performance).

4.3.42 NBPCo shall not, during the Contract Period, make any material changes in the functionality, design, layout, performance specification or other aspects of the UWG without giving sufficient Notice (in accordance with Paragraph 5.1.16 (Operational Environment) of Schedule 2.4 (Operational Performance) to Service Providers and any material changes to the UWG shall be agreed between NBPCo and Service Providers in advance of any such changes being implemented pursuant to the Wholesale Product Control Procedure. This does not limit or affect NBPCo's obligation to comply with Schedule 6.2 (Change Control Procedure) in respect of any change which is not material but which constitutes an Operational Change.

General requirements

- 4.4.1 Throughout the Contract Period, in developing, maintaining and implementing its OSS/BSS systems and associated processes, NBPco shall, in accordance with Best Industry Practice (for example eTOM, ITIL or equivalent), align each of these systems with an up to date industry standard service management framework.
- 4.4.2 NBPco shall design, maintain and implement its OSS/BSS systems to interface with its own UWG system.
- 4.4.3 NBPco shall design, maintain and implement its OSS/BSS systems to meet the Performance Levels specified in Part 1 (Performance Indicators and Performance Level Requirements) of Appendix 1 (Performance Level Requirements) of Schedule 2.4 (Operational Performance). In particular, the OSS/BSS systems shall be designed, maintained and implemented for high availability such that the loss of any single component of hardware, power, or data connection does not cause loss of service for Service Providers using the UWG to manage their wholesale input.
- 4.4.4 NBPco shall, at a minimum, include the following functionalities in its OSS/BSS solution:
 - (A) End User Management Database;
 - (B) Workforce Management System;
 - (C) Inventory Management System;
 - (D) Electronic Network Maps;
 - (E) Order Management and Provisioning Systems;
 - (F) Fault Management System;
 - (G) Trouble Ticketing System;
 - (H) [Not used]
 - (I) Network Operation Centre (NOC); and
 - (J) Billing System.

Operational Support and Readiness: (1) End-User Management Database

- 4.4.5 NBPco shall provide an End User Management Database as part of its OSS solution, which shall contain, at a minimum, the following information:
 - (A) records of Wholesale Products ordered or delivered for each Premises;
 - (B) records of the Service Provider which has purchased the Wholesale Product for each Premises;

- (C) records of service provisioning requests by Service Providers but which have not been fulfilled (reasons for not fulfilling service provisioning requests of Service Providers shall clearly be stated);
- (D) logs of faults and associated historical data experienced by certain Premises which have been discovered by NBPco itself or notified to NBPco by a Service Provider;
- (E) logs of interactions (including, at a minimum, notes from field engineers and recording of calls from Support Desk) between NBPco and Service Providers related to specific Premises; and
- (F) history for Wholesale Products supplied to each Premises,
(the “**End User Management Database**”).

4.4.6 [Not Used].

4.4.7 NBPco shall ensure the End User Management Database can be queried for at, a minimum, the following:

- (A) number and type of Wholesale Products provided to each RSP;
- (B) number of Premises Connected;
- (C) number of Premises for which Wholesale Product provisioning has been fulfilled in accordance with the Performance Levels defined in Paragraph 5 (Operational Performance) of Schedule 2.2 (Reference Offer Requirements);
- (D) number of Premises for which Wholesale Product provisioning could not be fulfilled in accordance with the Performance Levels defined in Paragraph 5 (Operational Performance) of Schedule 2.2 (Reference Offer Requirements); and
- (E) number of Premises for which Wholesale Product provisioning could not be completed and reasons for not completing the order.

4.4.8 [Not Used].

Customer Information Management: (2) Workforce Management System

4.4.9 NBPco shall provide a workforce management component as part of its OSS solution, which shall contain the following functionalities:

- (A) planning and allocation of tasks to field technicians involved in the fulfilment of Service Providers' orders and resolutions of faults;
- (B) scheduling of jobs according to appointments, and the allocations of tasks to individual field technicians, taking into account travel time to and from End User Premises;
- (C) booking of End User installation appointments on the behalf of RSPs in conjunction with the Order Management System; and
- (D) use of planned resource availability by geographical area to allocate tasks to work groups,

(the “**Workforce Management System**”).

- 4.4.10 NBPco shall make available through the Workforce Management System appointments for End User product installations and repairs by field technicians in allocated time slots where access is required to an End User Premises. The duration of each appointment slot shall be 4 hours. NBPco shall make available through the Workforce Management System a minimum of 3 appointment slots per day which shall be 8:00 to 12:00, 12:00 to 16:00 and 16:00 to 20:00, Monday through Saturday, excluding public holidays in Ireland. During the winter months (1st October to 28th/29th February), NBPco is not required to offer the 16:00 to 20:00 timeslot if the appointments require pole climbing or any other activities which would reasonably pose a health and safety risk in the hours of darkness.
- 4.4.11 NBPco shall design, maintain and implement its Workforce Management System to integrate a scheduling function which automatically allocates tasks to field technicians based on algorithms which optimise the number of appointments that are serviced within the time slot.
- 4.4.12 NBPco shall design, maintain and implement its Workforce Management System in such a way that field technicians have real time access to their appointments and the latest information regarding the status of orders and repairs through the system so that last minute changes to their schedules can be made. This is to ensure that if field technicians have encountered any delays through the day, the Workforce Management System can be updated in a timely manner and End Users planned to be visited in the next appointment slot are alerted to the potential delays by NBPco.
- 4.4.13 NBPco shall design, maintain and implement its Workforce Management System to include standard fault codes, fault cause codes and fault resolution codes.
- 4.4.14 NBPco shall design, maintain and implement its Workforce Management System to enable field technicians when they are within mobile/data coverage to, in a prompt and timely manner, report completion of a task, ensuring that the correct fault cause code and fault resolution codes are used, accompanied by explanatory notes of how the issue was resolved where appropriate.
- 4.4.15 In order to reduce disruption NBPco shall schedule, where possible, the installation and activation of multiple products for a single End User so that the work takes place on the same day where multiple service orders exist.
- 4.4.16 NBPco shall design, maintain and implement its Workforce Management System to provide reports to the UWG that show the number of appointments attended on time, attended late, missed due to an End User not being present, and missed due to the field technician not attending appointments.

Service Provider Information Management: (3) Inventory Management System

- 4.4.17 NBPco shall provide an inventory management system to track all physical and logical Assets deployed in the Network and to record spare stocks and which inventory management system shall at all times comply with the provisions of Clause 53 (Asset Register) (the “**Inventory Management System**”).
- 4.4.18 NBPco shall be responsible for defining the required processes to track physical and logical Assets deployed as part of its Inventory Management System.

- 4.4.19 NBPco shall design, maintain and implement its Inventory Management System to record which End User and which Service Provider a particular inventory item is assigned to.
- 4.4.20 NBPco shall design, maintain and implement its Inventory Management System to identify which Network inventory items are being used by Service Providers and which are available.
- 4.4.21 NBPco shall design, maintain and implement its Inventory Management System to include lifecycle information for both physical and logical inventory items. The lifecycle will be related to the inventory item type. For example, a logical inventory type might be an End User IP address. Assets' lifecycle stages might be allocated, in-service, pending cancellation, or unassigned.
- 4.4.22 NBPco shall design, maintain and implement its Inventory Management System to enable the automatic assignment of an available inventory item during service provisioning.
- 4.4.23 NBPco shall design, maintain and implement its Inventory Management System so that it supports NBPco's ability to diagnose and repair faults.
- 4.4.24 NBPco shall use its Inventory Management System to support the accuracy of Service Provider invoices. For example, NBPco shall use its Inventory Management System to make sure all active existing services are invoiced and that disconnected services are not invoiced.
- 4.4.25 NBPco shall ensure that the Minister can generate Asset reports to check the deployed Assets against Subsidy Payment Milestones to satisfy the requirements of Clause 53 (Asset Register) and Schedule 5.1 (Subsidy Payments).

Customer Information Management: (4) Electronic Network Map

- 4.4.26 NBPco shall provide a graphical representation of the Network, that allows different types of users, for example End Users, RSPs, WSPs, or the Minister to see different layers of the Network (for example at the duct and pole layer and at the dark fibre layer of the Network).
- 4.4.27 NBPco shall provide throughout the Contract Period a continually up-to-date and accurate interactive map for End Users that is accessible through the Public Portal showing the deployment of the Network and what Wholesale Products are available or planned for each Premises within the Intervention Area (the "**IA End User Interactive Map**").
- 4.4.28 NBPco shall ensure that any member of the public can access the IA End User Interactive Map through NBPco's Public Portal, so that member of the public can determine the following by entering its Eircode:
 - (A) the Network building status in that area. For example, whether building of the Network has not commenced, building of the Network is in its planning phase, building of the Network has commenced, or building of the Network has been completed.
 - (B) For areas where the Network build has been completed, what Wholesale Products are currently available to the Premises and what

indicative Download Speed and Upload Speed in Mbit/s the Premises can expect to receive.

- (C) For areas where the Network build will be completed within a 6 months' timeframe from the date the member of the public completes the search, what Wholesale Products will be made available and what indicative Download Speed and Upload Speed in Mbit/s the Premises can expect to receive.
- (D) For areas where the Network build will be completed in more than 6 months from the date the member of the public completes the search, the expected date of completion and the types of Wholesale Products which are planned to be made available, and what indicative download and upload speeds in Mbit/s the Premises can expect to receive.

4.4.29 The IA End User Interactive Map shall reference the Premises Database and the Wholesale Product Catalogue. The Premises Database shall be updated by NBPco in accordance with Paragraph 9.5 (Product Management) of Schedule 2.4 (Operational Performance).

4.4.30 NBPco shall provide Service Providers and the Minister with a map of the Network Equipment and other infrastructure which identifies all used infrastructure in the different Deployment Areas of the Network (the "**Network Infrastructure Map**"). NBPco shall ensure that any Service Providers and the Minister can access the Network Infrastructure Map through the Secure Portal, so that they can view, at a minimum, the following information:

- (A) precise geographical locations of all deployed infrastructure including ducts, sub-ducts (including micro-cables and micro-ducts if appropriate), poles, fibre cables, manholes, footholes, mast and tower sites, exchanges, Points of Handover;
- (B) number, size and utilisation of ducts in each sections of the network (between two consecutive manholes) of individual ducts;
- (C) number, size and utilisation of sub-ducts in each sections of the Network for each duct;
- (D) pole type and pole utilisation in each sections of the Network;
- (E) total number of physical media deployed in each cable (for example the total number of fibre strands);
- (F) total number of physical media used in each deployed cable;
- (G) total number of physical media unused or spare in each deployed cable;
- (H) information regarding any restrictions on the right of ways or wayleaves;
- (I) any other information required by Service Provider to determine what passive Wholesale Products can be provided by NBPco in any Deployment Area; and

- (J) any other information required by the Minister to visually determine the status of the Network deployment in any Deployment Area.

For avoidance of doubt, the Network Infrastructure Map shall include all Equipment and other infrastructure used by NBPco in connection with the Network, whether that Equipment and other infrastructure is owned by NBPco or owned by a third party.

- 4.4.31 NBPco shall ensure that the Network Infrastructure Map references the Premises Database and the Wholesale Product Catalogue and is updated by NBPco in accordance with Schedule 2.4 (Operational Performance).
- 4.4.32 NBPco shall ensure that the Network Infrastructure Maps can be imported into the Service Provider's own geographic information systems (GIS) as an overlay to Service Providers' existing network maps, provided that such Service Provider GIS system is an industry standard web based GIS.

Service Fulfilment: Order Management and Provisioning Systems

- 4.4.33 NBPco shall automate the fulfilment of as many order types as is possible and economically viable.
- 4.4.34 NBPco shall design, maintain and implement its Order Management System to automatically send service orders to the Service Provisioning System for tasks that can be fully automated, and, at a minimum, to the extent provided in the NBPco Solution.
- 4.4.35 NBPco shall design, maintain and implement its Service Provisioning System in such a way that it automates simple configuration activities such as the allocation of ports on active Equipment.
- 4.4.36 [Not used].
- 4.4.37 NBPco shall design, maintain and implement its Service Provisioning System in such a way that it provides the Order Management System with positive confirmation that a service order has completed successfully.
- 4.4.38 NBPco shall design, maintain and implement the user interface of the Service Provisioning System to ensure that Service Providers are kept up to date with the status of orders. The user interface of the Service Provisioning System shall, at a minimum, allow:
- (A) the viewing of the status of service orders;
 - (B) the management of service order priorities; and
 - (C) the manual cancellation of service orders.
- 4.4.39 [Not Used].
- 4.4.40 NBPco shall design, maintain and implement its Service Provisioning System to ensure it uses data from the Inventory Management System, and from other systems as required, to ensure consistency between the service provisioning tasks and the Inventory Management System. For avoidance of doubt, the Network Infrastructure Map shall include all Equipment and other infrastructure used by NBPco in connection with the Network, whether that Equipment and

other infrastructure is owned by NBPco or owned by a third party. The Network Infrastructure Map will not extend to infrastructure owned by that third party and not used as part of or for the purposes of the Network.

Service Assurance: (1) Fault Management Systems

- 4.4.41 NBPco shall integrate its Fault Management System with all active Equipment in order to collect status and alarm data.
- 4.4.42 NBPco shall categorise all Incidents in its Fault Management System according to their severity and have appropriate processes in place to resolve Incidents according to their severity, in accordance with the requirements provided in Paragraph 8 (Incident Management) of Schedule 2.4 (Operational Performance).
- 4.4.43 [Not used].
- 4.4.44 NBPco shall design, maintain and implement its Fault Management System to automate service impact analysis as far as possible.

Service Assurance: (2) Trouble Ticketing System

- 4.4.45 NBPco shall provide a Trouble Ticketing System which captures each stage of the workflow required to resolve issues raised by Service Providers or NBPco and to ensure that Service Providers are kept up to date with the resolution process.
- 4.4.46 NBPco shall provide an interface between the Trouble Ticketing System and the UWG to ensure that Service Providers are able to:
 - (A) open a ticket that they have raised using the UWG;
 - (B) query the status of a ticket that they have raised using the UWG; and
 - (C) close tickets for faults they have raised but which are within the Service Provider domain of responsibility.
- 4.4.47 NBPco shall design, maintain and implement its Trouble Ticketing System to ensure that the status of the ticket is updated in real time between the opening of the ticket and the permanent closure of the ticket. NBPco shall, at a minimum, include the following ticket status (or equivalent) in its Trouble Ticketing System:
 - (A) recorded - acknowledge that the ticket has been recorded on the UWG;
 - (B) assigned - ticket has been assigned to field force or to NOC;
 - (C) dispatched - owner assigned to field force;
 - (D) appointment requested;
 - (E) appointment booked - End User appointment has been booked;
 - (F) suspended - work to clear the fault has been suspended for a reason documented in the trouble ticketing system;

- (G) pending clear - ticket is awaiting Service Provider confirmation of fault resolution; and
 - (H) permanent clear - the fault has been permanently resolved and the ticket is closed.
- 4.4.48 NBPco shall implement its service assurance systems and associated processes to ensure that Service Providers are provided with four (4) hours (during normal working hours) to review each ticket in the “pending clear” status to give their approval (or not) to permanently close the ticket and move the ticket to the 'permanent clear' status.
- 4.4.49 NBPco shall ensure that for all opened tickets, standard fault codes, are visible by Service Providers through the UWG when they query the status of a ticket.
- 4.4.50 NBPco shall ensure that for all closed tickets, fault cause codes and fault resolution codes, are visible by Service Providers through the UWG when Service Providers query the status of a ticket.
- 4.4.51 [Not used].

Service Assurance: (3) Network Operation Centre (NOC)

- 4.4.52 NBPco shall provide a Network Operations Centre so that it is available 24 hours a day 7 days a week 365 days a year for monitoring services and resolving service problems.
- 4.4.53 NBPco shall design, maintain and implement a NOC to ensure that all relevant Performance Levels set out in Schedule 2.4 (Operational Performance) are achieved.
- 4.4.54 NBPco shall design, maintain and implement its physical NOC (the primary NOC) with appropriate entry security systems to ensure only authorised personnel can access the NOC.
- 4.4.55 Without limiting or affecting Clause 70 (Business Continuity and Disaster Recovery), NBPco shall provide, maintain, and operate throughout the Contract Period a fully staffed primary NOC and an unstaffed secondary NOC in physically separated geographical locations. NBPco shall ensure that the secondary NOC can be fully functional within eight (8) hours of the failure of the primary NOC.
- 4.4.56 NBPco shall design, maintain and implement dedicated processes for:
- (A) managing fault and incidents in the NOC, with a view to ensuring compliance with Paragraph 6.1.8 (Network) and Paragraph 8 (Incident Management) of Schedule 2.4 (Operational Performance);
 - (B) its Support Desk facility to comply with the specifications provided in Paragraph 5 (Operational Environment) of Schedule 2.4 (Operational Performance).
- 4.4.57 In case of a Severity 1 Incident, NBPco shall ensure appropriate processes are in place to communicate to all relevant stakeholders (Service Providers and the Minister) the incident, likely service impact and expected resolution time through

the UWG so that Service Providers and the Minister can see which End Users are likely to be affected by the issue.

Billing system

- 4.4.58 NBPco shall provide a wholesale billing system for calculating charges for and generating invoices to Service Providers.
- 4.4.59 NBPco shall provide a Billing System which complies with the Performance Levels specified in Part 1 (Performance Indicators and Performance Level Requirements) of Appendix 1 (Performance Level Requirements) of Schedule 2.4 (Operational Performance) regarding billing enquiries.
- 4.4.60 NBPco shall generate itemised invoices per Service Provider, on a per Wholesale Product basis and on a monthly basis.
- 4.4.61 NBPco shall provide, at a minimum, the following details in the invoice:
- (A) summary of Wholesale Products and associated volumes being invoiced;
 - (B) breakdown of one off charges (for example, any set-up charges) and monthly recurring charges; and
 - (C) SP Performance Credits imposed on NBPco for not meeting the SP Performance Levels and potential refunds.
- 4.4.62 NBPco shall detail and define processes for handling payment of invoices.
- 4.4.63 NBPco shall detail, define and implement a process for handling billing disputes in respect of the products and services provided by NBPco. Provided that all parties follow such process, disputed charges shall not fall due until the dispute has been closed.
- 4.4.64 NBPco, through its Billing System, shall track the amount of debt outstanding for each Service Provider.
- 4.4.65 NBPco, through its Billing System, shall both allocate payments to a specific invoice or, if no invoice is specified, to the amount of debt outstanding to the applicable Service Provider(s).
- 4.4.66 NBPco shall set a reasonable and proportionate credit limit for each Service Provider beyond which the Service Provider will not be permitted to order new Wholesale Products.
- 4.4.67 If Service Providers have overdue debts (with 'overdue' being defined in accordance with the Service Provider Terms), NBPco shall be permitted to reject new orders for Wholesale Products. To ensure service continuity for End Users, NBPco shall not be permitted to suspend the services of Service Providers' End Users unless NBPco exercises an express reasonable and proportionate right of suspension or termination under the Service Provider Terms.

Supply chain and logistics

- 4.4.68 NBPco, through its systems, shall automatically calculate its service provision and repair stock requirements on a monthly basis.

- 4.4.69 NBPco shall use all reasonable endeavours to reduce the need to dispatch on-site technicians (known as reducing the number ‘truck rolls’) in order to expedite service delivery and minimise disruption for End Users.
- 4.4.70 NBPco shall use all reasonable endeavours to replace faulty WCPEs and re-establish service in a single appointment with an End User.
- 4.4.71 NBPco shall ensure that its field technicians maintain appropriate stocks of spares in their vehicles. This is only applicable to provision technicians. Repair technicians shall not be required to hold such stock. Network elements for repair shall be available as consignment stock in depots e.g. cable drum. The stock shall be tracked by the Inventory Management System so it is possible to see in near real-time current stock levels. For example, if a spare is used during a field technician’s visit to an End User Premises the global stock position for that item will be reduced accordingly.

4.5 Public Portal

- 4.5.1 NBPco shall provide a public portal in the form of a website, accessible by PC, laptops, tablets and smart phones, using standardised transport technology such as HTML (or equivalent), which is compatible with mainstream web browsers throughout the Contract Period, and which can be accessed by any member of the public without any login credentials (the “**Public Portal**”).
- 4.5.2 NBPco shall ensure that the Public Portal includes, at a minimum, the following elements:
 - (A) an IA End User Interactive Map showing the state of deployment of the Network as well as a list of what Wholesale Products are available or planned for each Premises within the Intervention Area;
 - (B) the Wholesale Product Roadmap;
 - (C) the Technology Roadmap;
 - (D) full Reference Offers of and/or relating to all Wholesale Products offered under the Agreement;
 - (E) the list of RSPs that are able to provide retail services in the End User area (based on Eircode), using the Network;
 - (F) Clarification Log of Deployment Meetings as set out in Paragraph 7 (Service Provider Engagement Framework – Requirements) of Schedule 2.3 (Deployment Requirements);
 - (G) Network Deployment Plan Status as set out in Paragraph 7 (Service Provider Engagement Framework – Requirements) of Schedule 2.3 (Deployment Requirements);
 - (H) Service Provider Onboarding Process as specified in Appendix 3 (Service Provider Onboarding Process) of Schedule 2.4 (Operational Performance);
 - (I) End User demand pre-registration facility as specified in Paragraph 4.5.6 (Public Portal);

- (J) information for End Users regarding general terms and conditions for Connecting New Premises and Existing Premises; and
- (K) the benefits of High Speed Broadband in the context of the requirements set out in Paragraph 6.5.1 (Communications and Engagement Plan for 1A End Users) of Schedule 2.6 (Communications, Demand Stimulation and Brand Plan).
- (L) Details of the Connection Service and related charges including worked examples in order to allow End Users to have full visibility of the likely charges.

4.5.3 The Public Portal shall be operated and maintained by NBPco throughout the Contract Period.

4.5.4 Any significant change to the design and functionality of the Public Portal proposed during the Contract Period must be agreed in writing with the Minister in advance of its implementation in accordance with the Wholesale Product Control Procedure.

4.5.5 NBPco shall design, maintain and implement its Public Portal so that the Public Portal, at all times during the Contract Period, meets or exceeds the Availability requirements for the Public Portal that are specified in Appendix 1 (Performance Level Requirements) of Schedule 2.4 (Operational Performance). In that respect, NBPco shall provide the necessary redundancy and back-up to ensure that the Public Portal meets this required Availability.

4.5.6 NBPco shall also provide a pre-registration facility for members of the public to enable them to register their interest in obtaining High Speed Broadband services so that End Users can automatically receive updates as to when the Network and associated products will become available for the specified Premises. NBPco shall ensure that End Users are able to register their interest six (6) months before the Network is deployed in the End User's geographical area. NBPco shall have no obligations in relation to such End Users other than providing them with information on Service Providers serving that Deployment Area.

4.6 Secure Portal

4.6.1 NBPco shall design, develop, provide and maintain a Secure Portal so that it includes at a minimum, the following elements:

- (A) Network Infrastructure Map to be accessible by Service Providers and the Minister;
- (B) Programme Level Milestones described in Schedule 2.3 (Deployment Requirements);
- (C) process to introduce New Wholesale Products based on Service Provider requests as set out in Appendix 2 (Statement Of Requirements And Product Development Processes) of Schedule 2.4 (Operational Performance);
- (D) dashboard level operational updates;

- (E) details for the NBP Industry Council (see Paragraph 10.2 (Industry Engagement) of Schedule 2.4 (Operational Performance));
- (F) details for Service Provider test services as set out in Paragraph 7 (Service Provider Testing and Support Facilities) of Schedule 2.4 (Operational Performance);
- (G) all Reports described or mentioned in the table in Appendix 1 (Reports) of Schedule 6.5 (Reports and Records);
- (H) communication between NBPco and Service Providers in the context of the Service Provider Onboarding Process as set out in Appendix 3 (Service Provider Onboarding Process) of Schedule 2.4 (Operational Performance); and
- (I) [Not used];
- (J) Wholesale Product Launch Project Plan as set out in Paragraph 9 (Products Deployment – Requirements) of Schedule 2.3 (Deployment Requirements).

4.6.2 NBPco shall operate and maintain the Secure Portal throughout the Contract Period.

4.6.3 Any changes to the design and functionality of the Secure Portal proposed by NBPco during the Contract Period must be agreed in writing with the Minister in advance of their implementation in accordance with the Wholesale Product Control Procedure.

4.6.4 NBPco shall design, maintain and implement its Secure Portal so that the Secure Portal, at all times during the Contract Period, meets or exceeds the Availability requirements for the Secure Portal that are specified in Appendix 1 (Performance Level Requirements) of Schedule 2.4 (Operational Performance). In that respect, NBPco shall provide the necessary redundancy to ensure that the Secure Portal meets this required Availability.

4.7 Operational environment evolution and future proofing

4.7.1 NBPco shall ensure that the Operational Environment is designed to meet the expected traffic demand throughout the Contract Period and shall be scalable and scaled to accommodate an increasing number of Service Providers, Wholesale Products, Premises and transaction volumes throughout the Contract Period.

4.7.2 In designing, maintaining and implementing its Operational Environment, NBPco shall periodically review the functionality provided by the Operational Environment and ensure that the functionality throughout the Contract Period is consistent with Best Industry Practice (for example eTOM framework) and continually improves and evolves in accordance with Best Industry Practice.

4.7.3 Without limiting or affecting any other provision of this Agreement, NBPco shall, throughout the Contract Period, use all reasonable endeavours to ensure that the Operational Environment continually improves in accordance with Best Industry Practice so as to ensure an improvement in the quality of service for End Users. For example, NBPco shall use reasonable endeavours to increase the degree of automation of the system throughout the Contract Period.

- 4.7.4 In accordance with Clause 26 (Service and Network Future Proofing and Continuous Improvement) and with Schedule 6.2 (Change Control Procedure), the Minister may further specify the specification and requirements for the Operational Environment, in consultation with NBPco, in particular in light of expected demand, developments in Best Industry Practice, evolution in appropriate standards and to ensure improvements in quality of service.

5 NETWORK REQUIREMENTS FOR WHOLESALE PRODUCTS

5.1 Background

- 5.1.1 NBPco shall deliver all Network infrastructure and Equipment necessary to provide products to End Users so that a complete end-to-end broadband service can be provided over the Network without further Network build. NBPco shall provide all infrastructure and Equipment components including Backhaul Network and Access Network. For illustration, a reference Network is provided in Appendix 1 (Scope of Network) of this Schedule 2.1 (Technical Solution Specification) which non-exhaustively and for illustration purposes only sets out what NBPco is required to provide.
- 5.1.2 To support cost-effectiveness and to avoid the building of duplicate infrastructure, NBPco shall re-use, as far as technically and financially feasible, existing telecoms and non-telecoms infrastructure and Equipment. The existing infrastructure may comprise telecoms networks, but may also include other infrastructure such as utilities or transport infrastructure.
- 5.1.3 A range of technologies exist to provide High Speed Broadband services and their capabilities are constantly evolving over time. This Schedule 2.1 (Technical Solution Specification) specifies the outcomes that need to be achieved for IA End Users but does not require the Services and Network to be delivered by NBPco using any particular technology solution. This does not limit or affect NBPco's obligation to comply with the NBPco Solution.
- 5.1.4 The provisions of this Paragraph 5 (Network Requirements for Wholesale Products) describe the requirements for the Network in respect of Wholesale Products.

5.2 Network requirements for Wholesale Products

- 5.2.1 NBPco is responsible for designing, supplying, building, maintaining and operating the Network in a manner which, at a minimum, supports all Minimum Required Wholesale Products, Additional Required Wholesale Products and any Other Permitted Wholesale Products listed in Paragraph 3 (Product Requirements, Evolution and Roadmap) of this Schedule 2.1 (Technical Solution Specification) and meeting the minimum specifications set out in Paragraphs 4.2 (Wholesale Product Specifications), 4.3 (Wholesale Product Specifications) and 4.4 (Wholesale Product Specifications) of Schedule 2.2 (Reference Offer Requirements)
- 5.2.2 NBPco shall correctly dimension its Access Network and Backhaul Network to ensure there is sufficient capacity in the Network so that the Network supports:
- (A) the traffic generated by Active Wholesale Products; and
 - (B) the requirements associated with the supply of all Passive Wholesale Products.

- 5.2.3 NBPco shall design, build, maintain and implement the Network so that it is compatible with the Operational Environment specified in Paragraph 4 (Operational Environment Requirements) of this Schedule and is future proofed in terms of being able to extend the capability of existing Wholesale Products and/or to accommodate New Wholesale Products throughout the Contract Period.
- 5.2.4 In its Network solution, NBPco shall include, at a minimum, the following components:
- (A) an Access Network;
 - (B) a Backhaul Network; and
 - (C) a suitable number of Points of Handover (PoHs) for Active Wholesale Products and Passive Wholesale Products.

Point of Demarcation for active access minimum required products

- 5.2.5 NBPco shall ensure that the service Demarcation Points for Active Access Wholesale Products (as described in Paragraph 3 (Product Requirements, Evolution and Roadmap) of this Schedule 2.1 (Technical Solution Specification)) are:
- (A) the Local Area Network (LAN) port on the WCPE will be the Demarcation Point for the UNI at the End Users Premises. The passive Network Termination Unit will be the Demarcation Point at the End User's Premises for wires-only services; and
 - (B) the port of the active node (for example, the switch) which is the first point of active aggregation, facing the Access Network.
- 5.2.6 NBPco shall ensure that the service Demarcation Points for Active Backhaul Wholesale Products (as described in Paragraph 3 (Product Requirements, Evolution and Roadmap) of this Schedule 2.1 (Technical Solution Specification)) are:
- (A) the port of the active node (for example, the switch) which is the first point of active aggregation, facing the Backhaul Network; and
 - (B) the switch port at the Point of Handover (PoH) Connecting the Service Provider's network to NBPco's network being the Network to Network Interface (NNI).

Performance measurement points

- 5.2.7 The performance measure points for Active Wholesale Products shall be:
- (A) the Local Area Network (LAN) port on the WCPE being the User Network Interface (UNI) Demarcation Point at the End Users Premises. The passive Network Termination Unit will be the Demarcation Point at the End User's Premises for wires-only services; and

- (B) the switch port at the Point of Handover (PoH) Connecting the Service Provider's network to NBPco's Network being the Network to Network Interface (NNI).

Points of Handover

- 5.2.8 NBPco shall provide PoHs from which Service Providers shall be able to purchase Building and Cabin Co-Location Product as specified in Paragraphs 4.2.73 (Wholesale Product Specifications) to 4.2.81 (Wholesale Product Specifications) of Schedule 2.2 (Reference Offer Requirements) and/or InterConnect Products as specified in Paragraphs 4.2.66 (Wholesale Product Specifications) to 4.2.70 (Wholesale Product Specifications) of Schedule 2.2 (Reference Offer Requirements).
- 5.2.9 NBPco shall maintain its PoHs in a serviceable state so that they comply with Best Industry Practice on a continuing basis throughout the Contract Period.
- 5.2.10 NBPco shall locate its PoHs in such a way that it provides cost-effective Connection to Wholesale Products for any existing Service Provider's network infrastructure, while minimising any public-sector subsidy, and ensuring non-discrimination towards different types of Service Providers, including those with:
 - (A) national infrastructure;
 - (B) regional infrastructure, and
 - (C) limited or no infrastructure.

Points of Handover: (1) Active PoHs

- 5.2.11 NBPco shall locate its PoH supporting InterConnect Products for Bitstream Products in such a way that it shall be possible for Service Providers to Connect any Premises located in the Intervention Area via one or more PoHs.
- 5.2.12 NBPco shall locate its local PoH supporting VUA InterConnection services in such a way that it shall be possible for Service Providers to Connect with all Premises Connected to the local PoH.
- 5.2.13 NBPco shall provide a sufficient number of active PoHs for each County to enable Service Providers to efficiently Connect to Active Access Wholesale Products.
- 5.2.14 NBPco shall ensure that all Active PoHs support the Building and Cabin Co-Location services specified in Paragraph 4.2 (Wholesale Product Specifications) of Schedule 2.2 (Reference Offer Requirements).

Points of Handover: (2) Passive PoHs

- 5.2.15 NBPco shall locate its Passive PoHs either in exchanges, cabinets (through optical distribution frames (ODFs)), in manholes or on poles, where technically feasible and cost effective for the Service Provider.
- 5.2.16 NBPco shall allow Service Providers to co-locate their passive equipment in passive PoHs.

Backhaul Network

- 5.2.17 The Backhaul Network shall be designed, built, maintained and implemented in such a way that it supports Active Backhaul Wholesale Products and Passive Backhaul Wholesale Products listed in Paragraph 3 (Product Requirements, Evolution and Roadmap) of this Schedule 2.1 (Technical Solution Specification) and specified in Paragraph 4.2 (Wholesale Product Specifications) of Schedule 2.2 (Reference Offer Requirements).
- 5.2.18 NBPco shall ensure that capacity provisioning and upgrade on its Backhaul Network shall be carried out in such a way that no link should be utilised more than 80% for any period of three (3) consecutive months.

Access Network

- 5.2.19 NBPco shall design, build, maintain and implement its Access Network to ensure it delivers, at a minimum, the Minimum Required Wholesale Products, Additional Required Wholesale Products and Other Permitted Wholesale Products as specified in Paragraph 3 (Product Requirements, Evolution and Roadmap) of this Schedule 2.1 (Technical Solution Specification) for all Premises located in the Intervention Area. To accomplish this, NBPco's proposed Access Network may comprise one or more of a variety of different wireless and wireline technologies.

End-User Premises

- 5.2.20 NBPco shall be responsible for the supply, configuration, operation and maintenance of the WCPE in the Premises of End Users.
- 5.2.21 NBPco shall ensure that, where technically possible to do so, the WCPE is capable of being self-installed by End Users in order to minimise the need to dispatch technicians to site (known as reducing the number of 'truck rolls'.)
- 5.2.22 NBPco shall ensure that all WCPE has the functionality to allow its software to be remotely updated through the Network. NBPco shall perform software updates in accordance with the Broadband Forum standard TR-069 or equivalent. NBPco shall ensure that any Outages during the upgrade process are minimised to the maximum extent possible.
- 5.2.23 NBPco shall provide WCPE which can monitor the performance of the service provided. NBPco shall provide WCPE which support remote fault diagnosis and service verification so that Service Providers can support their End Users in a timely and cost-efficient way, and work with NBPco to quickly determine responsibility and resolve any service problems.

5.3 Requirements to adhere to standards

- 5.3.1 NBPco shall ensure that the Network is designed and maintained to adhere, and the operations to support the Network adhere, throughout the Contract Period to Best Industry Practice for public network and operations design, build and interoperability. These standards include, but are not limited to, the standards and guidelines determined by the following international standards bodies (in alphabetical order), where relevant and applicable:

- (A) 3GPP (Release 12 or later) (or equivalent);

- (B) DOCSIS (Release 3.1 or later) (or equivalent);
- (C) ETSI TISPAN latest relevant standard (or equivalent);
- (D) ITU latest relevant standards (or equivalent);
- (E) IEEE latest relevant standards (or equivalent);
- (F) Broadband Forum (TR-069) (or equivalent);
- (G) IETF (including IPv6 where relevant) latest relevant standards (or equivalent);
- (H) FSAN latest relevant standards (or equivalent); and
- (I) MEF latest relevant standards (or equivalent).

5.3.2 NBPco shall ensure that its solution for the Project is based on the latest relevant Codes and Standards throughout the Contract Period and shall ensure that its solution is, at a minimum, compliant with version N-2 (where N represents the current prevailing applicable standard) of the latest applicable Codes and Standards at all times throughout the Contract Period.

5.3.3 In the context of the Codes and Standards and quality for the build and wholesale components of the Services and Network, NBPco shall be certified for the following standards by no later than (six) 6 months from the Effective Date:

- (A) ISO9001 (quality);
- (B) ISO14001 (environment);
- (C) OHSAS 18001 (health and safety); and
- (D) ISO 20000 (service management).

5.3.4 NBPco shall maintain compliance with and hold a valid standard certificate throughout the Contract Period (from the date of its first acquisition in accordance with this Paragraph) for all of the above standards.

5.4 Network evolution and future proofing

5.4.1 On and from the Effective Date, NBPco shall develop and publish a technology roadmap on its Public Portal, showing all major architectural and technology changes and upgrades for the Network and Equipment over a rolling ten (10) Contract Year period throughout the Contract Period (the "**Technology Roadmap**") in accordance with the following timescales:

- (A) The first 12 month period of the Technology Roadmap shall include a month-by-month detailed description of new and/or enhanced architectural and technology changes and upgrades. NBPco shall update this section of the Technology Roadmap every Quarter during the Contract Period.
- (B) The subsequent 36 month period of the Technology Roadmap shall include a Quarter-by-Quarter detailed description of new and/or enhanced architectural and technology changes and upgrades.

NBPco shall update this section of the Technology Roadmap every six months during the Contract Period.

(C) The subsequent 72 month period of the Technology Roadmap shall include a Contract Year-by-Contract Year detailed description of new and/or enhanced architectural and technology changes and upgrades. NBPco shall update this section of the Technology Roadmap every 12 months during the Contract Period.

- 5.4.2 The Minister may make reasonable changes to the required format of the Technology Roadmap at any time during the Contract Period through the Wholesale Product Control Procedure.
- 5.4.3 NBPco shall provide or procure the provision of all technology and equipment upgrades stated in its Technology Roadmap, and acknowledges and agrees that this is an integral part of the Services.
- 5.4.4 NBPco shall ensure that its Network and associated operational solution are able to, and do, evolve to provide future enhanced Wholesale Products or New Wholesale Products as described in the Wholesale Product Roadmap.
- 5.4.5 NBPco shall ensure that its Network and associated operational solution are able to, and do, scale with data volumes and number of Premises associated with Active Wholesale Products to be provided throughout the Contract Period.
- 5.4.6 NBPco shall ensure that its Network and associated operational solution are able to, and do, scale with the range and volume of Passive Wholesale Products to be provided throughout the Contract Period.
- 5.4.7 NBPco shall design, build, maintain and implement the Network to ensure that the product characteristics of Active Wholesale Products can track those delivered in the Excluded Area by Authorised Undertakings in accordance with Clause 26 (Service and Network Future Proofing and Continuous Improvement) and Schedule 6.4 (Service, Network and Wholesale Product Compliance and Future Proofing).

APPENDIX 1 (SCOPE OF NETWORK)

Figure A.1: Scope of Network [Source: Analysys Mason, 2016]

