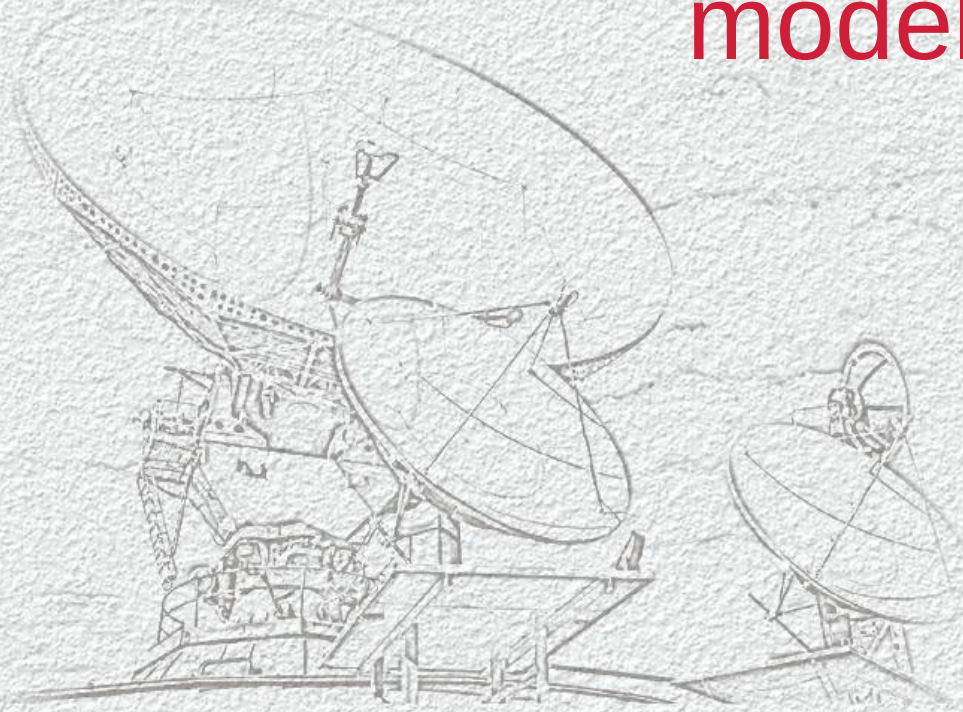
هيئة تنظيم الاتصالات
Telecommunications Regulatory Authority
Kingdom of Bahrain – مملكة البحرين

Developing bottom-up cost models: the Bahraini experience



BDT REGIONAL ECONOMIC AND FINANCIAL FORUM OF TELECOMMUNICATIONS/ICTS FOR ARAB STATES

Kuwait, 23 Nov 2014

2014

Agenda

- Background
- Why develop bottom-up cost models?
- Overview of the Bahrain bottom-up cost model project
  - Project timeline
  - Model definition phase
  - Model development phase
  - Model validation phase
- Lessons learned during the project

Background (1/3)

- The mission of the Telecommunication Regulatory Authority of Bahrain ('TRA') is:
  - To develop a competition-led market for the provision of innovative communications services, available to all, which: encourages sustainable, economically efficient investment; respects the interests of consumers; fosters ecologically friendly initiatives; and supports the social and commercial welfare of Bahrain.
- On many occasions, TRA has been recognised as the most progressive regulator in the region.
- Bahrain is also viewed as the most advanced liberalised telecommunications market in the region.

Background (2/3)

- TRA regularly reviews specific retail and wholesale telecommunication markets.
- In those markets in which TRA determines that an operator have significant market power (i.e. dominance), TRA imposes a set of obligations on such operator in accordance with the Telecommunication Law and Regulations:
  - Accounting separation obligations
    - Produce regulated separate FAC and LRAIC accounts.
  - Access obligations
    - Publication of a reference offer which details the price and non-price terms of regulated wholesale services. As per the Telecommunication Law, **regulated services shall be offered on fair, reasonable and non-discriminatory terms and their tariffs shall be based on forward-looking incremental costs.**
  - Retail tariffs notification obligations
    - Retail tariffs shall pass tariffs controls such as “no excessive pricing” or **“no margin squeeze”.**

Background (3/3)

- Until recently, TRA could only rely on the information provided by the top-down accounting model of the incumbent operator in Bahrain**.** Such top-down model is used to produce the separated regulated accounts.
- There is considerable delay between the time at which costs are effectively incurred and when regulatory accounts are submitted (~1 to 2 years).

- In 2011, TRA decided to develop bottom-up ('BU') cost models.
- BU cost models are engineering models which use detailed data and engineering rules to (re)build a hypothetical efficient network, reflecting as appropriate the network of the modeled operator.
- BU cost models are distinct from top-down models in which cost inputs are taken from the operator's accounting records and are allocated to services by using service demand and allocation rules.
- BU cost models use economic costs unlike top-down models which use accounting costs.

Why develop BU cost models? (1/3)

- While top-down cost models are important to assess the level of costs and margins of operators, it is generally considered as a best practice to use bottom-up cost models for setting regulated rates.
- BU cost models offer more granularity, and more transparency than top-down cost models and their development enables both regulators and operators to get a deep understanding of network costs.
- BU cost models can be used to complement top-down models. Moreover they use economic costs instead of accounting costs.
- BU cost models are valuable tools in the context of setting tariffs based on forward-looking incremental costs as required by the Telecommunications Law in Bahrain.
  - The current reference offer is based on top-down models which may or may not represent efficient network operations.
  - There is a considerable delay between the time when costs are incurred by the incumbent operator and the time prices are approved or ordered by TRA (2 years for the last incumbent operator reference offer).

Why develop BU cost models? (2/3)

- TRA has therefore developed **3 bottom-up cost models**:
  - **Access network BU cost model** which calculates the cost of deploying a copper access network and a fibre access network in Bahrain. This model reproduces the incumbent operator's access network and calculates the cost of duct access and local loop unbundling services. It also provides cost inputs to the core network cost model.
  - **Core network BU cost model** which calculates the cost of providing fixed telecommunication services in Bahrain (fixed telephony, broadband internet access, leased lines). This model reproduces the incumbent operator's transmission network. It provides useful information for the setting of regulated wholesale charges, including:
    - fixed termination rate;
    - wholesale DSL and Bitstream access services;
    - wholesale leased line access services; and
    - wholesale interconnection link services.
  - **Mobile network BU cost model** which calculates the cost of providing mobile telecommunication services in Bahrain for the 3 existing mobile operators and a 'generic' operator. It provides useful information for the setting of mobile termination rates.
- **Operators have actively participated** in the project:
  - 2 consultations (draft Position Paper and draft BU cost model)
  - 4 workshops (draft position paper, data collection phase, draft BU cost models and final BU cost models).

Why develop BU cost models? (3/3)

- The BU cost models assist TRA in:
  - **Costing retail and wholesale telecommunications services;**
  - **Gaining a better understanding of cost drivers;**
  - **Monitoring, setting, approving or reviewing retail and wholesale tariffs;**
  - **Analysing anti-competitive pricing complaints;**
  - **Assessing the cost efficiency of dominant/SMP operators**
  - **Setting and reviewing price regulation frameworks.**
- TRA is not supplanting the use of existing top-down cost information with the BU cost models, but instead it uses both modelling approaches as complementary regulatory tools.
  - Regulatory cost models can provide tangible benefits both for operators and regulators as it brings forward an objective, transparent, and holistic regulatory tool – built in a cooperative way and through a consultative process.
- The BU cost models also provide useful information in the context of the governmental-led policy to deploy a National Broadband Network in Bahrain (e.g. different investment scenarios for the deployment of a fibre access network.)

Overview of the BU cost model project

Project timeline

Phase 1 – Model definition 2011

- 2011: Position Paper
  - January 2011: kick off meeting with operators
  - May-June 2011: industry presentation and consultation on TRA's draft Position Paper on the development of BU cost models
  - October 2011: final Position Paper

Phase 2 – Model development 2012-2013

- 2012: Data collection
  - October/November 2011: workshops with operators - First information request + network site visits
  - May 2012: second information request
  - 2012-2013: Several meetings/conference calls to clarify data request and adjust models
- 2012-2013: Model development
  - In May 2012: Preliminary versions of the draft models were presented to operators

Phase 3 – Model validation 2013-2014

- 2013: Model consultation
  - Mid 2013: Draft models sent to operators for comments
  - End of 2013: Adjustments made to the models taking into accounts operators' comments
- 2014: Model finalization
  - Dec 2013 - Jan 2014: Final workshops with operators
  - Q1 2014: Development of additional pricing modules and final adjustments
  - April 2014: Final versions of the models

Overview of the BU cost model project

Model definition phase – Position Paper (1/2)

- **During the model definition phase, TRA issued a Position Paper which details the main principles followed for the development of the BU cost models:**
  - Pure LRIC and LRIC+ implemented for services handled by the fixed core and the mobile networks.
  - Shapley-Shubik allocation methods implemented for joint and common network costs and EPMU used for allocating un-attributable costs.
  - Economic asset lives and Adjusted tilted annuities as a proxy of economic depreciation
  - The “yearly approach” is used to optimise the dimensioning of the networks. However a “business plan approach” is also used in the mobile model for the calculation of the pure LRIC mobile termination rate.
  - Bottom-up approach for the calculation of OPEX. In cases where operator data is unavailable, a benchmark is conducted.
  - The cost of working capital which is not CAPEX-related is excluded :
    - Non-network related costs of working capital are excluded from model
    - Network OPEX-related working capital costs are excluded from model unless operators provide evidence that such costs are material and efficient.
  - The scorched node approach is used for both the fixed and the mobile models.

Overview of the BU cost model project

Model definition phase – Position Paper (2/2)

- **Fixed core and fixed access network cost models:**
  - Fixed core network cost model are based on the incumbent operator's existing NGN core network.
  - Fibre access network: P2P architecture deployment will be modelled (as opposed to GPON)
- **Mobile network cost model:**
  - Operators specific models and a generic model has been implemented for mobile networks
  - 2G and 3G technologies have been modelled. In the future, TRA may update the model to take into account LTE deployments (4G)
  - An average spectrum holding is used when modelling the mobile network of a generic operator.
  - Two options for licence costs in the 'generic operator' model: average licence costs or latest entrants' licence costs. Models is flexible to run sensitivity analysis on this parameter.
- **Use of models:**
  - It may be appropriate in some cases to use gradients for the setting of regulated prices
  - Models will cover a period of 4 to 5 years
  - Use of a glide path might be appropriate to move from existing to the appropriate cost-based charges

Overview of the BU cost model project

Model development phase – Data collection

- Detailed specifications of the data required has been sent to operators. For each of the 3 types of networks modeled, the data requested included, for example:

MOBILE NETWORK

- Traffic data (retail and wholesale demand)
- RAN: number of equipment, investments, engineering rules
- Switching data: number of equipments, investments, engineering rules
- Transmission data: number of links, types of links, investments,
- Unit price of equipment
- …

FIXED CORE NETWORK

- Retail and wholesale demand: number of fixed lines, traffic data, engineering rules (BHT)
- Network topology
- Interconnection with operators
- Switching: number of equipment, investments, engineering rules
- Transmission: # of equipment, investments, engineering rules
- Routing factors
- Unit price of equipment
- ….

FIXED ACCESS NETWORK

- Retail and wholesale demand
- Number of equipment: DPs, lines, MDFs, etc.
- Dimensioning rules
- Number of units
- LFI
- MDF coverage maps
- Geographic and demographic data
- Unit price of equipment
- …

Overview of the BU cost model project

Model development phase – Access network model (1/2)

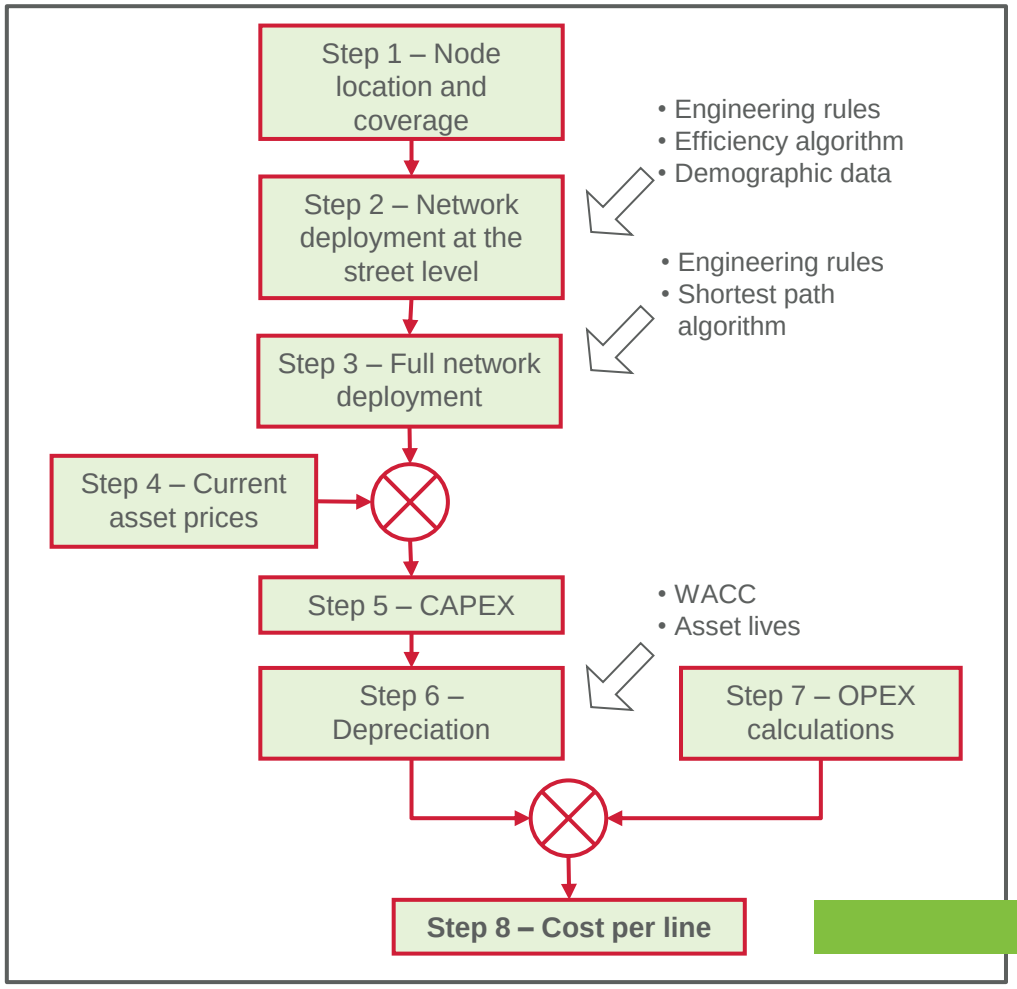
- The access network cost model calculates the cost of deploying:
  - a copper access network in Bahrain (as deployed by the incumbent operator); and
  - a fibre access network connecting every building in Bahrain.
- The costs calculated by the access model are:
  - civil engineering costs (trenches, manholes, and ducts); and
  - passive network infrastructure costs (joints and cables).
- The model has been developed based on geographic and demographic data.

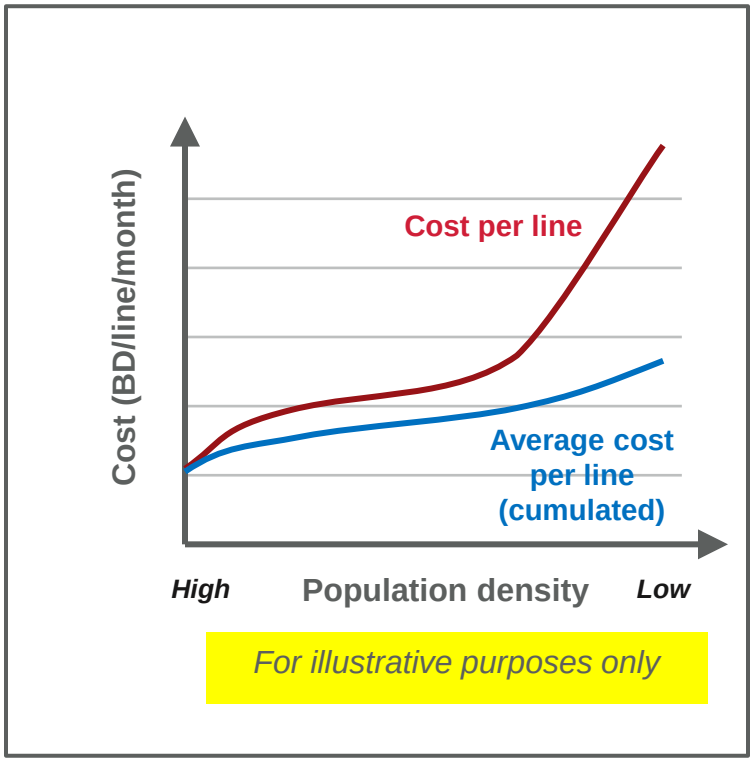
Satellite

Vectorised data

Overview of the BU cost model project

Model development phase – Access network model (2/2)



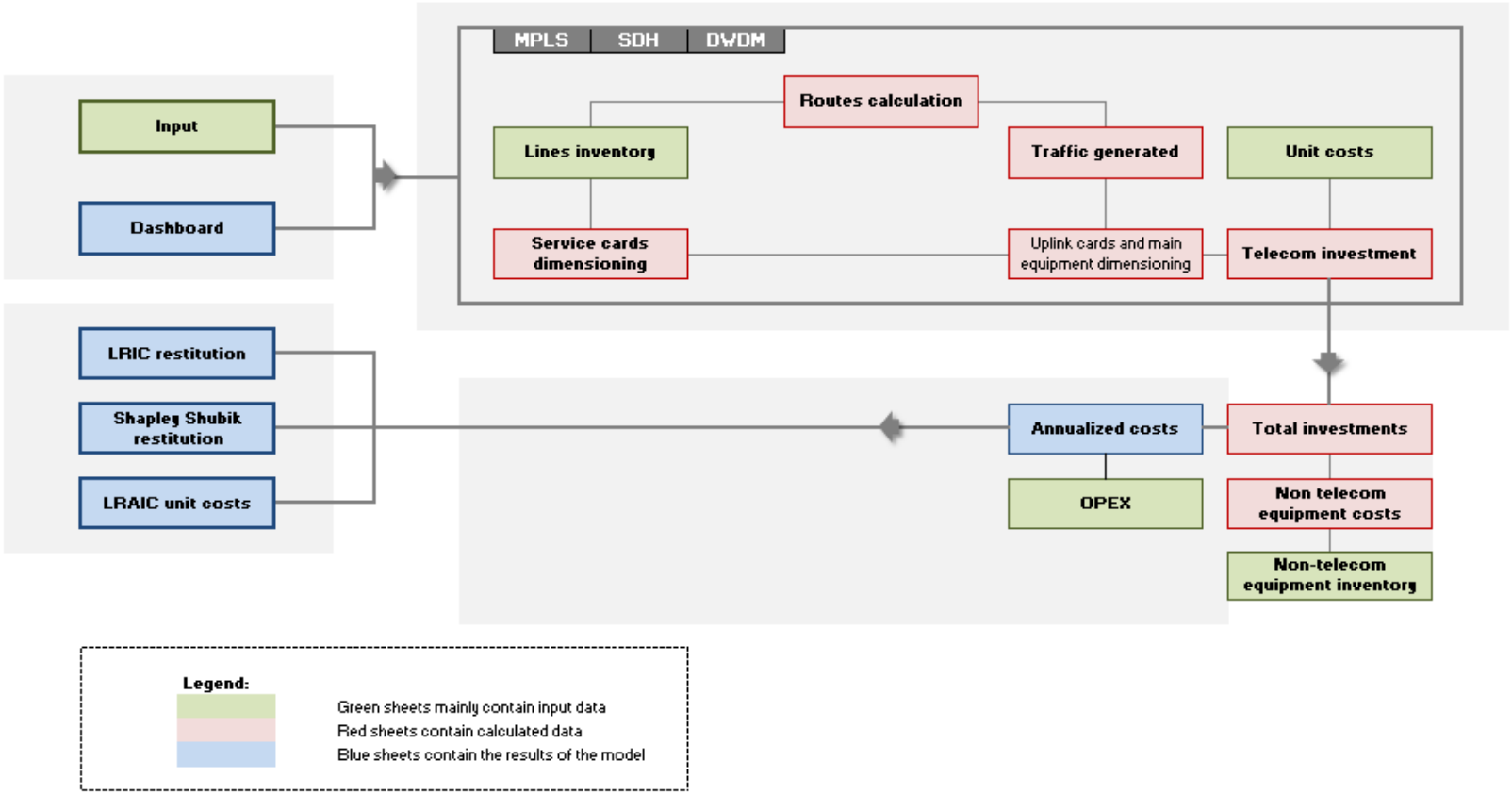


RESULTS

Overview of the BU cost model project

Model development phase – Core network model

- The core BU cost model is a relatively complex model that is comprised of 78 Excel sheets. Based on network dimensioning rules and based on traffic demand, the model calculates the cost of:
  - Incumbent operator's active elements in the access network (MSAN for copper, GPON for fibre)
  - Incumbent operator's core transmission (MPLS/SDH/DWDM).



Overview of the BU cost model project

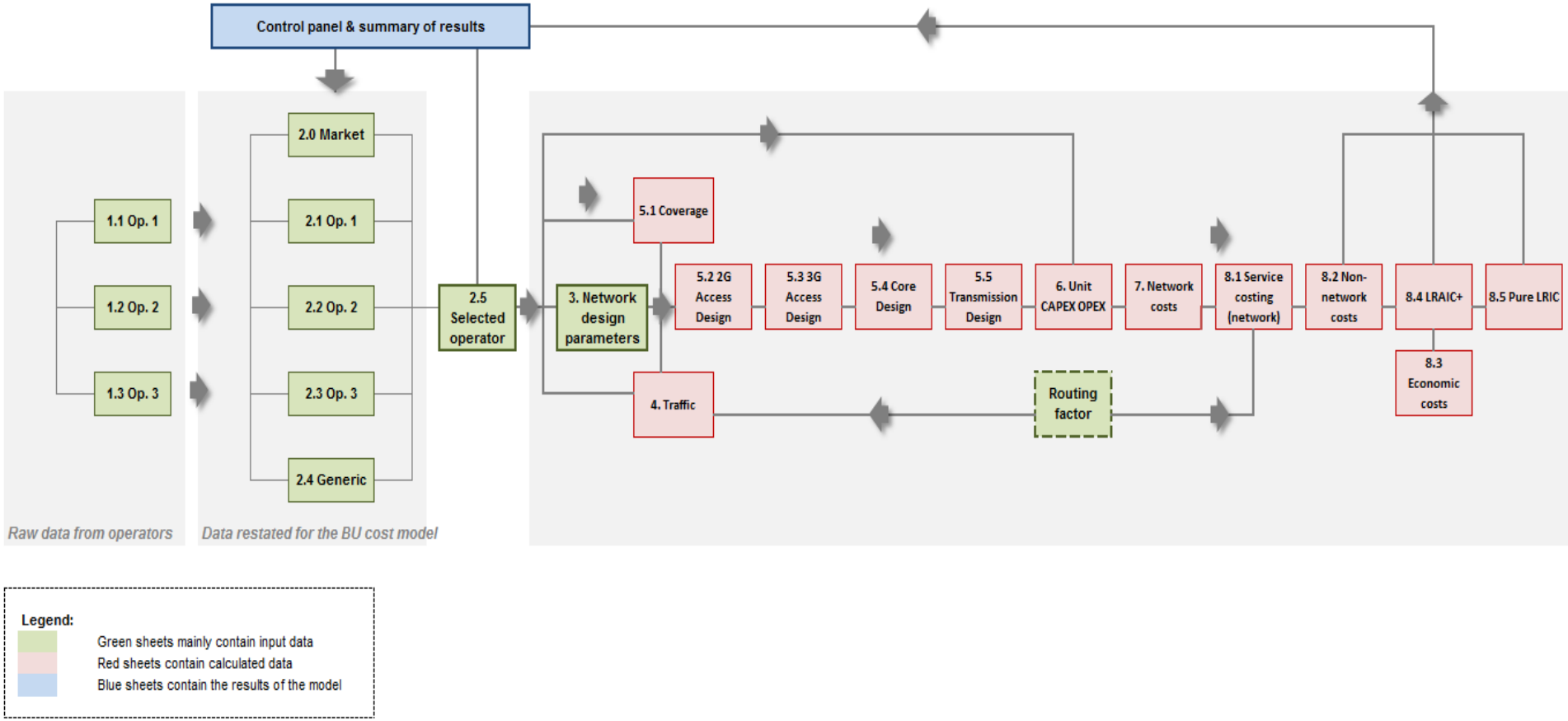
Model development phase – Mobile network model (1/2)

- The mobile network BU cost model calculates the costs of deploying and operating a mobile network in Bahrain. It is based on the following approach:
  - dimensioning of the mobile network based on current and future service demand;
  - calculation of the costs of this dimensioned network with the relevant depreciation method;
  - allocation of the costs to the different services (and especially to the wholesale voice call termination service); and
  - calculation of the unit cost of each service.
- The mobile BU cost model calculates the unit cost of mobile services for 4 operators:
  - 3 specific models (one for each operator)
  - 1 model for the 'Generic' operator

Overview of the BU cost model project

Model development phase – Mobile network model (2/2)

- The general approach of the mobile model is summarized in the figure below:



Overview of the BU cost model project

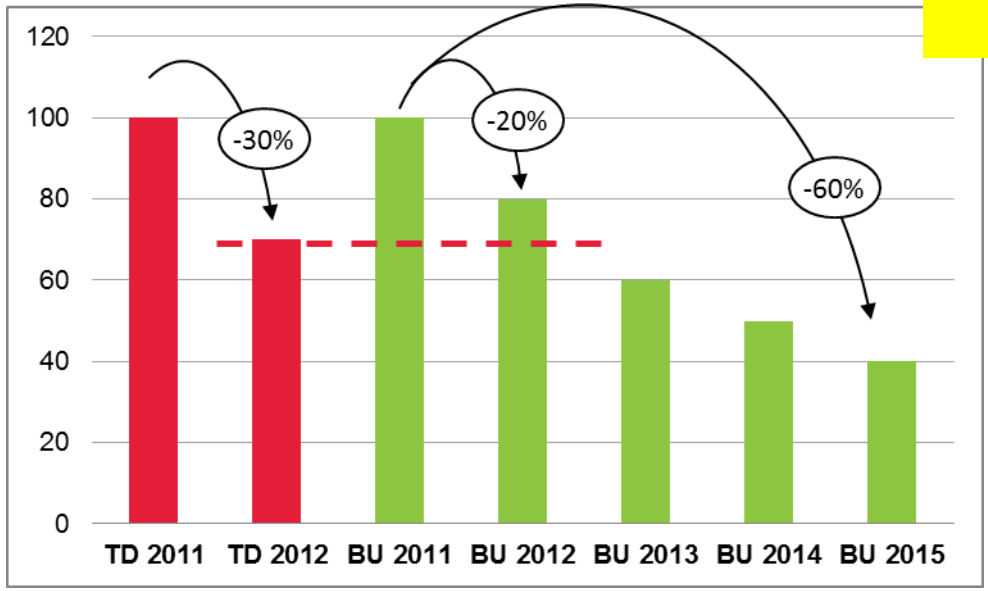
Model validation phase – Core network model results

- Based on the results provided by the core network BU cost model, it is possible to forecast the unit cost of MPLS transmission and compare it with actual top-down results. BU results can thus be used to address the "lag" between the time when cost are actually incurred and the time when regulatory accounts are submitted.

- BU results provide useful information to assist TRA in setting "forward-looking" regulated charges.

Top-down cost and bottom-up cost of MPLS transmission (2011 base 100)

For illustrative purposes only



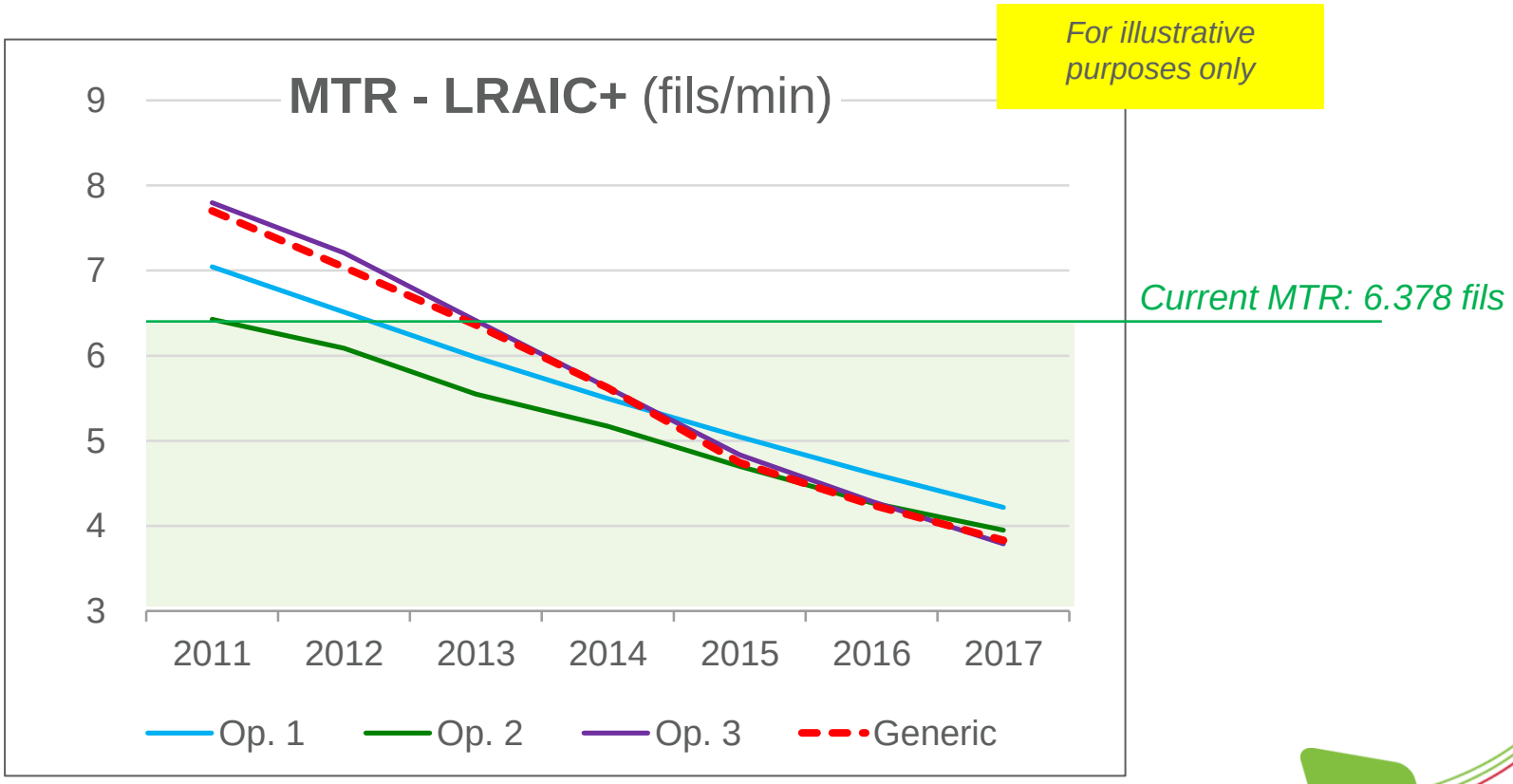
Top-down results based on regulatory account submissions

Bottom-up cost model results

Overview of the BU cost model project

Model validation phase – Mobile network model results

- The current regulated mobile voice termination rate is 6.378 fils per minute.
- The model calculates an LRAIC cost of mobile voice termination at ~5 fils/min in 2015 (and ~4 fils in 2017).



Lessons learned during the project

- "*The journey is just as important as the destination*"
  - **Involvement**: It is critical to involve operators at the early stage of the project. This ensures that the BU cost models are understood and used by all parties.
    - Understand the main variables impacting network costs (i.e. sensitivity analyses) and the reasons behind the differences between bottom-up and top-down results.
    - Ensure that operators "own" and use the models (through dedicated workshops and trainings)
  - **Transparency**: model documentation should be developed at the early stage of model development and draft models should be shared with operators for comments and validation. All changes made to the models should be dully documented.
- "*Simple is beautiful*"
  - BU cost models do not have to exactly match reality: it is important to manage the trade-off between "reality/complexity" and "flexibility/usability".
  - Usable and flexible BU cost models are more valuable than a "black box".

Thank You!

TRA's Position Paper on BU cost models: http://www.tra.bh/media/document/MCD1011144PositionPaperonBU-LRICcostmodels.pdf

Thomas HAIN, Senior Analyst at TRA: thain@tra.org.bh