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# Bottom-up mobile LRIC model for ARCEP (Release 1): Conceptual Choices

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# (Release 1): Conceptual Choices

Report for ARCEP

## Contents

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# 1    Introduction

Analysys has been commissioned by ARCEP to develop a model of the long-run incremental cost (LRIC) of voice and SMS termination delivered by a 2G and 3G mobile network operator in France. The purpose of the model is to assist ARCEP in understanding differences between the top-down models already developed by mobile operators.

This document summarises the conceptual choices made by Analysys in developing the bottom-up mobile LRIC model specification on behalf of ARCEP. Many of the issues discussed have already been implemented and are described in the document *Bottom-up mobile LRIC model for ARCEP (Release 1): Model Documentation.*

This proposal is structured as follows:

- Section 2: operator issues
- Section 3: technology issues
- Section 4: service issues
- Section 5: implementation issues.


# 2    Operator issues

The model will be a bottom-up model. It will be reconciled at a high level to the top-down data held by ARCEP in terms of numbers of current number of assets, GBV and operational expenses. We understand that ARCEP will rely on a hybrid approach, using both top-down and bottom-up models, in order to set mobile termination rates.

The model will be parameterised for four different operators: Bouygues, Orange, SFR and a generic French operator. Appropriate parameters for each operator will be defined for each of the following variables:

- subscribers and traffic demand (including split by 2G, 3G)
- coverage by technology (primarily GSM+GPRS and UMTS R99. However we will also rely on parametric changes in order to model EDGE and HSDPA)

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- spectrum used over time (by geotype where relevant) and licence fees payable.

The model structure will be identical in each case, and the network design algorithms will be designed to model a reasonably efficient operator and to scale appropriately on the basis of changes in the parameters listed above.

We will rely on actual data from operators in order to derive parameters for historical subscribers, traffic, coverage and spectrum availability for each of the individual operators. For the generic operator, we will agree with ARCEP appropriate parameters to be used. We will develop a small number of forecast scenarios to reflect the likely development of these parameters over time. For the individual operator cases, we expect to either maintain current differences between operators over time or to migrate towards equal market share and equal traffic per subscriber among all operators.

# 3    Technology issues

The parameters used to model a generic operator will assume the use of a GSM+GPRS network and a UMTS R99 network.  We will seek to ensure that the demand forecasts used in the model (particularly for data traffic) are consistent with this assumption.

In order to calibrate with top-down data, we will make adjustments to key parameters in order to model the impact of individual operators adopting EDGE and HSDPA as part of their network deployment strategy. This is likely to involve the adjustment of capital costs, operating costs, capacity of cells, relative loading of voice and data traffic in the radio network, cell radii, and data traffic forecasts.

We note that the purpose of these adjustments is primarily that of calibration and reconciliation. The focus of the modelling work is to identify the unit cost of voice and SMS termination services. We consider that the cost of providing termination on a GSM+GPRS network and a UMTS R99 network represents an upper bound for these unit costs for a reasonably efficient operator. Since EDGE and HSDPA technologies are designed primarily to offer enhanced packet data services then we do not consider that it would be appropriate to derive higher unit costs for voice and SMS termination on the basis of these technologies. Due to uncertainty in future demand for data services we would

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also recommend caution in the application of lower voice and SMS rates which arose solely due to an uncertain forecast of EDGE/HSDPA traffic combined with the inclusion of EDGE/HSDPA expenditures and network impacts.

The network design algorithms will initially be based on those utilised in the Ofcom September 2006 mobile LRIC model. However, these will be modified to be consistent with the approach used in compiling top-down accounting data and to reflect the specificities of the French market. We will seek information from operators as part of the data request to determine any modifications necessary. We will not develop multiple network algorithms to model the four operators independently – instead we will seek to modify algorithms where required for an efficient generic operator in France, and develop parameters for each operator where applicable.

Areas in which we will consider modifications include:

- 2G radio network deployment – to account for varying quantities of spectrum being available over time
- signalling network – to account more precisely for the cost of SMS services
- backhaul network – to account for the use of leased lines as well as microwave links.

In order to parameterise the model for the three existing operators, we will use information regarding current and historic spectrum allocations in use, and licence fees payable. In particular, should an operator not have made use of all the potential spectrum available to it in the past, we will account only for the spectrum actually used. For the generic operator, we will agree with ARCEP appropriate spectrum to model; this is likely to include a mix of 900, 1800 and 2100MHz over time.

We will not consider the impact of additional spectrum that may become available in future or the use of 900 or 1800 spectrum for 3G services.

## 4    Service issues

We will consider the following set of services within the model for the purposes of calculating costs:

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| 2G services | 3G services |
| --- | --- |
| 2G Incoming voice call | 3G Incoming voice call |
| 2G Outgoing voice call | 3G Outgoing voice call |
| 2G On-net voice call | 3G On-net voice call |
| | 3G Incoming video call |
| | 3G Outgoing video call |
| | 3G On-net video call |
| 2G Incoming SMS | 3G Incoming SMS |
| 2G Outgoing SMS | 3G Outgoing SMS |
| 2G On-net SMS | 3G On-net SMS |
| 2G Push SMS | 3G Push SMS |
| 2G Incoming voicemail | 3G Incoming voicemail |
| 2G Voicemail retrieval | 3G Voicemail retrieval |
| 2G SMS notification | 3G SMS notification |
| 2G Packet data | 3G Packet data |

**Exhibit 1:** List of service costs [Source: Analysys]

Although it is necessary to consider separately services delivered on 2G and 3G networks for the purposes of bottom-up costing, the model will present blended costs that account for both 2G and 3G services together.

The model will account for the loading that each service places on the network in terms of the radio network, the core network, and the signalling network.

# 5 Implementation issues

## 5.1 Depreciation methods and form of output costs

The model will consider network deployment and costs from the year of launch; it will also forecast long-run deployment and costs for use in the economic depreciation algorithm. Results will be presented for the entire modelled period, but we understand the primary focus is on the years 2008–2010.

The model will calculate costs in real 2006 terms. Historic, current and forecast levels of WACC will be determined by ARCEP.

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The model will output costs according to two different depreciation methods: straight-line depreciation based on historic cost accounting (HCA), and a form of simplified economic depreciation. These two methods have been selected in order to provide two different views on the profile of service costs over time. Each of the methods is discussed in outline below.

*Straight-line depreciation based on HCA*

This form of depreciation represents a standard HCA approach. It relies on straight-line depreciation over the accounting lifetime of an asset. The total network cost incurred in each year is equal to depreciation plus operating costs. This cost is all recovered only from the services delivered in that year. This tends to mean that in the early years of service provision, when networks typically have low levels of utilisation, the unit service costs are high. However, in later years, when the network has reached a higher level of utilisation, the unit service costs may be much lower.  It should also be noted that in years in which costs are incurred but no services provided (for example prior to commercial launch), cost recovery is not achieved.

Cost recovery under this method is not dependent on future service demand, but the cost per unit may vary quite significantly over time, particularly when a new technology such as 3G is deployed.

*Economic depreciation*

Economic depreciation relies on a cost recovery profile that is dependent only on changes in input costs and not on changes in the volume of services delivered over time. This means that unit service costs do not depend on the level of utilisation at a particular point in time, but rather on the average level of utilisation achieved over the lifetime of the network.

If input prices were to remain constant over time then this approach would result in constant unit service costs over the lifetime of the network, so that the total costs recovered in each year would be directly proportional to the volume of services in that year. If input

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prices change over time then the unit service costs also reflect these changes (declining input prices result in declining unit service costs).

Cost recovery under this method is more stable than under the HCA method, but does rely on forecast levels of service provision in future, which may be uncertain when a new technology such as 3G has been recently deployed.

## 5.2   Cost allocation method

The cost allocation method will be designed to be consistent with the cost drivers used to determine network deployment. The model will rely on routing factors (also consistent with the regulatory accounting approach where relevant) to fully allocate network costs to specific services, including voice and SMS. Certain network elements will be treated with a pre-allocation to functional activities (notably signalling and reservation for GPRS) before individual service costing. Data required to determine appropriate routing factors will be collected from operators.

Non-network common costs (e.g. business overheads) will be accounted for by considering a simple exogenous mark-up on the results, consistent with ARCEP's  accounting decision[1].

## 5.3   Geotype definition

The model will consider a number of geotypes in order to capture differences between the different terrain and traffic demand found across France. Each geotype may rely on different parameters for: total traffic and busy hour traffic loading; coverage over time; spectrum available; proportion of traffic carried on microcells and picocells; use of 1-, 2- or 3-sector cells and TRX; cell radii achievable; backhaul method.

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[1] Décision n° 05-0960 de l'Autorité de régulation des communications électroniques et des postes (8 décembre 2005)

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Analysys and ARCEP will determine the preferred definition of geotypes. The choice of geotypes will be based on:

- classifications used by operators – to be described by operators in terms of population and area covered
- variations in spectrum available to each operator across France
- variations in population density across France (as a proxy for variations in traffic demand)
- other information from operators concerning areas in which site deployment differs from that of other areas (e.g. highways, zones blanches, tourist areas, etc.)

Regardless of the precise definition of geotypes we will rely on a scorched node approach and seek to calibrate the model to the number of base stations and other assets actually deployed by operators.

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