Mobile call termination: stakeholder workshop

Hosted by Ofcom
26 October 2009

Agenda - outline for the workshop

Topic	Timing	Session lead
Arrival and coffee	09.15 – 09.30	-
Workshop aims, role within MCT review	09.30 – 09.50	David Stewart
Modelling assumptions: Demand and Traffic volumes	09.50 – 10.15	Steve Liput
Modelling assumptions: Network technology	10.15 – 10.40	Mani Manimohan
Break (if necessary)	10.40 - 11.00	
Modelling assumptions: Spectrum	11.00 – 11.20	Will Godfrey
Modelling assumptions: Cost standards and cost measurement	11.20 – 11.40	James Mackley
Discussion of the main issues	11.40 – 12.00	Andrea Coscelli
Close	12.00	David Stewart

External attendees for MCT modelling workshop

Stakeholder name	Personnel
H3G	Jane Jellis, Shital Patel, Tim Miller and Adam Mantzos (external consultant)
O2	Lawrence Wardle
T-Mobile	Daniel Jacobson, Andrew Ellis
Orange	Rupert Handley, Jo Stretton, Sarah Hayes, Jane Cooper
Vodafone	Howard Roche, Jonathan Sandbach
BT	Alun Banner, Geoff Haigh, Resham Mahal
C&W	Justin Hornby

Ofcom attendees for MCT modelling workshop

Name	Role
David Stewart	Project Director
Andrea Coscelli	Economics Director
William Godfrey	Economics Principal
Paul Jacobus	Project Manager
James Mackley	Economics Manager
Mani Manimohan	Competition Policy Manager
Kevin James	Economics Manager
Steve Liput	Analysys Mason
David Grassham	Analysys Mason

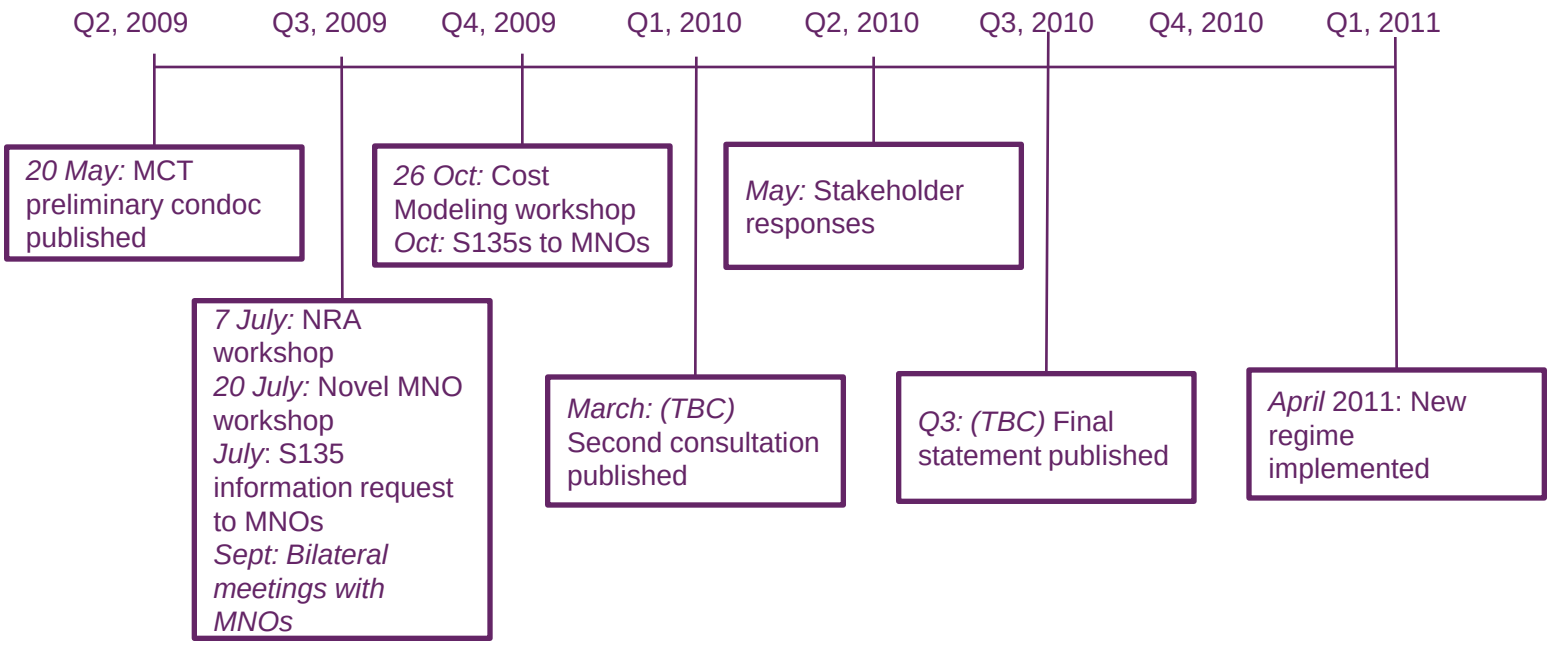
Introductions and purpose of workshop

- Cost modelling work is part of wider market review
- Cost model relevant to 2 of 6 options: LRIC+ and ‘pure’ LRIC (as recommended by the European Commission)
- Purpose of workshop is to consider some of the assumptions needed for the cost model exercise
- We want to share our initial thinking with you, and give you a chance to tell us what you think
- Thank you for the time and effort already given to this process

Introductions and purpose of workshop

- We will outline the various options on a number of issues, and be open about the questions/issues where we specifically seek your input
- But all of the modelling work remains under development and you are welcome to comment on any aspect of our work (i.e. not just the questions we ask)
- We can take input today and are also happy to get views in writing or in follow-up meeting or call.
- We will aim to offer a meeting to all participants in the next few weeks
  - Paul Jacobus will contact you this week to arrange
- Ask questions, seek clarification - more open questions to be made at the end

MCT Review timeline



Modelling objectives and approach

- Objective is to model a hypothetical efficient network operator in 2014/15 from which we get unit costs for benchmark regulated charges for the 2011 to 2015 period.
- The cost model would be used if we use either a LRIC+ or a pure LRIC methodology
- With more operators it is possible we identify a single benchmark MTR – note the parallel to the regime today of reciprocity for FTRs. This will be a question in the consultation
- In setting a cost-based MTR , technology choice, traffic assumptions, spectrum value and cost standards are likely to have a significant impact on the final year target charge.
- There are two important principles for regulatory charge setting to remember before we start the discussions:
  - We are not seeking to model actual costs for MNOs today.
  - We are seeking to set efficient charges based on the costs of an efficient operator in 2014/15

What will not be covered today

WACC

- Looking for benchmark cost of capital for a hypothetical efficient MNO.
- March 2007 pre-tax real WACC = 11.5%, equivalent to pre-tax nominal 14.6% (at the time).
- We are doing further work on this. For indicative levels on non-firm specific parameters see Annex 8 of May 2009 statement *"A new pricing framework for Openreach"*

Calibration

- Allows the cost model to be a hybrid model: combining the advantages of the forward look and efficiency of a bottom-up model, with the "practical reality" of a top-down model (since we don't have regulatory accounting data for mobile voice termination).

Admin costs

- Contribution to admin costs is appropriate for a LRIC+ regime and possibly CBC (depending on cost standard used for CBC);
- Contribution to admin costs not needed in pure LRIC, reciprocity or B&K options.

Agenda - outline for the workshop

Topic	Timing	Session lead
Arrival and coffee	09.15 – 09.30	-
Workshop aims, role within MCT review	09.30 – 09.50	David Stewart
Modelling assumptions: Demand and Traffic volumes	09.50 – 10.15	Steve Liput
Modelling assumptions: Network technology	10.15 – 10.40	Mani Manimohan
Break (if necessary)	10.40 - 11.00	
Modelling assumptions: Spectrum	11.00 – 11.20	Will Godfrey
Modelling assumptions: Cost standards and cost measurement	11.20 – 11.40	James Mackley
Discussion of the main issues	11.40 – 12.00	Andrea Coscelli
Close	12.00	David Stewart

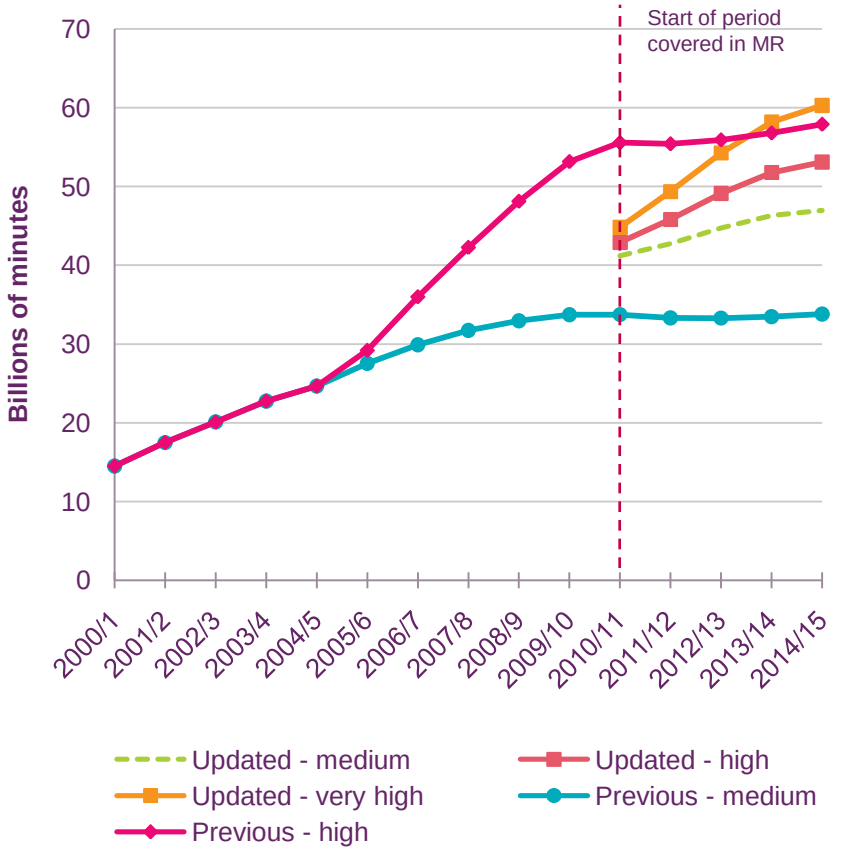
General demand and traffic modelling assumptions

- We have updated historical demand figures based upon information from MNOs via section 135 data requests
- We are now focusing upon key drivers of future traffic:
  - data volumes from dongles and handsets
  - total voice minutes
- We have a range of key forecasts to capture uncertainty
- Input from mobile operators and external parties will be used to further develop forecasts
- We acknowledge the relationship between demand and supply (i.e. deployed technologies and available spectrum)
  - The highest demand scenarios may not be appropriate unless there are new technologies or additional spectrum
- We propose to keep existing assumptions (i.e. the assumptions used in the cost model we used for the 2007 statement) for geographic split of traffic and time of day distribution unless there is new evidence to suggest a change

Take-up and usage of voice services

- Voice traffic per operator has grown to a level between the previous medium and high demand scenarios
- Our expectation is that mobile voice will continue to grow
  - Note that the chart opposite is per operator and this includes a reduction in market share around 2011-2013. This reduction is to account for the fifth mobile operator reaching scale which reduces the average market share from 25% to 20%. The market share assumption is unchanged from the previous modelling at present
- The model is most sensitive to total minutes rather than e.g. number of minutes per user

Annual minutes for an average operator



Data services

Data services on handsets

- Data service penetration is growing on handsets, possibly due to more desirable devices such as the iPhone, Blackberry, etc
- The usage per subscriber of such devices is also increasing
- Our demand forecasts therefore expect an increase in usage of data services on handsets

Dongles / data cards

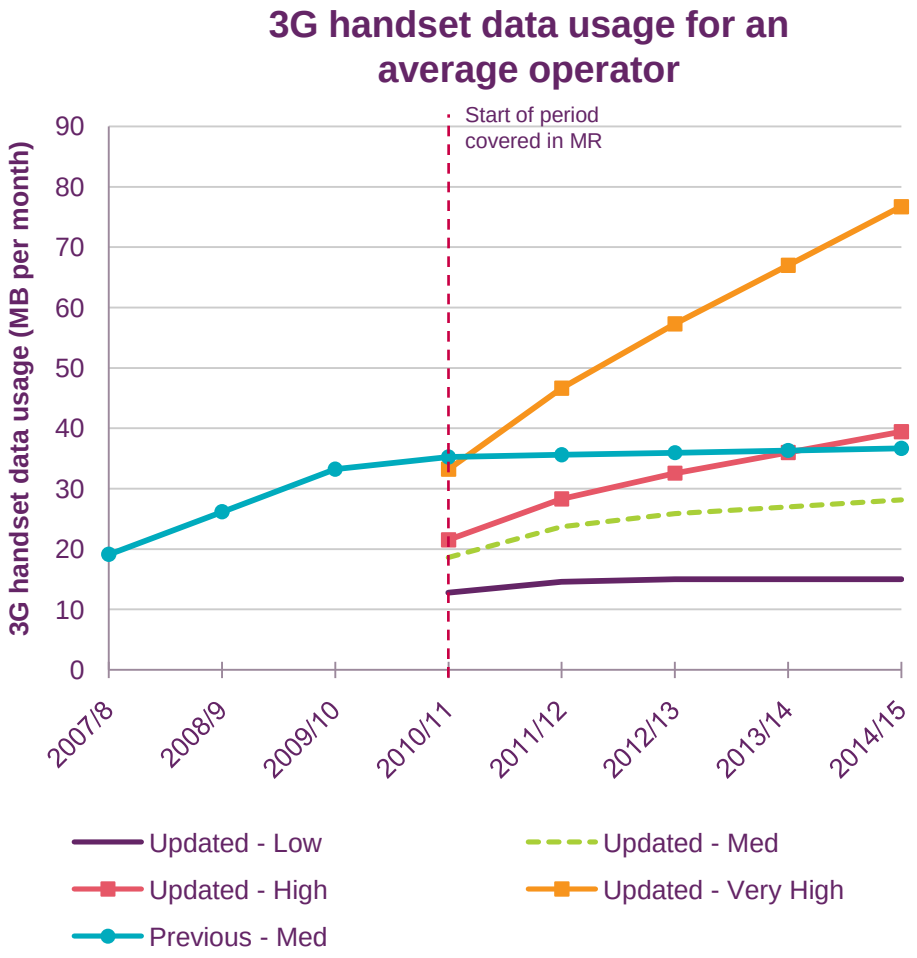
- There has been very rapid take-up, with more than 10% of homes having access to mobile broadband
- Rapid growth is forecast to continue – independent forecasts exceed 15m by the end of 2014
- There is less certainty around how usage (MB) per device will evolve
  - increasing demand for bandwidth…
  - …but will future new subscribers have lower usage and dilute overall usage?

Previous modelling

- Did not explicitly split usage from handsets and data cards. These have now been separated due to the significant growth in data cards

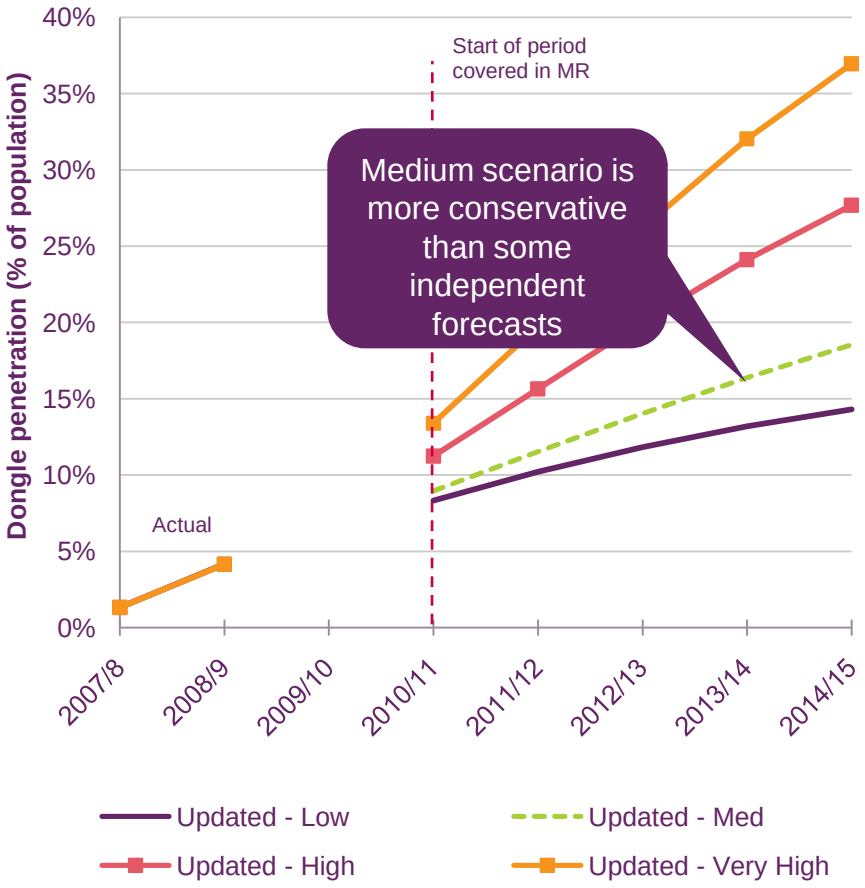
Data services: handset usage may grow rapidly

- The previous modelling did not split out 3G data usage between handsets and dongles
- We believe historical usage for handsets has been around the current medium demand scenario
- Data service take-up on handsets is beginning to grow rapidly
- Uncertainty over the level of future usage of data services on handsets has led to a wide range between our forecasts
- Usage on 2G handsets is also increasing. By 2014/15 our updated forecasts range between 1.4 MB per month and 5.9 MB per month

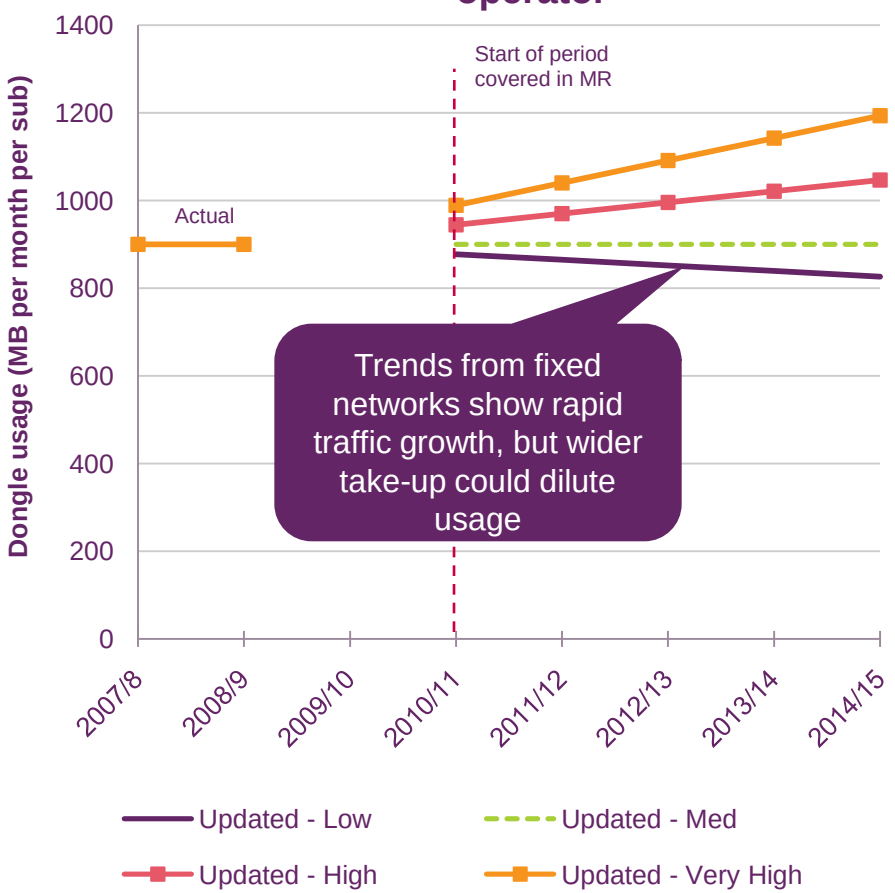


Data services: future take-up of dongles is uncertain

Forecast dongle penetration



Dongle data usage for an average operator



Other demand assumptions

- The model also contains demand for other services
  - SMS via 2G and 3G
  - MMS via 2G and 3G
  - Video calls

Messaging

- Demand for messaging has grown faster than previously expected, and is forecast to continue growing quickly
- Messaging has low demands upon the network, so we propose to not consider a range of demand scenarios

Video calls

- Demand for video calling is very limited
- Due to lack of demand (and lack of information from some MNOs) we are considering removing video calling from the model as an explicit service

Do you agree with the suggested range of forecasts?
Are there any other major drivers of demand that could be focused upon?

Agenda - outline for the workshop

Topic	Timing	Session lead
Arrival and coffee	09.15 – 09.30	-
Workshop aims, role within MCT review	09.30 – 09.50	David Stewart
Modelling assumptions: Demand and Traffic volumes	09.50 – 10.15	Steve Liput
Modelling assumptions: Network technology	10.15 – 10.40	Mani Manimohan
Break (if necessary)	10.40 - 11.00	
Modelling assumptions: Spectrum	11.00 – 11.20	Will Godfrey
Modelling assumptions: Cost standards and cost measurement	11.20 – 11.40	James Mackley
Discussion of the main issues	11.40 – 12.00	Andrea Coscelli
Close	12.00	David Stewart

Modelling assumptions: network model

- This session will cover two areas:

1) **Technological developments** since the last review and potential developments to 2014/15;

2) **Regulatory approach/principles** relevant to modelling efficient unit costs in 2014/15 recognising:

    - Charge controls set a ceiling on charges designed to capture a reasonable trend in future productivity gains.
        - It is not the role of regulation to speculate on every possible technological development, particularly when these may be some way off within the control period.

Modelling assumptions: technology developments

Updating assumptions used in 2007 model

- **Technology has evolved since the 2007 model**
  - Growth in data services
  - Deployment of data efficient technologies (e.g. HSPA)
  - RAN sharing between operators
- **Upgrade 2G/3G parameters to reflect improvements in asset capabilities**
  - Reflect technology evolutions
- **We have identified a number of assumptions that need updating**
  - 3G base station capacity
  - RNC & SGSN dimensioning rules
  - Mix of backhaul technologies
  - Unit costs of 3G base station and upgrading to HSPA
- **S135 data requests will cover these areas**

Modelling assumptions: technology developments

HSPA and impact on network efficiency

- **HSPA as 3G technology upgrade**
  - Proven efficient technology modelled as capacity upgrade of existing 3G equipment
    - Same cell site locations
  - Dedicated HSPA carrier in a dual 3G carrier scenario
  - In the long term 85% of 3G data traffic is carried over HSPA

- **HSDPA network parameters**
  - HSDPA sector capacity & relative efficiency
    - We propose that the different upgrades of HSDPA are deployed gradually

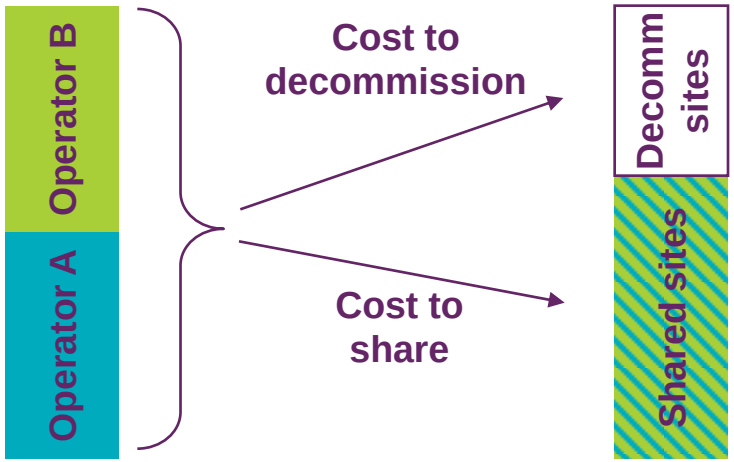
HSDPA upgrade	3G sites all upgraded	Max realistic site throughput*	Implied efficiency compared to Release 99
3.6 Mbps	mid 2007/08	4.8 Mbps	1.50
7.2 Mbps	end 2008/09	5.6 Mbps	1.75
14.4 Mbps	end 2011/12	6.4 Mbps	2.00

** The average throughput across all sites is lower due to efficiency allowances*

Modelling assumptions: technology developments

RAN sharing

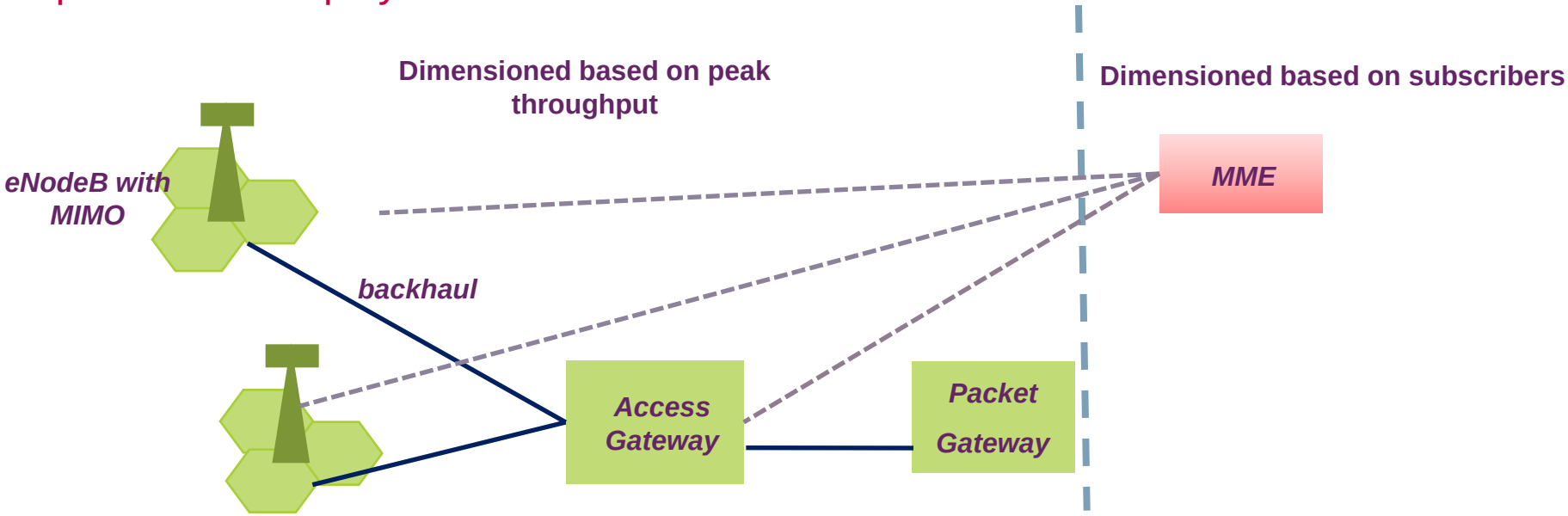
- It may be appropriate to assume that an average efficient operator deploys RAN sharing
- Our current assumption is that two operators would take 4 years to deploy complete RAN sharing
- Impact of RAN sharing modelled by doubling the traffic on the shared RAN network with
  - Dedicated spectrum for each operator
  - Share cell sites and base stations
  - Separate backhaul and core networks



Should RAN sharing be included in the base case scenario?

Modelling assumptions: technology developments

Impact of LTE deployment



- **LTE used as proxy to capture efficiency improvement from moving to**
  - Higher spectrally efficient technology
  - Flatter IP-based architecture
- **LTE deployment assumptions**
  - 2x10 MHz spectrum assumed for LTE FDD deployment

Should LTE be included in the base case scenario?

Modelling assumptions: technology developments

Modelling impact of femtocells

- **Femtocell deployment costs**
  - Femto gateways included in model to capture cost of femtocell deployment to operators
- **Subscriber costs not included in model**
  - Costs of femtocells are assumed to be borne by either subscribers or deployed as part of a retail service
  - Costs of backhaul via the subscriber's fixed broadband line are not included in the modelling
- **Femtocell penetration assumptions**
  - 40% of user traffic may be carried over femtocells

Should femtocells be included in the base case scenario?

Modelling assumptions: regulatory approach

Technology mix decision framework

- Possible criteria for selecting the technology mix to model efficient unit costs in 2015:
  - What is the MEA (lowest cost, proven technology asset) for the benchmark competitive market?
  - Can operators recover efficiently incurred costs if we were to adopt particlar benchmark models?
  - Does the approach minimise regulatory exposure to information asymmetry?
  - Does the approach avoid spurious accuracy?

Modelling assumptions: regulatory approach

Technology generation options

Technology Mix options	Pros	Cons
2G, 3G (WCDMA & HSPA)	-2G & 3G both proven technologies -Parallel running costs explicitly captured	-2G is not the most efficient technology and a hypothetical entrant is likely to choose 3G over 2G -Vulnerable to asymmetry of information (period & costs of parallel running);
3G (WCDMA & HSPA)	-Not only is 3G proven technology it is also likely to be the most efficient during 2011 -2015 -Competitive entry most likely from 3G rather than 2G, all incumbents have established 3G networks -Not vulnerable to asymmetry of information on period and costs of parallel running	-May fail to capture parallel running costs; -Cost of extending 3G coverage to achieve 2G footprint. (How would the resulting total costs compare to the omitted parallel running costs of 2G?)
Add LTE	-By 2015, some competitive constraint from LTE is possible	LTE not commercially proven and costs too uncertain?

Modelling assumptions: regulatory approach

3G-only model?

- **Considering a 3G-only model has merits**
  - The most efficient proven technology is used as the benchmark for setting the regulated price ceiling
  - Reflects the likely technology that will be chosen by a hypothetical entrant
  - May be the logical successor to the “2G cap” principle
    - Total costs (spectrum + network costs) of established technology sets the ceiling for charges for the same services delivered using new technology.
- **Need to consider impact of not modelling 2G**
  - Recognise parallel running costs may be incurred as it will take time to migrate all 2G-only customers to 3G;
  - Off-setting this is that the final decile or so of coverage on a 3G network may be higher cost than achieving the same incremental coverage with 2G;
  - Further uncertainty of valuing spectrum (900MHz & 1800MHz) used for 2G services (see later discussion on spectrum valuation)

Agenda - outline for the workshop

Topic	Timing	Session lead
Arrival and coffee	09.15 – 09.30	-
Workshop aims, role within MCT review	09.30 – 09.50	David Stewart
Modelling assumptions: Demand and Traffic volumes	09.50 – 10.15	Steve Liput
Modelling assumptions: Network technology	10.15 – 10.40	Mani Manimohan
Break (if necessary)	10.40 - 11.00	
Modelling assumptions: Spectrum	11.00 – 11.20	Will Godfrey
Modelling assumptions: Cost standards and cost measurement	11.20 – 11.40	James Mackley
Discussion of the main issues	11.40 – 12.00	Andrea Coscelli
Close	12.00	David Stewart

Modelling assumptions: Spectrum

Forward looking opportunity cost principle

- We wish to value spectrum based on the forward looking opportunity cost of this asset.

- We are interested in spectrum value only in so far as identifying the amount of spectrum costs to be recovered from voice call termination.

Modelling assumptions: Spectrum

Liberalisation, spectrum supply and economic value

- Important developments by 2015:
  - **Liberalisation** Where spectrum currently used for 2G services (i.e. 900MHz and 1800MHz) is liberalised and tradable, current levels of 2G AIP will underestimate spectrum value:
    - 3G and ultimately LTE could use 900MHz & 1800MHz frequencies. If 3G and LTE allow the delivery of higher value services as well as existing services (e.g. voice and messaging) this increases the value of spectrum at 900MHz & 1800MHz.
    - Other things equal, liberalisation increases the value of spectrum
  - **Spectrum availability:** with more spectrum available (e.g. 800MHz and 2.6GHz) which can be used to deliver mobile services, the value of 900MHz, 1800MHz & 2.1GHz spectrum will be affected:
    - Other things equal, reduced scarcity of spectrum lowers its price
- If there was an effective secondary market for spectrum, we would expect prices for spectrum to adjust to equalise the total costs of operation at different frequencies.
  - For example, if higher frequency spectrum for a given technology results in higher network costs, the value of spectrum at that frequency will fall.

Modelling assumptions: Spectrum

Options for valuing spectrum (I)

- 900/1800MHz spectrum:
  - 2G AIP may not be an appropriate measure for spectrum value in a 2014/15 world;
  - Value likely to be determined by the cost savings of delivering voice & data using the least cost technology (3G, even LTE?) compared to next best alternative frequency (e.g. 2.1GHz?)
  - What, if any, relevant anchor points do we have?

Modelling assumptions: Spectrum

Options for valuing spectrum (II)

- 2.1GHz spectrum
  - Historic 3G values
    - roundly rejected by CC/CAT;
  - Book values:
    - similar drawback to above as mostly historic values
    - Impairment reviews add limited additional insight;
  - International benchmarking:
    - Time series and cross-sectional differences not easily accounted for;
    - Context of award (auction vs. beauty contest vs. trade) also not easily accounted for.

Modelling assumptions: Spectrum

Options for valuing spectrum (III)

- 2.1GHz spectrum (cont.)
  - Re-run 2G cap approach
    - Only gives value of network cost advantage of voice using 3G compared to 2G at existing frequencies;
    - If 3G is more cost efficient than 2G and 3G can be used at 900MHz the 2G cap approach breaks down as a means to value 2.1GHz spectrum;
  - Implied valuation from recent M&A activity
    - But how to extract licence value from total net asset value (including synergies)?
    - Most use in identifying upper bound?
  - Commission independent valuation by recognised expert:
    - Advantage of being forward looking
    - Complex and uncertain – e.g. Impacts of forthcoming liberalisation and further spectrum awards complex to model.
  - Specify a charge control re-opener based on spectrum developments anticipated for late 2010 (i.e. award of 800MHz and 2.6GHz spectrum)
    - Pre-specify the methodology by which the new information (e.g. licence payments and/or revised AIP) may feed through to the spectrum value input , hence efficient unit costs in 2015.
    - Does this introduce regulatory uncertainty and/or is it disproportionate to single out spectrum (e.g. what about other key parameters such as volumes?)

Agenda - outline for the workshop

Topic	Timing	Session lead
Arrival and coffee	09.15 – 09.30	-
Workshop aims, role within MCT review	09.30 – 09.50	David Stewart
Modelling assumptions: Demand and Traffic volumes	09.50 – 10.15	Steve Liput
Modelling assumptions: Network technology	10.15 – 10.40	Mani Manimohan
Break (if necessary)	10.40 - 11.00	
Modelling assumptions: Spectrum	11.00 – 11.20	Will Godfrey
Modelling assumptions: Cost standards and cost measurement	11.20 – 11.40	James Mackley
Discussion of the main issues	11.40 – 12.00	Andrea Coscelli
Close	12.00	David Stewart

Modelling assumptions: Cost standards

This section will cover four areas:

1) **Original Economic Depreciation**;

2) **Implementing pure LRIC** when using Original Economic Depreciation;

3) **Implementing RAN sharing** when using Original Economic Depreciation; and

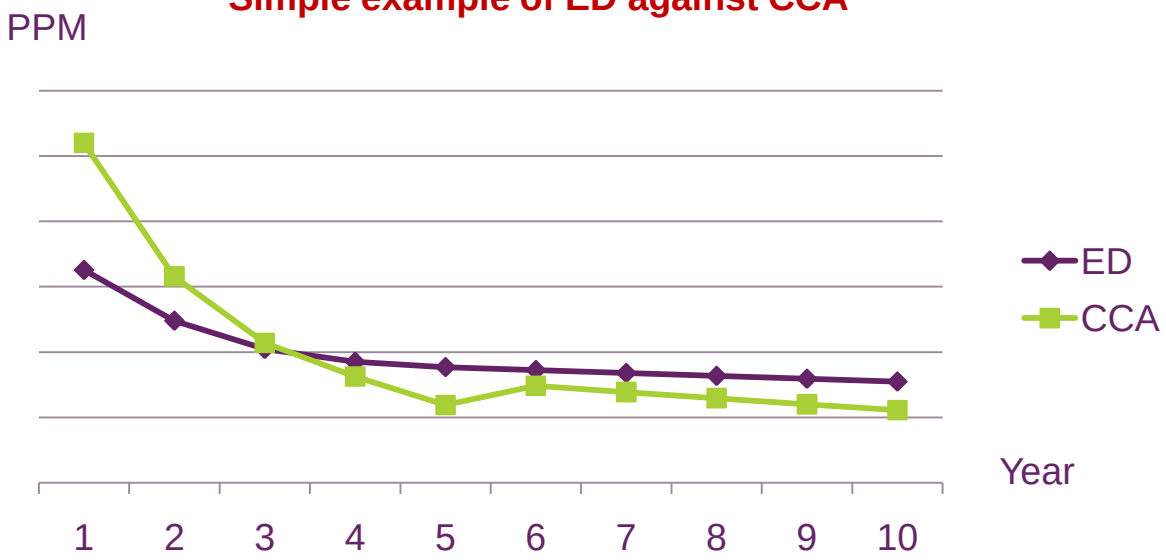
4) **Market share and pure LRIC.**

Economic depreciation

How does Original ED work?

- Original Economic Depreciation (the Ofcom approach) seeks to set efficient price signals by determining the path of prices in a benchmark competitive market.
- Unit costs do not depend of the level of utilisation at that point in time, but on the level of utilisation achieved over the lifetime of the network.
- The shape of the ED profile of unit cost recovery is dependent on input cost trends only.

Simple example of ED against CCA



Economic depreciation (II)

How do we implement pure LRIC when using Original ED?

The Increment

The European Commission recommendation defines the termination increment as:

> *"the difference between the total long-run costs of an operator providing its full range of services and the long-run costs of that operator not providing a wholesale call termination to third parties"*

- Our increment is all incoming voice termination, but what does this mean in practice for our modelling?

Removing the increment

Our current approach can be outlined in four steps

1. Run the LRIC+ model with all services included
2. Remove the incoming termination traffic and rerun the model
3. Calculate the present value of the difference in lifetime costs
4. Apply an asset price trend to the value to produce the correct Original ED profile

- Should the termination increment be a lifetime increment or a forward looking increment?

Economic depreciation (III)

Implementing RAN sharing

Using Original ED causes particular problems when modelling RAN sharing.

Preferred Approach

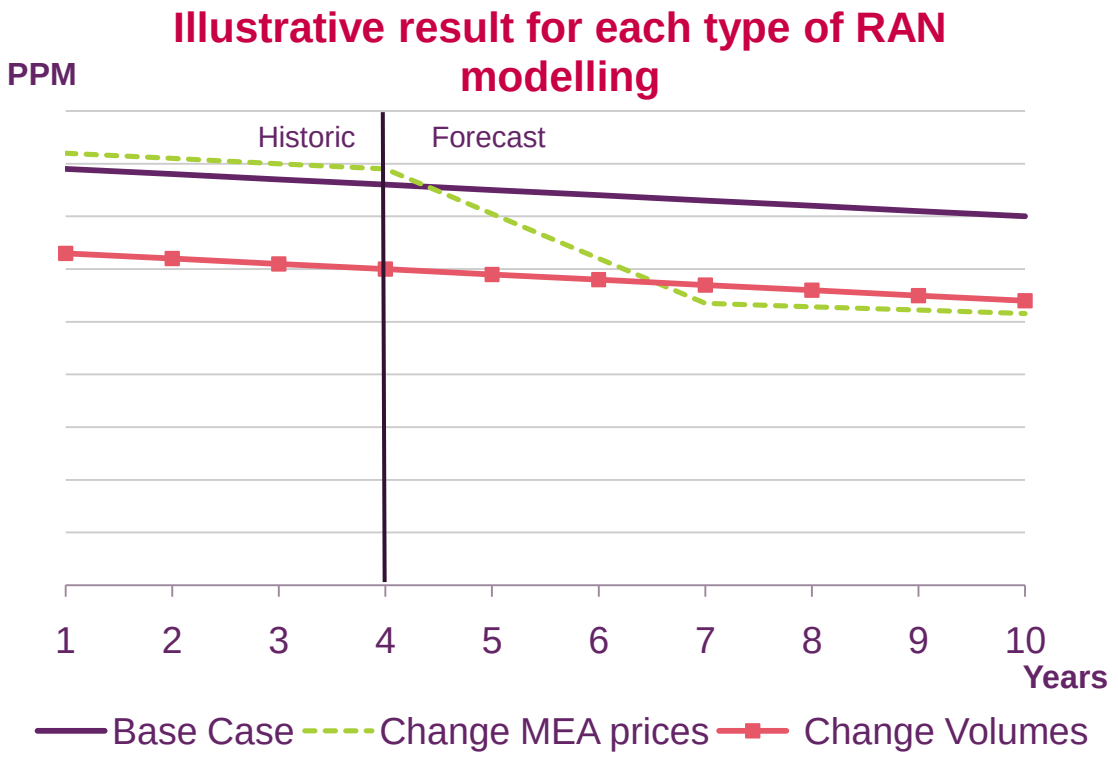
- Currently our preferred approach is to model RAN sharing by doubling the volumes on the network.
- Because OED uses lifetime volumes, doubling the volumes affects termination charges for the entire life of the network.
- By using this approach we have a smooth economic deprecation path (see chart)
- A consequence of this approach is that the model would suggest actual charges had historically been too high.

Alternative Approach

- An alternative approach is to model RAN sharing through adjusting the MEA prices.
- This approach leads to a less smooth depreciation path (see chart). Charges will also be dependent on how quickly the change in MEA prices occurs.
- A consequence of this approach is the model would suggest charges had historically been too low.

Economic depreciation (III) cont.

At which point should RAN sharing start to be implemented?



Market share and pure LRIC

- **The European Commission's Recommendation**
  - The European Commission recommends a 20% market share as the "minimum efficient scale". However, deviation from this figure is allowed where market conditions suggest a different minimum efficient scale would be appropriate.

- **Market share in a LRIC+ model**
  - We see an inverse relationship between market share and termination costs in our LRIC+ model.
  - Within the range we have considered, the efficient operator benefits from economies of scale.

- **Market share in a pure LRIC model**
  - Within a pure LRIC model the relationship between market share and termination cost is not as clear.
  - Lower market share may mean that there is additional spare capacity from any coverage obligation.

Agenda - outline for the workshop

Topic	Timing	Session lead
Arrival and coffee	09.15 – 09.30	-
Workshop aims, role within MCT review	09.30 – 09.50	David Stewart
Modelling assumptions: Demand and Traffic volumes	09.50 – 10.15	Steve Liput
Modelling assumptions: Network technology	10.15 – 10.40	Mani Manimohan
Break (if necessary)	10.40 - 11.00	
Modelling assumptions: Spectrum	11.00 – 11.20	Will Godfrey
Modelling assumptions: Cost standards and cost measurement	11.20 – 11.40	James Mackley
Discussion of the main issues	11.40 – 12.00	Andrea Coscelli
Close	12.00	David Stewart

Discussion

- Have we captured the key assumptions?
- Do you have concerns with what we intend to do?