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Attachment A: Updates to ESL pricing methodology

This attachment outlines 2 categories of updates to the ESL pricing methodology. The first category contains proposed changes to what we have previously proposed – e.g. we previously proposed a tilted annuity approach but are recommending moving to a flat annuity approach for duration adjustments. The second category contains refinements to the methodology where we were uncertain previously – e.g. landing on a specific WACC rate for duration adjustments.

Proposed changes to ESL pricing methodology

Order of step-by-step approach to direct benchmarking

We want to apply the direct benchmarking (DB) methodology so that groups of substitutable spectrum bands have equivalent values. To do so, we propose to reorder the step-by-step process for direct benchmarking that was outlined in Attachment A to the ESL pricing methodology package presented at the October 2024 Spectrum Committee meeting.

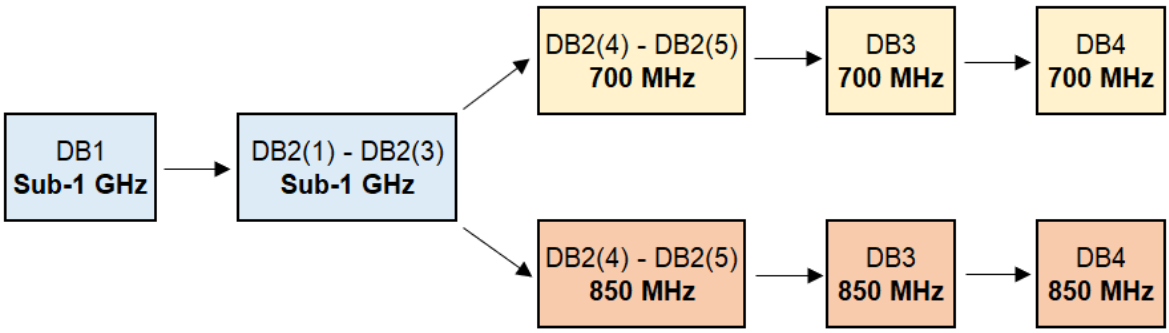
For example, sub-1 GHz spectrum is considered substitutable for wireless broadband purposes, so it may be intuitive for sub-1 GHz bands to have equivalent prices. The sub-1 GHz bands that are part of this ESL process include the 700 MHz band (expiring 31 Dec 2029) and the 850 MHz band (expiring 17 Jun 2028). Staff consider that both bands should have equivalent prices (controlling for renewal payment date and renewed licence duration).

If we were to perform the steps previously outlined in October 2024 for each of the 700 MHz and 850 MHz bands, the process would include the following:

- **Step DB1:** Compile all international benchmark prices (single process that applies to all sub-1 GHz benchmarks).
- **Step DB2:** Convert benchmarks to consistent time, duration and currency.
  - DB2(1): Convert valuation to a single-year cashflow (single process for all sub-1 GHz benchmarks)
  - DB2(2): Convert to Australian dollars (single process for all sub-1 GHz benchmarks)
  - DB2(3): Carry forward benchmark valuations to the present (single process for all sub-1 GHz benchmarks)
  - DB2(4): Carry forward to payment date (separate processes for 700 MHz and 850 MHz bands, although all sub-1 GHz benchmarks would be used in both processes)
  - DB2(5): Convert to desired licence duration cashflows (use all sub-1 GHz benchmarks, but separate processes for 700 MHz and 850 MHz bands)
- **Step DB3:** Weighting (separate processes for 700 MHz and 850 MHz bands)
- **Step DB4:** Determine band valuation (separate processes for 700 MHz and 850 MHz bands)

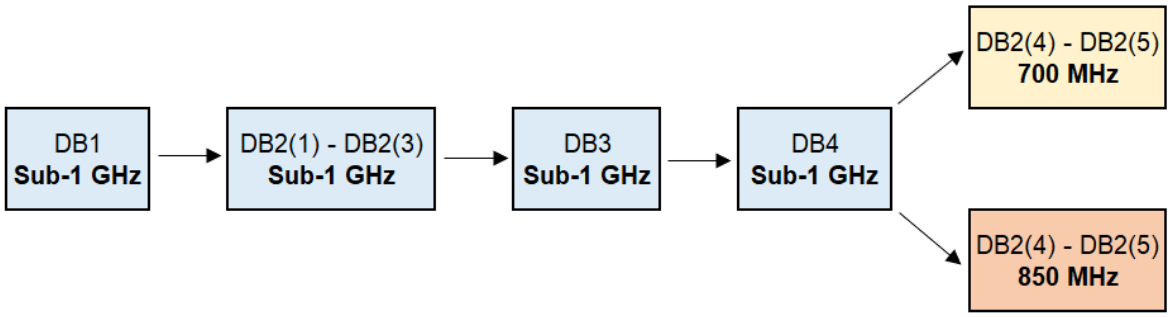
The above process begins to be split into separate processes for the 700 MHz and 850 MHz bands from Step DB2(4) onwards, as at that point that analysis is based on different potential payment dates. It operates as per the diagram below.

Figure 1: Direct benchmarking methodology – original process map



The issue is that Steps DB3 and DB4 do not have to be performed separately. Given we want both bands to have equivalent values (when controlling for timing and duration), it would be intuitive to perform these steps once each so that they apply to both bands in the same way. To do this, we can move these steps to the point before the process splits off into separate branches. It would look like the following diagram.

Figure 2: Direct benchmarking methodology – new process map



The proposed rearrangement of the order would create the following process:

- **Step DB1:** Compile all international benchmark prices (single process that applies to all sub-1 GHz benchmarks).
- **Step DB2 *(Part I)*:** Convert benchmarks to present time, single-year duration and Australian dollars.
  - DB2(1): Convert valuation to a single-year cashflow (single process that applies to all sub-1 GHz benchmarks)
  - DB2(2): Convert to Australian dollars (single process that applies to all sub-1 GHz benchmarks)
  - DB2(3): Carry forward benchmark valuations to the present (single process that applies to all sub-1 GHz benchmarks)
- **Step DB3:** Weighting (single process that applies to all sub-1 GHz benchmarks, for a single-year licence in the present)
- **Step DB4:** Determine valuation for group of bands (single process that applies to all sub-1 GHz benchmarks, for a single-year licence in the present)
- **Step DB2 *(Part II)*:** Convert valuation for group of spectrum bands to desired licence duration and specific payment date for individual spectrum bands

- DB2(4): Carry forward to payment date (separate processes for 700 MHz and 850 MHz bands)
- DB2(5): Convert to desired licence duration cashflows (separate processes for 700 MHz and 850 MHz bands)

The key benefit of rearranging the steps is that it will help avoid any inconsistencies in pricing between substitutable spectrum bands. It will also be more efficient for staff to perform, as Steps DB3 and DB4 will only have to be performed once for each group of bands rather than for every individual spectrum band. The downside is that the weighting exercise and determining a band valuation will apply to single-year valuation, so they may not appear intuitive at first glance when compared with a 20-year valuation (or a different multi-year duration), but this is a simple issue for staff to overcome and does not outweigh the benefits of rearranging the steps in the process.

Flat annuity approach

We previously proposed using a tilted annuity approach to convert benchmark valuations to different durations – e.g. converting a 15-year valuation into a 1-year valuation or converting a 1-year valuation out to a 20-year valuation. We are proposing to change to a flat annuity approach for duration adjustments.

The tilted annuity approach assumes nominal cashflows will increase year-on-year throughout the licence term by a constant rate, which is referred to as the 'tilt' or the 'cashflow growth rate'. In contrast, the flat annuity approach assumes nominal cashflows will be identical for each year of the licence term (i.e. the cashflow growth rate is 0%).

The key reasons for moving from tilted annuity to flat annuity include the following:

- We historically used the tilted annuity approach as there were reasonable expectations of cashflow growth throughout the licence term. For example, for a newly available spectrum band, cashflows should grow over time as more end-users obtain devices that can use the spectrum and capital investment costs moderate after a large initial outlay. This theory has not necessarily played out in reality for more recently allocated spectrum bands (as demonstrated by the MSR/MHz/pop index, where MSR is mobile service revenue) and is not applicable for ESL bands at the time that licences will expire (or are renewed). The flat annuity approach (with an implied cashflow growth rate of 0%) is therefore likely to be more suitable than a tilted annuity approach where we have to select a growth rate that is highly uncertain and could be subject to contention from stakeholders.
- It would align with recommendations in the Ian Martin Advisory report provided to the ACMA in June 2024. While we note that there was support for the tilted annuity approach from Plum Consulting and Frontier Economics, this was not in the context of a comparison to a flat annuity approach. Plum Consulting in particular suggested that we needed to be very cautious about our cashflow growth assumptions.

Staff also note that the change in approach would not cause significant changes to converted benchmark prices. The key difference is that the flat annuity approach causes shorter licences to be more valuable and longer licences to be less valuable. For example, assume a 15-year licence at $1.36/MHz/pop, with an annual WACC of 8.49% and a cashflow growth rate of 2.5% when using tilted annuity. The different approaches using these parameters are illustrated in Figure 3: and Figure 4: . Figure 3: includes the series of nominal cashflows, while Figure 4: includes the series of real cashflows (i.e. nominal cashflows discounted back to present value using the 8.49% WACC).

Figure 3: Nominal cashflow series – flat annuity vs tilted annuity

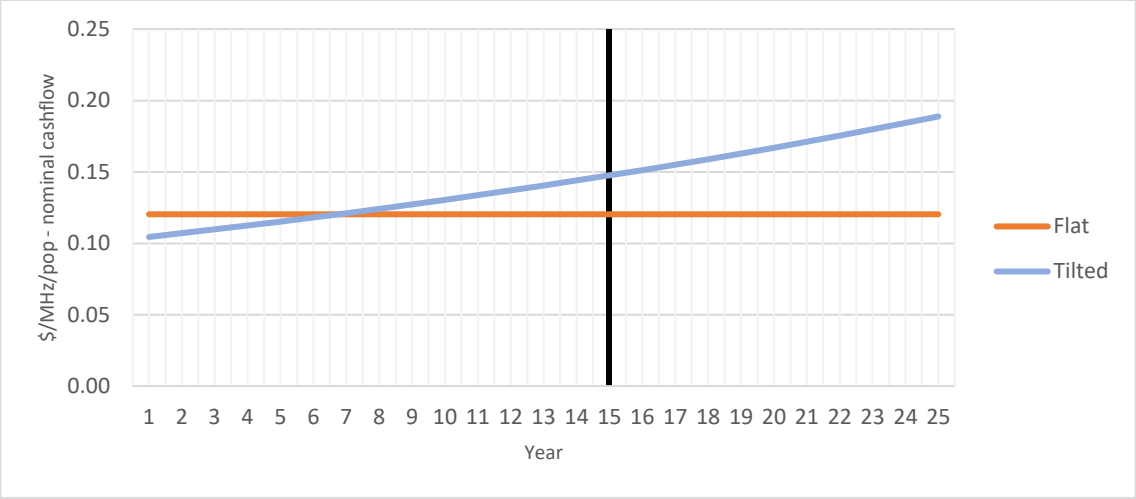
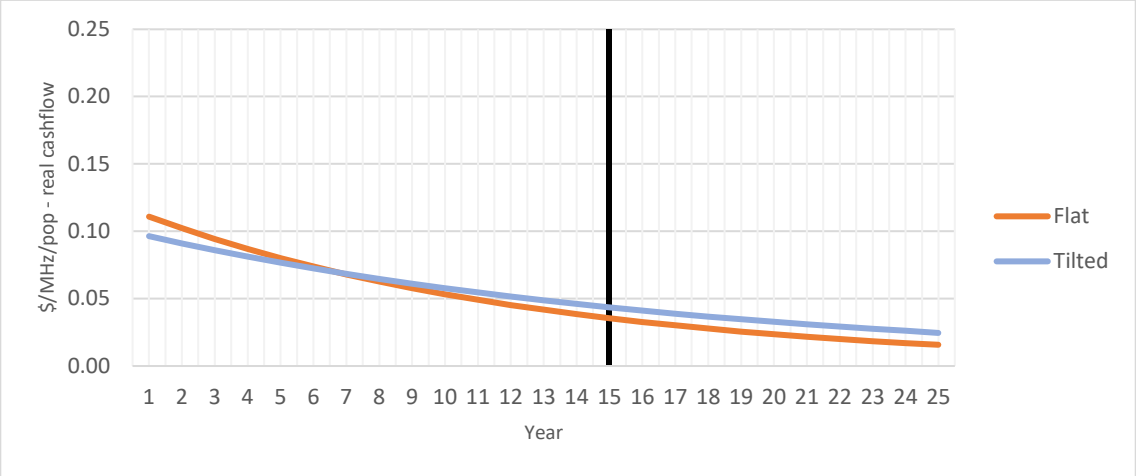


Figure 4: Real cashflow series – flat annuity vs tilted annuity



Both approaches result in a net present value of $1.36/MHz/pop for a 15-year licence (i.e. up to the black line cut-off). If the licence is extended further than 15 years, the orange flat annuity cashflows being added to the series are smaller than the blue tilted annuity cashflows, so for each additional year there is less of an increase in value. The differences are relatively minor though – e.g. when converting a 15-year licence valuation, a 20-year licence would be 3.7% lower using a flat annuity rather than a tilted annuity approach. The differences for several different durations being converted from an original 15-year valuation are outlined in the table below and help demonstrate why staff consider there is minimal risk in switching to a flat annuity approach.

Table 1: Licence value differences (net present value) – flat annuity vs tilted annuity

Years	Tilted annuity	Flat annuity	Difference
1	0.0963	0.1109	15.2%
5	0.4311	0.4744	10.0%
10	0.7557	0.7900	4.5%
15	**1.0000**	**1.0000**	**0.0%**
20	1.1839	1.1397	-3.7%
25	1.3224	1.2327	-6.8%

Proposed refinements to ESL pricing methodology

Weighted average cost of capital (WACC)

Staff had not landed on an appropriate WACC to use at the time of the October 2024 Spectrum Committee meeting. Upon further consideration of the issue, we propose to use Frontier Economics' long-term, post-tax nominal WACC recommendation of 8.49% for all instances of converting licence values for different durations.

The key reasons for preferring a long-term, post-tax nominal WACC include the following:

- The expert advice we have procured in 2024 indicates that we would ideally have an appropriate WACC for the country and year for each spectrum allocation we are using for a benchmark price, as that would reflect contextual investment expectations. However, various consultants noted that this would be heavily resource-intensive and is likely to be unachievable. A long-term WACC that can be used across a range of contexts is more appropriate for our purposes.
- The duration of spectrum licences (e.g. 20 years) means that investment expectations should not be heavily subject to short-term considerations. For example, a relatively low WACC in 2021 due to COVID-era ultra-low interest rates was unlikely to be reflective of the WACC across a 20-year licence term that started in that year. As such, we would be better placed using a consistent WACC that reflects long-term investment expectations and could be considered relevant for allocations that have occurred in a range of different years, rather than a WACC rate affected by special circumstances at a particular time.
- The use of a post-tax rather than pre-tax WACC is appropriate for international benchmarking as it controls for variable corporate tax rates in different countries, while a nominal rate has been used as we are considering nominal cashflows.

Staff note that Ian Martin Advisory recommended a nominal vanilla (i.e. post-tax) WACC for 2024 of between 8.1% and 8.8%. The long-term WACC recommended by Frontier Economics falls near the middle of this range, so there was a level of consistency in recommendations across different consultants.

It should be noted that duration adjustments for licences with proposed renewal periods that are not multiples of whole years will require daily rather than yearly duration adjustments. The methodology can easily be applied on a daily basis. We can use a daily WACC of 0.02233% (equivalent to an annual WACC of 8.49%), and use days rather than years to reflect different periods (e.g. rather than converting a 1-year valuation to a 20-year valuation, we will convert a 365-day valuation to a 7,305-day valuation).

MSR/MHz/pop index

We previously proposed to use the MSR/MHz/pop index provided by Ian Martin Advisory to carry forward benchmark valuations from various licence start dates to the present (Step DB2(3) in our direct benchmarking methodology) and through to future licence expiry dates (Step DB2(4)). We still intend to use this method and have settled on some assumptions for how the method can be applied:

- **We propose to use a 3-year moving average of the index rather than the simple index values for each year.** This helps smooth out volatility, particularly resulting from increases in spectrum supply. For example, rather than the 125 MHz from the 3.6 GHz band auction being added in a single year and causing a rapid jump in overall spectrum supply (and a consequent decline in MSR/MHz/pop), the moving average approach means that it progressively gets added over 3 years (i.e. 41.33 MHz per year). This is

likely to be more appropriate with respect to how spectrum supply influences MSR – i.e. new spectrum supply will not drive an immediate increase in MSR as it will take time to deploy networks using the new spectrum and potentially for users to have devices compatible with it. Staff note that we tested moving averages for different numbers of years, and 3 years appeared to provide the best balance of smoothing volatility but also ensuring that it does not take new spectrum supply too long to fully affect the index.

- **We intend to keep the MSR/MHz/pop index constant from 2026 to 2032.** The MSR/MHz/pop index provided by Ian Martin Advisory is forecast out to 2026. We intend to keep the index constant thereafter, between 2026 and 2032. The reasons for this include the following:
  - We propose to keep spectrum supply (i.e. MHz) constant in this index, as the availability of new spectrum should not be assumed to reduce the value of ESL spectrum, which a fall in the MSR/MHz/pop index would imply (i.e. assuming MHz increases and MSR and population remain unchanged). In addition, the availability of new spectrum is uncertain and is dependent on future ACMA decision-making – we do not want to be hinting at any future spectrum planning outcomes.
  - There has been no consistent long-term trend of MSR outpacing population or vice versa, so we can assume that both parameters will grow at a similar pace.
  - We note that for substitutable spectrum, this would result in equivalent $/MHz/pop prices for licences expiring any time between 2028 and 2032 (assuming identical licence durations). While this may appear concerning, we note that later licence renewals will have $/MHz/pop prices multiplied by larger population figures (assuming continued population growth). This would effectively mean that the prices for renewed licences are increasing year-on-year in the same way as our apparatus licence taxes, which have population-based annual adjustments.

The only remaining uncertainty is whether to weight different spectrum bands in the MSR/MHz/pop index. For example, sub-1 GHz spectrum can be given greater weight than 3.4–3.8 GHz spectrum as it likely adds more to MSR on a ‘per MHz’ basis. While weighted values appear intuitive, they may result in circular outcomes – i.e. the weights may theoretically be based on relative $/MHz/pop values, but the index is what will help us generate those relative $/MHz/pop values. We are testing the index using both weighted and unweighted values for the MSR/MHz/pop index.

Weighting approach (cohort analysis or numeric weighting)

Staff propose to continue using both the cohort analysis and numeric weighting approaches at this stage, as they effectively provide a checking mechanism for one another. We will provide further updates on this matter prior to the Stage 3 consultation paper, as we will likely adopt the approach that provides more appropriate prices (or price ranges) and can be best explained in a transparent manner publicly.