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Inception report for the Agency for Electronic Communications of the Republic of Macedonia

Cost model methodology for broadcasting free-to-air services on the DTT platform and associated WACC calculation

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1 Introduction

ONE Telecommunication Services DOOEL Skopje (ONE) was designated by the Agency for Electronic Communications of the Republic of Macedonia (AEC) as having significant market power (SMP) in the commercial FTA DTT market[1], after it was awarded the licence for two MUXs in 2012 through a tender procedure[2].

As a consequence, AEC has imposed price control and cost accounting obligations on ONE and is now willing to set the prices for the services offered by ONE on a cost-oriented basis.

Furthermore, in January 2015 the two operators ONE and Vip merged in a new player called One.Vip, which is the legal successor of ONE (and Vip). As such, all of the obligations and remedies originally imposed on ONE are now referred to One.Vip.

Analysys Mason Limited (Analysys Mason) and Grant Thornton LLP (Grant Thornton) have therefore been commissioned by AEC to develop a cost model for broadcasting commercial free-to-air services on the digital terrestrial platform (commercial FTA DTT) and to calculate the weighted average cost of capital (WACC) to be applied in the cost model.

This report focuses on the proposed conceptual approach and methodology for the development of the cost model and for the calculation of the WACC.

The remainder of this document is laid out as follows:

- Section 2 describes the DTT market and the regulatory environment in Macedonia
- Section 3 describes the proposed methodology for the DTT cost model
- Section 4 describes the approach to calculating the WACC for the modelled operator.

Finally, Annex A provides a list of abbreviations and acronyms used in the report.

1 See http://www.aek.mk/mk/analiza/pregled-na-analizi/golemoprodazhba?start=10.

2 AEC procedure no. 02-2954 of 15 October 2012; DVB-T broadcasting licence no. 107976/1 issued by AEC to ONE on 17 May 2013.

2 The DTT market and regulatory environment in Macedonia

This section provides a summary of the main developments in the DTT market in Macedonia; a brief description of the regulatory process that led AEC to determine ONE's (now One.Vip's) dominant position in the market and the applied remedies; and finally an overview of the merger between ONE and Vip.

2.1 The DTT market

The TV market was liberalised in Macedonia in 1997, allowing TV broadcasting companies to be established. Since then, TV content has been distributed over different technologies, such as terrestrial broadcasting (initially only based on analogue platforms), cable and satellite.

The development of DTT improved the TV service conditions for final consumers to get advantages in terms of range of offer, transmission quality, etc., compared to analogue broadcasting, as well as a more efficient use of spectrum thanks to multiplexing of TV channels.

The first licences for multiplexing were awarded in 2009 and DTT services were launched in the same year. In accordance with European directives and recommendations, as well as the government's programme for the period 2011–15, the government of Macedonia planned to conduct a full digitalization of terrestrial TV broadcasting in 2013.

The analogue switch-off (ASO) in Macedonia, which took place on 1 June 2013, did not trigger any immediate loss of TV channels, although some of the channels later decided to move to cable networks. Today, the Macedonian broadcast market has five fewer channels than it did in 2013. Figure 2.1 shows the number of terrestrial TV channels before and after the ASO: approx. one third of local commercial broadcasters were able to reach regional coverage thanks to the introduction of DTT. Potential further changes in the list of channels and in the licenses for radio diffusion activity issued by AVMU (Agency for Audio and Audiovisual Media Services) will be acknowledged in future reports.

Figure 2.1: Pre- vs. post-ASO broadcast market dynamics [Source: Analysys Mason, 2015]

Network	Coverage	Type	Before ASO	After ASO	Today
Broadcast	National	Public	3	3	3
Broadcast	National	Commercial	4	5	5
Broadcast	Regional	Commercial	10	26	21
Broadcast	Local	Commercial	46	-	-
Moved to cable	Regional	Commercial	-	2	2
Moved to cable	Local	Commercial	-	27	27
Total			**63**	**63**	**58**

The digital broadcasting market in Macedonia currently consists of seven DVB-T MUXs, which have been assigned over the years to three operators:

- The first three MUXs were assigned in 2009 to Digi Plus Multimedija, owned by Telekom Slovenije, through a tender procedure for the broadcast of commercial pay-TV services.
- Two MUXs were awarded at the beginning of 2012 to the public broadcasting service for public FTA DTT.
- Two other MUXs were awarded in November 2012 through a tender procedure to ONE, owned by Telekom Slovenije[3], for commercial FTA DTT.
- An additional MUX is available but has not been assigned yet.

Each MUX has been assigned a set of frequency channels on a regional basis (i.e. an SFN network on a regional basis). Figure 2.2 shows the channel allotments of each MUX based on regions.

Figure 2.2: Macedonian frequency plan for DVB-T [Source: Analysys Mason, 2015]

Channel	Digi Plus Multimedija			Public service		ONE	
Allotment	MUX 1	MUX 2	MUX 3	MUX 4	MUX 5	MUX 6	MUX 7
CRN VRV/Skopje	26	28	30	23	52	33	45
CRN VRV/Veles	26	28	30	23	52	40	47
Stracin	21	41	46	37	42	50	56
Turtel	22	32	43	24	39	38	55
Boskija	21	37	49	34	41	57	54
Pelister	25	29	33	22	37	38	42
Vlaj	32	39	41	26	36	44	50
Stogovo	51	57	59	28	43	35	31

2.2 Regulation in the DTT sector

AEC completed its market analysis (Market 13, 'Broadcasting transmission services to deliver broadcast content to end users', according to AEC's market definition[4]: the market definition is eventually refined by defining a number of sub-markets, including FTA DTT) on 3 April 2014, designating ONE as an SMP operator in the FTA DTT sub-market and imposing cost accounting and price control obligations.

3 In 2012 ONE was entirely owned by Telekom Slovenije. In January 2015 ONE merged with Vip in One.Vip; the merged company is now 55% owned by Telekom Austria and 45% by Telekom Slovenije.

4 See http://www.aek.mk/mk/analiza/pregled-na-analizi/golemoprodazhba?start=10.

In its market analysis, AEC specifies that ONE is the only operator that provides TV content broadcasting services using DTT infrastructure to third parties, charging the annual price of MKD4 836 000 per Mbit/s for national services and MKD632 000 per Mbit/s for regional services.

As a result, ONE was considered as having 100% market share and therefore as holding a dominant position in the market, making the market subject to *ex ante* regulation.

The EC Recommendation 2003/311/EC defined the relevant product and service markets within the electronic communications sector that were susceptible to *ex ante* regulation in accordance with Directive 2002/21/EC[5]. Such Recommendation defined Market 18 as the market for broadcasting transmission services to deliver broadcast content to end users, including transmission of broadcasting signals (radio and TV) to end users on behalf of content providers. The 2007 Recommendation eliminated Market 18 from the list of markets susceptible to *ex ante* regulation, leaving however room to national regulatory authorities (NRAs) to undertake market reviews and impose obligations on SMP operators, mostly in terms of infrastructure sharing.

Figure 2.3 below shows the current (de-)regulation status of former Market 18/2003 in the main EU countries: an SMP operator has been identified in nine countries, and for all of them a price control remedy has been applied.

Figure 2.3: Regulation of former Market 18/2003[6] in main EU countries [Source: Analysys Mason, 2015]

Country	SMP	Site-access obligation	Wholesale broadcasting service	Price control
Austria	✗	✗	✗	✗
Czech Republic	✓ Radio-komunikace	✓ Access to equipment, co-location	✗	✓ Cost orientation
Denmark	✗	✗	✗	✗
Estonia	✓ Levira	✓ Network elements	✓ To wholesale customers	✓ Cost orientation
Finland	✓ Digita Oy	✓ Antenna lease	✓ Capacity provision	✓ Cost orientation
France	✓ TDF	✓ Access to buildings and masts, and transmission equipment	✗	✓ Replicable sites: non-excessive and non-predatory prices Non-replicable sites: cost orientation

5 Macedonia is not part of the EU; however, the EU regulatory framework provides a useful reference point for this type of analysis.

6 Market 18 is not defined exactly in the same way in all the countries (obligations for free-to-air DTT are indicated in the table).

Country	SMP	Site-access obligation	Wholesale broadcasting service	Price control
Germany	✘	✘	✘	✘
Greece	✘	✘	✘	✘
Hungary	✓ Antenna Hungaria	✓ Access and interconnection	✓	✓ Cost orientation
Italy	✘	✘	✘	✘
Latvia	✘	✘	✘	✘
Netherlands	✘	✘	✘	✘
Slovakia	✘	✘	✘	✘
Slovenia	✓ RTV Slovenija	✓ Transmission network and infrastructure	✓ Transmission services	✓ Price control and cost accounting
Spain	✓ Abertis Telecom	✓ Co-location, interconnection	✘	✓ Cost orientation
Sweden	✓ Teracom	✘	✓ Wholesale access	✓ Cost orientation, accounting separation
UK	✓ Arqiva	✓ Access to masts and sites	✘	✓ Cost orientation, reference offer

2.3 Merger between One and Vip

Besides being the FTA DTT operator, ONE (formerly Cosmofon) was also the third MNO in Macedonia, with approx. 26% market share of subscribers.

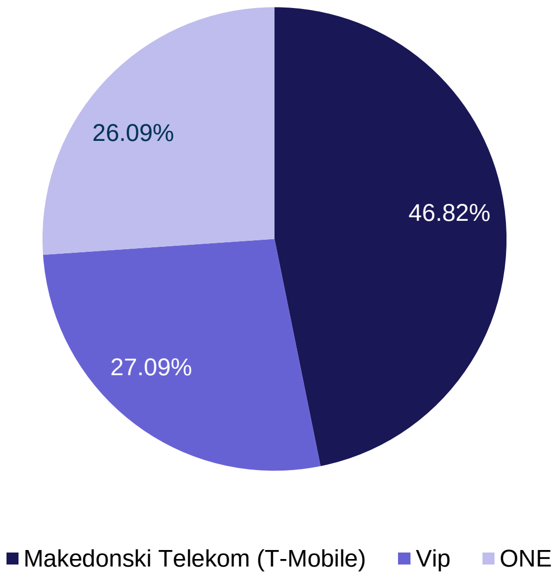


Figure 2.4: Market share of mobile subscribers in 3Q 2015 [Source: AEC, 2015]

In January 2015 Mobilkom Mazedonien Beteiligungsverwaltung GmbH, Vienna, Austria, and Telekom Slovenije d.d., Ljubljana, Slovenia (ONE' shareholder), have informed the Commission for Protection of Competition of the Republic of Macedonia about the market concentration originating by the agreement through which Vip gained control over ONE, merging the two operators.

The merger was approved by the Commission for Protection of Competition in July 2015, subject to conditions such as the provision of MVNO access to third parties. As a result of the merger, 55% of the combined entity, One.Vip, is now under the control of Telekom Austria (Vip's main shareholder), while Telekom Slovenije has retained the remaining 45%.

One.Vip has notified AEC it would have acted as a merged operator from 1 October 2015; however, at the time of writing the two operators still operate the two networks independently as of before the merger, and no information has been made available regarding network integration.

As a result of the merge, One.Vip is now the mobile market leader in the country, accounting for over 53% of mobile subscribers in 3Q 2015[7].

7 Source: AEC.

3 Methodology for the DTT cost model

This section describes the proposed modelling approach for the development of the commercial FTA DTT cost model.

We propose building a bottom-up long-run incremental cost model (BU-LRIC) informed by network and cost inputs coming from the data that will be made available after the data request process. We will carry out a top-down cross-check of the model results against One.Vip's accounting data.

The conceptual issues to be addressed throughout this section are classified in terms of four dimensions: operator, technology, service and implementation, as shown in Figure 3.1 below.

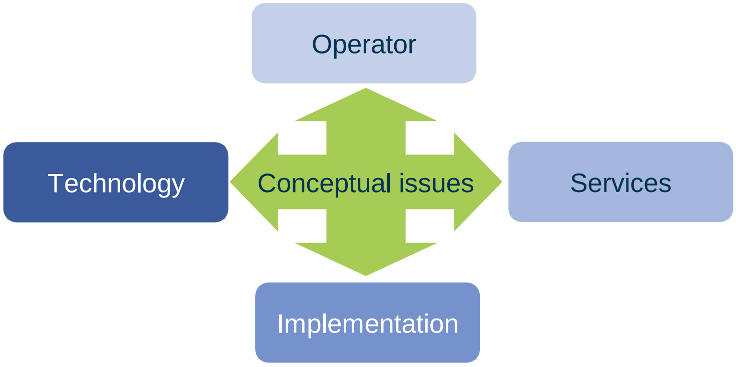


Figure 3.1: Framework for classifying conceptual issues [Source: Analysys Mason, 2013]

Operator In light of AEC's market analysis and current regulatory framework, the operator to be regulated is only One.Vip; therefore, the modelled operator will replicate One.Vip's scale and network.

Service The two modelled services will be the ones currently offered by One.Vip to its wholesale customers (the TV content producers), i.e. a national and a regional digital TV broadcast transmission service.

Technology The type of network to be modelled depends on the technology and network architecture deployed. As for the characteristics of the operator, the model will replicate One.Vip's already deployed network to provide DTT broadcasting services. Additionally, since One.Vip focuses only on the provision of a part of the services in the DTT value chain, we will take into account only the relevant components of the network for the provision of the regulated services.

Implementation The costing part of the model requires two implementation choices:

- The **time series of the model** – Since we do not expect significant variation in demand and capacity is in any case constrained by the number of available MUXs (and to a lesser extent by the technical parameters of the MUX), we will build a single-year model.

- The **depreciation** method to be applied to annual expenditure – We propose to apply tilted annuity, reporting results calculated with other depreciation methods for information purposes if requested.

The remainder of this section is structured as follows:

- Section 3.1 discusses the choice of costing methodology
- Section 3.2 discusses the main conceptual issues.

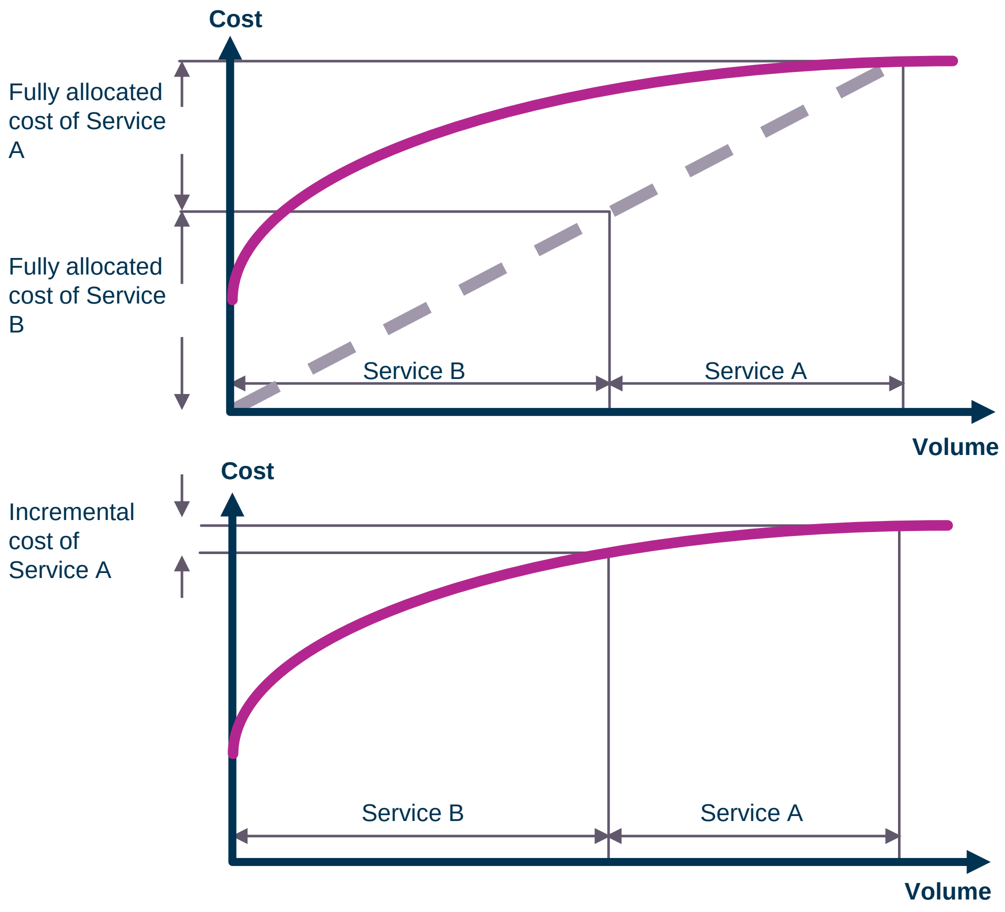
3.1 Costing methodology

3.1.1 Choice of costing methodology

Regulatory models are often developed using the so-called long-run incremental costing (LRIC) approach, whereas internal models tend to be based on the fully allocated cost (FAC) methodology. There are a number of differences between LRIC and FAC models, including how costs are allocated to products. LRIC models adopt an incremental approach, as shown in Figure 3.2 below, which means that they consider only the incremental costs directly related for the provision of the volume of a specific service (indeed often with a bottom-up/*ex ante* approach).

On the other hand FAC models allocate a share of the total costs underlying the provision of all the services to a specific one (indeed often with a top-down/*ex post* approach).

Figure 3.2: Cost allocation in FAC (top) and LRIC (bottom) models [Source: Analysys Mason, 2015]

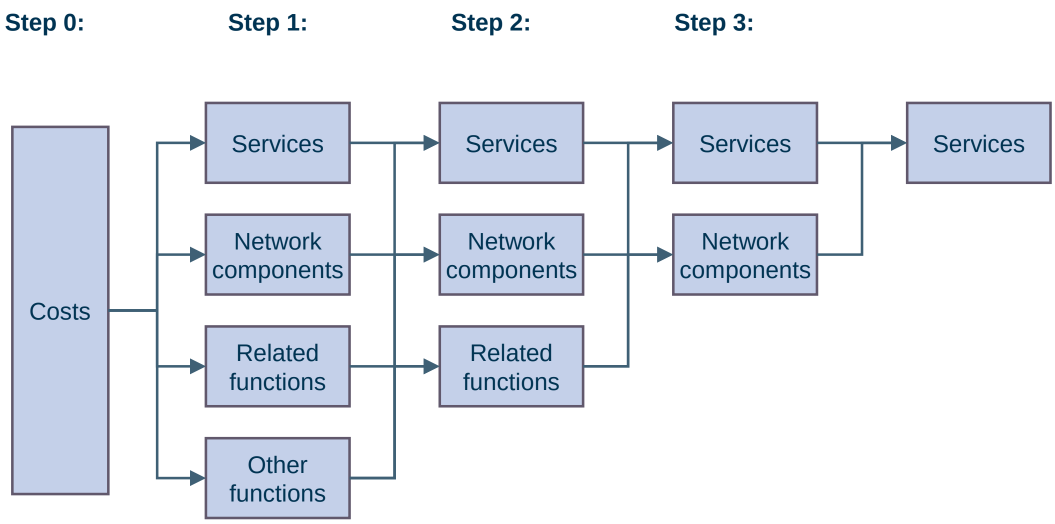


FAC models

A FAC model provides the flexibility to allocate revenue, costs, assets and liabilities to activities, network elements and products according to a transparent attribution and apportionment methodology which is typically based on cost causality. We have developed a methodology for the development of top-down FAC models based on guidelines from the European Regulators Group (ERG, now BEREC)[8]. Figure 3.3 illustrates this methodology in greater detail; the various steps involved are also described below.

8 Source: ERG COMMON POSITION Guidelines for implementing the Commission Recommendation C (2005)3480 on Accounting Separation & Cost Accounting Systems under the regulatory framework for electronic communications.

Figure 3.3: Overview of our standard methodology for developing top-down FAC models [Source: Analysys Mason, 2015]



The development of a FAC model typically begins with a classification of the cost categories in the internal systems, including investments and operating expenses, into:

- **Services**: costs that can be directly identified with a particular service (retail or wholesale).
- **Network components**: costs relating to various components of the transmission, switching and other network systems.
- **Related functions**: costs of retail and wholesale functions necessary for service provisioning (e.g. billing, maintenance, customer services, marketing, sales).
- **Other functions/overheads**: costs of functions not directly related to the provision of particular services (e.g. planning, personnel and general finance), which will be treated as common costs.

The allocation steps are as follows:

- **Step 0: Attribution of costs from internal systems to the cost categorisation needed**. This step also includes valuation and depreciation adjustments if one chooses to deviate from the accounting standards used.
- **Step 1: Allocation of costs from other functions**. The other functions are treated as common costs (costs for which it is not possible to identify a driver with cost causality). They are therefore allocated with an equi-proportionate mark-up (EPMU) to the remaining cost categories, based on the proportion of costs in each category.[9]

9 The allocation of these costs can be done either as a first or as a last step.

- **Step 2: Allocation of costs from related functions**. These will include both direct costs and indirect costs that are allocated to the network components and the services through causal ad-hoc drivers

- **Step 3: Allocation of costs from network components**. As a final step, the network components are allocated to the services through network load calculations set up with the help of a routeing table.

The allocation in each step will be done based on causal drivers in accordance with, for example, the so-called activity-based costing (ABC) systems, in order to ensure that the allocation of costs properly reflects the actual underlying drivers for costs. The output of this process is unit costs for the network services.

The characteristics of FAC models provide some important advantages for internal use:

- they are based on real data and can be audited using objective criteria
- they have a very flexible structure which facilitates periodic updates of input data and key variables
- their results are not overly dependent on modelling assumptions
- they allow for full recovery of costs.

LRIC models

LRIC models are intended to take a long-run view and thus eliminate certain inefficiently incurred costs that the regulator does not intend to allow the regulated operator to cover with wholesale charges. LRIC models can be developed as:

- top-down models, starting from an FAC model and then applying certain adjustments
- bottom-up models, in which the asset quantities and costs are calculated based on actual or forecast network demand.

It is essential to understand what the definition of LRIC underlies:

- Long-run costs include all the costs that will ever be incurred in supporting the relevant service demand, including the ongoing replacement of assets used. As such, the duration 'long run' can be considered at least as long as the network asset with the longest lifetime. Long-run costing also means that the size of the network deployed is reasonably matched to the level of demand it supports, and any over- or under-provisioning would be levelled out in the long run.

- Incremental costs are incurred in the support of the increment of demand, assuming that other increments of demand remain unchanged. Put another way, the incremental cost can also be calculated as the avoidable costs of not supporting the increment.

There is considerable flexibility in the definition of the increment, or increments, to apply in a costing model, and the choice should be suitable for the specific application. Possible increment definitions include:

- the marginal unit of demand for a service
- the total demand for a service
- the total demand for a group of services
- the total demand for all services in aggregate.

In Figure 3.4, we illustrate where the possible increment definitions interact with the costs that are incurred in a five-service business.

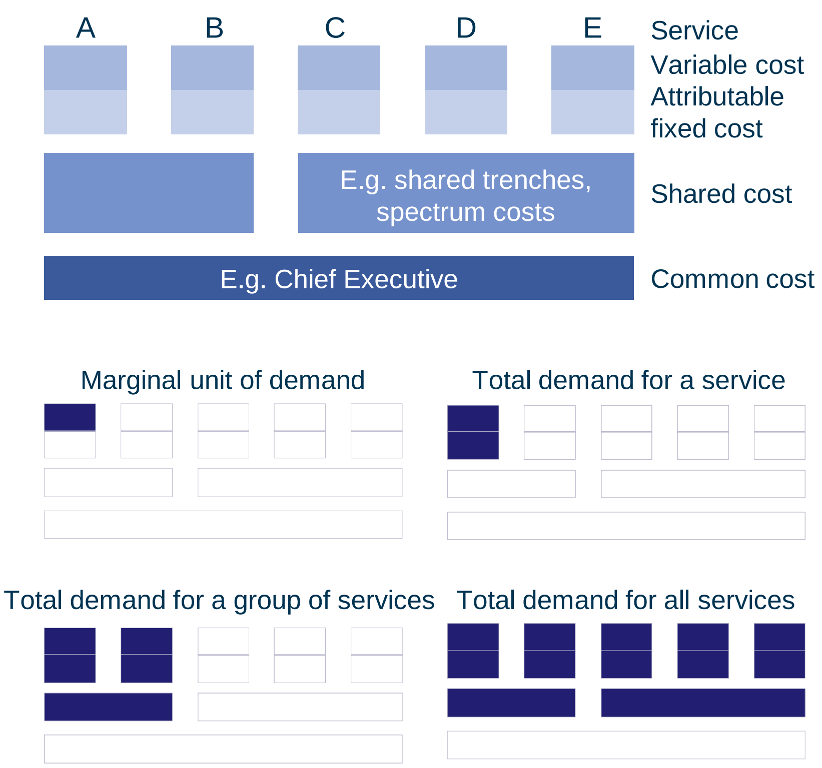


Figure 3.4: Possible increment definitions [Source: Analysys Mason, 2015]

Proposed approach

When choosing between different costing methodologies for a DTT cost model, there are not many examples which we can rely on for a benchmark. However, whenever we have modelled a DTT network to estimate its costs (for instance in the UK, France, the Netherlands, Cameroon and Mexico), a bottom-up approach has been adopted, without referring to any specific existing network or operator. Figure 3.5 examines the suitability of the different approaches.

Figure 3.5: Suitability of costing methodologies [Source: Analysys Mason, 2015]

Cost model type	Top-down	Bottom-up
FAC	• Based on operator’s actual data, provided availability of data • Incorporates the actual operator’s inefficiencies • Flexible structure which facilitates periodic updates of input data and key variables	• Not common, but it can be used when the model is built bottom-up with some inputs from the operator’s actual data

Cost model type	Top-down	Bottom-up
	• Results not overly dependent on modelling assumptions • Allows for full cost recovery	
LRIC	• Not too suitable and viable	• Allows to model a modern efficient operator • However degrees of inefficiencies/ mark-ups for common cost recovery at discretion can be included • Inputs and results can be easily benchmarked against other similar models

Since this choice largely depends on the type and quality of inputs, which is unknown at this stage, our proposed approach is to build a bottom-up LRIC model based on actual costs whenever available and on benchmarks when they are not. Additionally, the model results will be cross-checked against One.Vip's accounting data according to availability (i.e. a top-down validation will be performed) whenever applicable (i.e. to the extent costs associated to the commercial FTA DTT service provision will be clearly identifiable from the data provided by One.Vip). Therefore, we might slightly adjust our approach on the basis of the type of information made available to us.

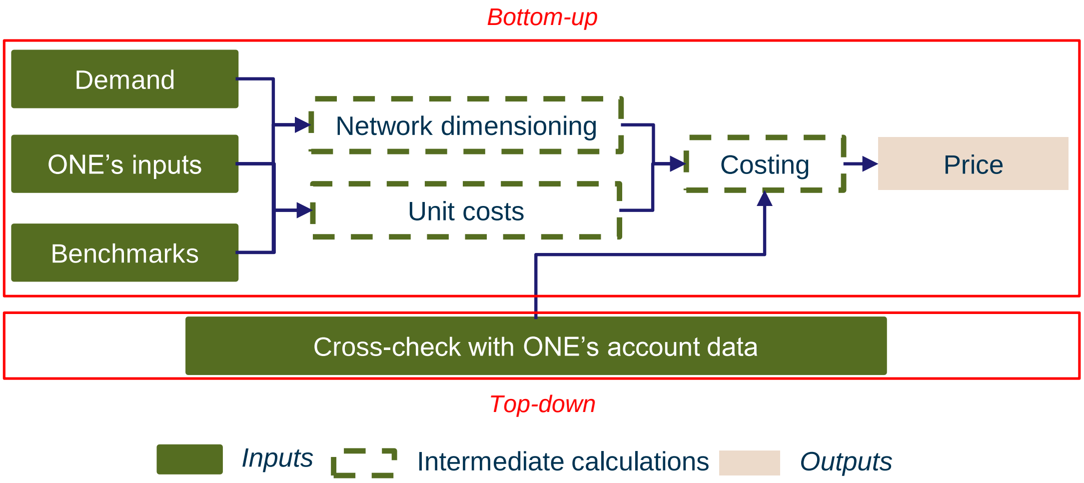
Finally, regardless of the type of model adopted, we are aiming at cross-checking the model results with the current market prices and the P&L statements of the major TV channels, in order to assess the economic sense of the prices set and ensure their sustainability for the market.

Proposed concept 1: Our proposed approach is to build a bottom-up LRIC model based on One.Vip's inputs and benchmarks and to cross-check the model results against One.Vip's accounting data and market prices. Some aspects of the approach might be refined at a later stage based on the availability and quality of data.

3.1.2 Preliminary model structure

Figure 3.6 provides a high-level overview of the proposed structure of the model.

Figure 3.6: Conceptual structure proposed for the model [Source: Analysys Mason, 2015]



As discussed in Section 3.1.1, the model will be built with a bottom-up approach and informed by One.Vip's network and cost inputs, complemented with benchmarks (from comparable operators, other similar assignments, etc.) whenever data is not made available.

The inputs about One.Vip's network architecture and scheme for network components, complemented by benchmarks when appropriate, will determine the required network elements, calculated taking into account engineering dimensioning rules and the demand for One.Vip's services (network dimensioning phase).

At the same time, One.Vip's inputs, again complemented by benchmarks when appropriate, will also be used to determine unit costs, which will be eventually applied to the network elements to calculate the network costs (costing phase).

Finally, the costs will be allocated to different services (i.e. the national and the regional service) to determine the cost of each of them as well as the unit cost (dividing the cost allocated to the service by that service demand, in this case Mbit/s).

Finally, we will cross-check the model results against data from One.Vip's accounts, if available, and against market prices currently charged by One.Vip, e.g. by checking to what level of wholesale revenue One.Vip would get by applying the prices calculated by the model against the ones actually achieved by the company (for the same actual level of demand).

3.2 Conceptual issues

3.2.1 Modelled operator

The type of operator to be designed in the model is the primary conceptual issue which determines the subsequent structure and parameters of the model. In this case, in light of AEC's market analysis and current regulatory framework, the operator to be regulated is only One.Vip, and therefore One.Vip's current network architecture and transmission technology will be used as reference for the model.

ONE was awarded a licence for two DVB-T MUXs (MUX 6 and MUX 7) in 2012 following a tender procedure, on which it broadcasts 5 national and 21 regional TV channels.

The cost model will take into account only the network infrastructure and the costs associated with the provision of DTT, using when possible inputs from One.Vip's separated accounts, carefully excluding costs pertaining to the mobile activities.

Proposed concept 2: One.Vip is the operator to be modelled and therefore its current DTT network architecture and transmission technology will be used.

3.2.2 Modelled services

One.Vip currently offers two FTA DTT transmission services to TV broadcasters, which can choose (i) a national and (ii) a regional service in one or more of the eight allotment areas mentioned in Section 2.1[10].

Since the cost model is intended to be used to define One.Vip's pricing, the costs will be calculated for broadcasting services on the DTT network at both a national and regional level.

Proposed concept 3: The model will calculate costs for commercial FTA DTT broadcasting services at both a national and regional level.

3.2.3 Technology issues

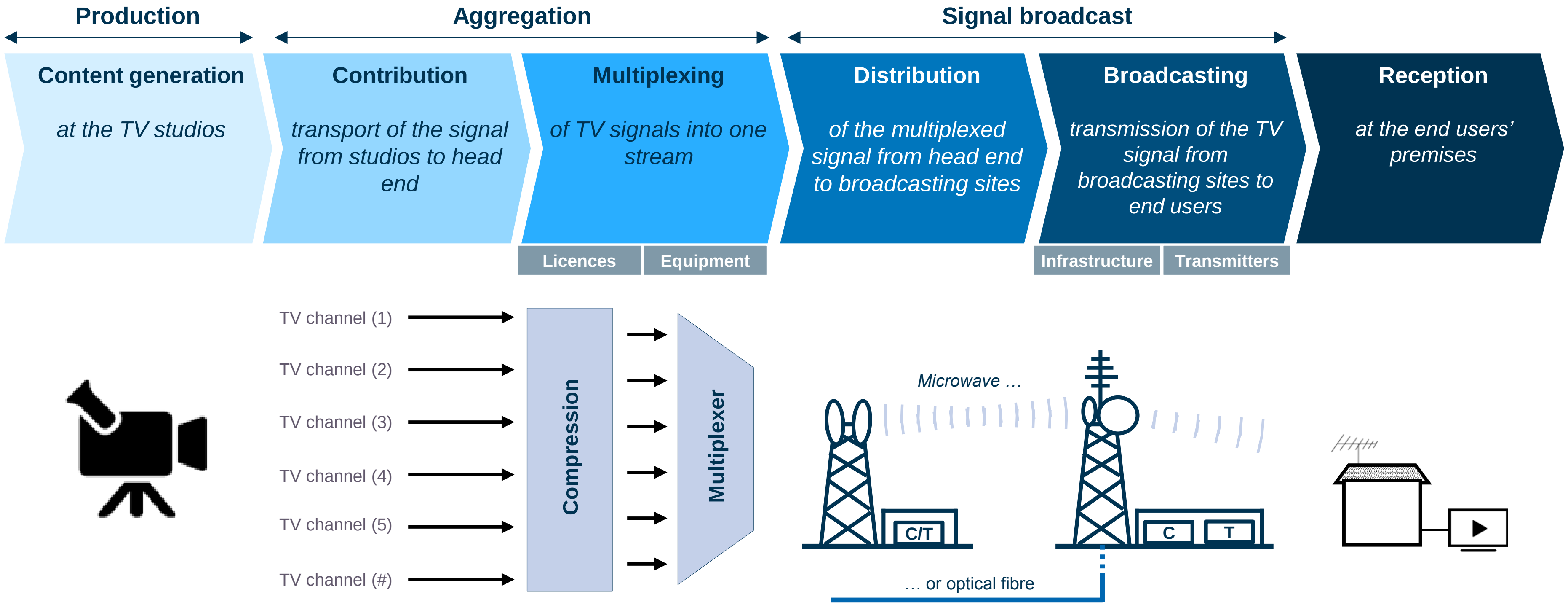
The definition of the DTT value chain and of the services potentially subject to regulation is the key technology-related issue affecting the cost model. The DTT value chain is composed of several segments, each of which potentially involving different players:

- **content generation** at the TV studios
- **contribution**, which is the transport of the signal from studios to head end
- **multiplexing** of TV signals into one stream
- **distribution** of the multiplexed signal from head end to broadcasting sites
- **broadcasting**, which is the transmission of the TV signal from broadcasting sites to end users
- **reception**, at the end users' premises.

The DTT value chain is depicted in Figure 3.7 below.

10 Source: Framework agreement on Digital Broadcasting of Programme Service between ONE and its counterparties.

Figure 3.7: DTT value chain [Source: Analysys Mason, 2015]



Based on the information about One.Vip's MUX licence, infrastructure and services provided, as well as on the framework agreement contract, One.Vip's regulated services cover the following value chain steps and related network elements:

- **Multiplexing** – One.Vip owns both the licence and the equipment for the compression and multiplexing of TV signals in its "head end" in Skopje, where the signal is delivered by TV content producers.
- **Distribution** – One.Vip transmits the compressed signal to its broadcasting sites across Macedonia through its backhaul links (typically fibre or microwave).
- **Transmission** – One.Vip transmits the TV signal from the broadcasting sites to the end users: in particular, the operator provides active services, meaning that it routes the TV content to end users on behalf of TV content producers through its transmission capacity and active equipment. We will only consider active services, which include the costs for the underlying passive infrastructure.

Proposed concept 4: The model will cover the multiplexing, distribution and broadcasting stages of the DTT value chain.

3.2.4 Implementation issues

Time series

The model time series is the period of time across which demand and asset volumes are calculated in the model. A long time series allows the consideration of all costs over time, and it is best suited to model the costs of an operator whose service demand varies over time.

We are going to build a single-year model for two main reasons:

- the service demand is not expected to vary significantly or in any predictable way over the years[11]
- the network dimensioning is not significantly affected by the level of demand[12].

In light of the low degree of predictability of demand, we will cost the services on a single-year basis, i.e. with the demand of a specific year (assuming this demand is going to be broadly stable over time).

11 Cost trends will be in any case included in the model and factored in through the adopted depreciation method.

12 The number of MUXs is pre-defined and the passive infrastructure dimensioning (e.g. physical sites) does not depend on the service demand.

Proposed concept 5: We are building a single-year cost model in light of the expected low variation of demand level in the next few years.

Depreciation method

There are four main potential depreciation methods for defining cost recovery:

- historical cost accounting (HCA) depreciation
- current cost accounting (CCA) depreciation
- standard annuity
- tilted annuity
- modified tilted annuity
- economic depreciation (ED).

The primary factor in the choice of the depreciation method is whether the network output is changing over time. As stated before, we assume the demand and the DTT network assets to be stable over time, which allows creating the model for one year only. This excludes economic depreciation from the list of viable depreciation methods, since this method requires a multi-year model.

Among the other different approaches listed above we propose to use tilted annuities, since this allows accounting for all the factors except the increase in network output, which is not expected to be relevant (see Figure 3.8). However, if requested, we will also use other depreciation methods for our calculations to provide AEC with additional points of comparison.

Figure 3.8: Factors considered by depreciation method [Source: Analysys Mason, 2015]

Item	HCA	CCA	Standard annuity	Tilted annuity	Modified tilted annuity
MEA cost today	✗	✓	✓	✓	✓
Forecast MEA cost	✗	✗	✗	✓	✓
Output of network over time	✗	✗	✗	-[13]	✓[14]
Financial asset lifetime	✓	✓	✓	✓	✓
Economic asset lifetime	✗	✗	✓	✓	✓

Proposed concept 6: We intend to calculate depreciation using tilted annuity in the model; results calculated with other depreciation methods will be included for information purposes, if requested.

13 An approximation for output changes over time can be applied in a tilted annuity by assuming an additional output tilt factor of x% per annum.

14 Assuming constant growth over time.

4 Calculation of the WACC

4.1 Methodology

The cost model will require a WACC to be specified. The WACC value is an important input into regulatory cost accounting, defining the reasonable return on capital employed by the operator. In other words, the cost-oriented price should not only cover the costs incurred by the SMP operator in providing the regulated service, but also remunerate the cost of capital employed.

In light of the forthcoming construction of the DTT cost model, estimating the WACC to be used in the model is a key task affecting the model results.

The generic formula of the post-tax WACC is:

$$WACC_{post-tax} = C_d \times \frac{D}{D+E} + C_e \times \frac{E}{D+E}$$

where:

- C_d is the cost of debt
- C_e is the pre-tax cost of equity
- D is the value of the operator's debt
- E is the value of the operator's equity.

Moreover, we usually refer to the company gearing, defined as $G = \frac{D}{D+E}$.

Proposed concept 7: The WACC is defined as the weighted average of the cost of debt and cost of equity.

4.2 Cost of equity

It is considered best practice to estimate the cost of equity with the capital asset pricing model (CAPM). The Independent Regulators Group (IRG) has acknowledged[15] that the use of CAPM is supported by its relatively simple implementation and by its wide use among regulators and practitioners.

According to CAPM, the cost of equity C_e is calculated as follows:

$$C_e = R_f + \beta \times R_e$$

where:

15 IRG: *Regulatory accounting: Principles of Implementation and Best Practice for WACC calculation*, February 2007. Referred to as 'the IRG paper' in the rest of the present document.

- R_f is the risk-free rate of return
- R_e is the equity risk premium
- β is a measure of how risky a particular company or sector is relative to the national economy as a whole.

Proposed concept 8: The cost of equity is calculated using the CAPM.

Risk-free rate

The risk-free rate of return is the expected return on a risk-free asset, i.e. an asset that carries zero risk. The risk-free rate is conventionally approximated by the expected return on government bonds with a long (e.g. ten-year) maturity, as they are likely to carry the lowest default risk in a given market and are therefore the best proxy for a risk-free asset.

In the case of Macedonia, the Government issued a Eurobond in 2014 of the amount of EUR500 million with a maturity of 7 years at an annual interest rate of 3.975%[16]. We will use this interest rate as a proxy of the risk-free rate of return, as it is the latest issued bond with a medium-term maturity.

Proposed concept 9: The risk-free rate of return is equalled to the annual interest rate of the latest issued mid-term maturity Government bond, i.e. 3.975%.

Beta coefficient

Beta (β) is a statistical measure of the sensitivity of the returns of an asset's equity in relation to the return from a fully diversified equity index. For example, if the beta coefficient is greater than one, this implies that the company's equity returns are more volatile (hence riskier) than the market returns. The theory compares the returns from the asset with the returns from the market with the view that equity investors can diversify their risks by investing equally in the full range of the assets available in the market. By holding such a market portfolio, the investors would receive the average return of the market.

Since One.Vip is owned by the Telekom Slovenije and Telekom Austria groups, it is not listed and therefore it is not possible to derive its actual beta coefficient. For this reason, we will estimate the possible range of values for the beta based on benchmarks of similar companies.

When benchmarking the beta coefficient, it is important to note that the value of the equity beta (i.e. the beta required by the CAPM calculation) will not only reflect the operational risk, but also the financial risk. The equity beta can be adjusted based on the gearing to remove the financial risk and to give an asset beta (which only reflects operational risk) according to the following formula:

16 See http://www.finance.gov.mk/en/node/4174

$$\beta_{equity} = \beta_{assets}(1 + (D/E))$$

The asset beta is therefore more likely to present a fair benchmark. This is a company-specific parameter whose value can be benchmarked with that of comparable companies in other countries.

Proposed concept 10: The beta value will be estimated based on available information and through benchmarks.

Equity risk premium

Equity risk premium is the increase over the risk-free rate of return that investors demand for providing equity financing. As it is riskier to invest in stocks (equity) than to invest in risk-free government bonds, investors demand a risk premium. Often, companies listed on the national stock market are taken as the sample over which this average is calculated.

The IRG paper recommends a balanced approach considering the relevance and quality of available information, using one or more of the following methods: (adjusted) historical premium, survey premium, benchmarking, or implied premium (ex-ante approaches based on, for example, the dividend growth model).

We will use benchmarking against the value of risk premium in comparable equity markets.

Proposed concept 11: The risk premium will be estimated based on available information and through benchmarks.

Gearing level

A gearing level describes the financing structure of an organisation as it identifies the loan capital as a proportion of the total financing needs of a company. Gearing is typically expressed as:

$$G = \frac{D}{D + E}$$

Gearing represents a parameter that can be estimated based on available information on the company and benchmarking the capital structure of comparable operators across Europe.

Proposed concept 12: The gearing level will be estimated based on available information and through benchmarks.

4.3 Cost of debt

The cost of debt (C_d) is calculated to reflect the typical corporate bond yields, represented by this formula:

$$C_d = (1 - t) \times (R_f + R_d)$$

where:

- R_f is the risk-free rate
- R_d is the company's debt premium
- t is the corporate tax rate.

Risk-free rate

The risk-free rate calculated for the cost of equity (see Section 4.2) is also used for the cost of debt.

Debt premium

Debt premium is defined as the country- and company-specific risk premium for corporate debt above the risk-free rate. For the country-specific risk premium, the simplest and most widely used calculation method is to use the rating assigned to a country's debt by a ratings agency. These credit ratings measure default risk but also take into account many other factors such as political and economic stability, as well as the country's budget and trade balances.

Company-specific risk premium will be determined based on a benchmark of debt premium values of comparable operators across Europe.

Proposed concept 13: Company-specific premium will be determined through benchmarks.

Tax rate

The corporate tax rate in Macedonia for 2015 is 10%[17], and will be used in our calculations.

Proposed concept 14: The model will use the corporate tax rate for Macedonia in 2015, i.e. 10%.

4.4 Pre- and post-tax WACC

The relation between pre- and post-tax WACC is represented by this formula:

$$WACC_{pre-tax} = \frac{WACC_{post-tax}}{(1 - t)}$$

A benchmark of the WACC of real operators 'comparable' to the modelled operator could provide useful insight to compare the calculated value. In this task, the key issue is the choice of the benchmark sample, as the degree of similarity can be evaluated from several points of view (operations in place, years from launch, market share, reference market, etc.).

17 See http://www.ujp.gov.mk/en/plakjanje/category/21

Proposed concept 15: The WACC will be expressed in nominal, pre-tax terms, and its value will be cross-checked against a benchmark of comparable operators.

Annex A List of abbreviations used

Figure A.1 below lists the acronyms and abbreviations used in this report.

Figure A.1: List of acronyms and abbreviations [Source: Analysys Mason, 2015]

Acronym	Meaning
AEC	Agency for Electronic Communications of the Republic of Macedonia
ASO	Analogue switch-off
BEREC	Body of European Regulators for Electronic Communications (formerly ERG)
CAPM	Capital asset pricing model
CCA	Current cost accounting
DTT	Digital terrestrial television
ED	Economic depreciation
EPMU	Equi-proportionate mark-up
ERG	European Regulators Group (now BEREC)
FAC	Fully allocated costs
FTA	Free to air
HCA	Historical cost accounting
IRG	Independent Regulators Group
LRIC	Long-run incremental costs
MEA	Modern equivalent asset
MFN	Multi-frequency network
MNO	Mobile network operator
MVNO	Mobile virtual network operator
MUX	Multiplex
NRA	National regulatory authority
SFN	Single-frequency network
SMP	Significant market power
WACC	Weighted average cost of capital