BASIN OFFICIALS COMMITTEE

Agenda Item 4 of Meeting 47 – 11 May 2017

FOR DECISION

Title: Update on the Improved Regulation of the River Murray project

PURPOSE

1. To provide an update to the Basin Officials Committee (BOC) on the progress of the improved regulation of the River Murray project.

RECOMMENDATIONS

2. It is recommended that the Committee:

   (a) **agrees** to the proposed technical solution to correction of the operational loss equation in the sustainable diversion limit (SDL) modelling framework as proposed by technical review panel at **Attachment A**.

   (b) **agrees** that the MDBA either:

      (i) [apply the revised Oploss Equation as a supply measure] OR

      (ii) [apply the revised Oploss Equation as a non-mandated benchmark change]

BACKGROUND

3. Victoria and New South Wales have proposed the improved regulation of the River Murray project (IRRM) as a supply measure. The proposal is based on changing the operational loss equation in the modelling framework to reflect new operating behaviours on the River Murray.

4. Operational loss is the difference between the actual releases made and releases required if perfect knowledge of future system conditions was available. It is included in monthly model of the River Murray (MSM) to calibrate the model to data observed through the historic climate record.

5. Analysis by the Victoria and the Murray–Darling Basin Authority (MDBA) has determined that there is a need to recalibrate the operational loss equation. The equation, that is currently in the benchmark model, results in an unrealistic volume of water being transferred to Lake Victoria in the model. This modelling treatment *inter alia* limits the benefits of the proposed changes to the Menindee Lakes.

6. The proposal prepared by Victoria and New South Wales has been independently reviewed by Drew Bewsher. The review concluded that the project met the definition of a supply project and importantly noted that the “the Oploss relationship for Benchmark conditions will need to be further improved”.

7. The draft findings of the Bewsher review were presented to the Sustainable Diversion Limit Adjustment Assessment Committee. However, divergent views about the project remain across jurisdictions.

ISSUES

8. While there has been agreement amongst the jurisdictions that the operational loss equation needs to be recalibrated, there has not been agreement as to whether the proposal should be included as a supply measure.

9. The process agreed to resolve the outstanding issues associated with the project is:

   (a) through independent facilitation to consider the technical aspects of a revised operational loss equation (see technical changes below)

   (b) to seek guidance from the BOC on the policy issues associated with whether the changes are included as a supply measure or a non-mandated benchmark change (see policy considerations below).

Technical resolution of the operational loss equation

10. The proposal has been subject to ongoing technical review, principally associated the appropriate technical and mathematical treatment of the operational loss equation.

11. Jurisdictions have commissioned a technical panel, independently chaired by Brett Tucker with support from Andy Close, to consider and agree alternative operational loss calibration equations for the model.

12. The outcomes of the technical review have been documented including an executive summary by the independent Chair, at **Attachment A**. A verbal update will be provided at the meeting.

13. Once agreed the equation can be applied to the model as either a benchmark correction or as a supply measure change for the purpose of determining an SDL offset.

Policy considerations

Benchmark change

14. If the revised operational loss equation is applied to both the benchmark and the package of notified projects, there will be no SDL adjustment directly attributable to the change. However, the revised operational loss equation will allow changes in other projects, including Menindee, to be better represented in the overall system outcome for the model.

15. Arguments that support the project to be included as a benchmark change to the model include:

   (a) The model is essentially a framework for accounting for changes in river operations – in the absence of ongoing real world change, changing the model to derive an outcome is not consistent with the intent of the SDL adjustment methodology.

   (b) The experience of river operations over the millennium drought (2000–2010) have been identified as the most likely cause of the requirement to change the model calibration. However, recent wetter years are not exhibiting the same behaviour. It is unclear if the changes observed over the drought are of a permanent nature.

   (c) Most of the change in operator behaviour/technological advances that are assumed to have caused the requirement to review the existing model calibration (eg weather forecasts, improved operating systems), occurred before 2009 – which is the date from which changes should be accounted for under the SDL adjustment mechanism.

(d) Changes post 2009 could be included but these are likely to be less significant.

(e) The 2750 GL recovery set in the Basin Plan was an “on-balance decision” and not solely driven by a particular modelling outcome. As a result an error in the modelling framework should be considered a benchmark change.

(f) If considered as a benchmark change, essentially a model correction, there is no subsequent need to define how the change delivers and enduring outcome.

16. Arguments against this include:

(a) The Drew Bewsher review of the Business Case identified that the change is a valid supply measure by the definition of the Basin Plan.

(b) This approach will require BOC to remove the project from the package of notified measures.

Supply Measure

17. If the changes to the operational loss equation are only applied to the package of nominated projects and the benchmark remains unaltered then the MDBA estimates that the change will generate a SDL adjustment between 30–70 GL.

18. Arguments that support this option include:

(a) The river is now operated more efficiently as a result of learnings through the millennium drought.

(b) Significant technological changes have occurred that have underpinned these changes (for example, better forecasts, better irrigation infrastructure and ordering).

(c) The Authority determined 2750 GL based on the model outcomes. Changing the operational loss equation may have resulted in the Authority selecting a lesser volume.

(d) The change has been determined as a valid supply measure by the Bewsher review.

19. Arguments against this option include:

(a) The project basically corrects the operational loss equation for Hume dam – this is essentially a model calibration that gets out of sync as more data, from recent years, is included in the model.

(b) It is very difficult to define an enduring change that could underpin a SDL adjustment.

Enduring change for IRRM

20. A key concern expressed with having IRRM as a supply measure is how any change can be made enduring. The options for an enduring change are to:

(a) create an entitlement

(b) define a process that gives the jurisdictions confidence that the changes made in improvements in river operations will be enduring.

Entitlement

21. The option of creating an entitlement that reflects the SDL adjustment is possible. The characteristics and ownership of the entitlement would have to be resolved, along with responsibility for all associated ongoing costs (e.g. headworks charges).

22. Victoria as the lead of the joint proponents have indicated that it is not prepared to create an entitlement as the changes can be better addressed by an ongoing process that not only locks in the changes to date but builds on the changes with further improvements.

Ongoing improvement process

23. The alternative to creating an entitlement is to have the jurisdictions agree that the changes in river operations that have resulted in the need to recalibrate the operational loss equation are enduring. These changes include:

    (a) improved weather forecast accuracy and lead time

    (b) improved river operations tools

    (c) improved accuracy and stability of irrigation orders (underpinned by total channel control).

24. Changes in the regulatory environment that oversights operation of the River Murray include:

    (a) the Objectives and Outcomes for River Operations in the River Murray System which is approved by the BOC each year (that is, jurisdictions have direct line of sight)

    (b) the River Murray system annual operating plan which is approved by the BOC each year (that is, jurisdictions have direct line of sight)

    (c) the Independent River Operations Review Group (IRORG) that conducts an annual independent review of river operations and reports to the BOC

    (d) The River Murray Operations Committee (RMOC) that has been specifically instituted to provide the jurisdictions with oversight capacity of the River Murray operations and joint venture assets.

25. These four arrangements provide multiple avenues of review and oversight for the River Murray to ensure that changes in river operation remain consistent with the expectations of the jurisdictions. As such they provide a potential mechanism to ensure that the improvements in operation of the river are maintained, but remain able to be adapted to take advantage of new opportunities for better outcomes.

QUORUM

26. The contracting governments required to consider this item include the Australian Government, New South Wales, Victoria and South Australia.

Murray–Darling Basin Agreement or directive: *N/A*
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Attachments **A:** IRRM Oploss - Independent Chair Technical Summary 5 pp.

Australian Government

MURRAY–DARLING BASIN AUTHORITY

Technical Review of Operational Loss in MSM

Report Summary

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Problem Statement

Operational loss (OPLOSS) is the term used to describe the volume of water released from storage which is in excess of the release required to meet the downstream demands.

The MDBA's Monthly Simulation Model (MSM) includes a regression equation which predicts the OPLOSS in the River Murray System. In recent modelling for the Basin Plan SDL Adjustment Mechanism, there was evidence to suggest that the existing regression function may no longer be fit for purpose, primarily based on a comparison between modelled storage behaviour for Lake Victoria compared to real operating conditions (Lake Victoria being a significant asset for the capture of surplus water from the upstream system).

The proposition is that the regression relationship in the model has broken down due to factors which might include evolutionary improvements to operator skill; step changes triggered by the millennium drought, and shifts in traditional demand patterns as entitlement moves from irrigation to the environment.

Review task

In recent months since concerns emerged, various modelling revisions using different assumptions and parameters have shown a large (300GL) range of predicted OPLOSS volumes, contributing to a low level of confidence in comparative model outputs. In response, the MDBA established a review committee involving the State jurisdictions, tasked with identifying and resolving the key issues impacting on the fitness of the regression model to predict future operating losses.

Three key factors were identified as having the greatest influence on the predictive capability of the model :-

1. The calibration period used.
2. Whether or not to include environmental water in gross diversions in the application of the model.
3. Whether or not to include two independent variables in the construct of the regression function – water availability and water ordering.

Regarding the calibration period, the Committee agreed that the most representative period for data calibration is the 2000-2016 sequence of years, incorporating the full range of seasonal conditions and better reflecting the change in operations driven by the Millennium drought.

Regarding environmental diversions, the review committee agreed that to omit environmental diversions in the application of the model would be inappropriate, in light of the significant and increasing volume of entitlement now controlled for environmental purposes.

In respect of the two independent variables, various combinations were discussed and analysed via an iterative process, with model performance compared across a number of metrics, including:

- Whether or not the model demonstrated an improvement in regression correlation (fitness)
- The level of improvement in the modelled prediction of Lake Victoria seasonal storage volumes.
- Whether or not the model predicted the likely change in OPLOSS from baseline to benchmark conditions throughout the year, across wet, median and dry year sequences.

Review results

An improvement in model "fitness", as demonstrated via r-squared values, was evident with the inclusion of both water availability and water ordering functions, both combined and individually. However, the review committee remained concerned that the improvement was very small in

comparison to the large impact each parameter was having on the average OPLOSS volume. Other performance measures were therefore scrutinised in more detail to establish the preferred approach, including seeking qualitative advice from the system operators.

The prediction of Lake Victoria behaviour was most improved by excluding “water ordering” from the regression function. A hybrid approach excluding both “ordering” and “availability” at different times of the year showed similar improvements. Neither approach was considered as fully capturing the real operating conditions and the Committee noted that future modelling effort should address this issue.

The modelling of seasonal distribution of operating losses under different catchment conditions was also most improved by excluding “water ordering” from the regression function. The “hybrid” regression function demonstrated the same level of improvement.

Summary of findings

1. Two regression functions produced similar modelling improvements across three performance metrics.
2. Neither of these functions was able to fully capture the new operating paradigm although the Committee was of the view that there was sufficient improvement to move forward with an agreed position.
3. With the exclusion of “water ordering” being a less complex regression function than the “hybrid’ model, the Committee was of the view that this should be the agreed regression function.
4. On this basis, the Committee recommended that the Monthly Simulation Model be amended to include the coefficients and monthly constants detailed in Annexure A.

Annexure A

Agreed coefficients and monthly constants for MSM OPLOSS Regression Function

Item	Coefficient / Constant
Order	0.0000
Diversions*Rainfall	0.00280
Kiewa+Ovens flow	-0.1119
NSW+Vic Allocation	0.00803
Jan	36.48
Feb	41.40
Mar	20.48
Apr	-10.72
May	-13.19
Jun	-17.04
Jul	25.88
Aug	62.33
Sep	43.07
Oct	106.89
Nov	89.00
Dec	52.40