
General Insurance Practice Committee

Technical Paper: Insurance Concentration Risk Charge – Other Accumulations Vertical Requirement

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A. Purpose and status of Technical Paper

1. The original Technical Paper was prepared by the ICRC OA Working Group ("Working Group") of the General Insurance Practice Committee ("GIPC") of the Actuaries Institute ("Institute"). The members of the Working Group were:

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This version has been updated to include an example for Cyber Risk due to its rising prominence based on considerations provided by Susie Amos and Danielle Casamento.

2. APRA's capital standards include a requirement for general insurers to assess their other accumulations vertical requirement ("OA VR") as a component of their insurance concentration risk charge ("ICRC") calculation. A separate paper has been authored by an Institute Working Group dealing with the 'natural perils' vertical component of the ICRC.
3. This Technical Paper includes guidance on APRA's requirements with regards to the OA VR and presents a scenario-based methodology for determining the OA VR amount. The methodology proposed represents the collective view of the Working Group which comprised actuaries with significant experience in capital management and catastrophe risk modelling. The OA VR is, however, a comparatively new area of actuarial involvement and further review and development of the ideas presented in this Technical Paper is encouraged. Feedback from Institute Members should be forwarded to the GIPC.
4. This Technical Paper does not represent a Professional Standard or Practice Guideline of the Institute. The information contained in this Technical Paper is commentary and general information only.

This Technical Paper does not constitute legal advice. Any interpretation or commentary within the Technical Paper regarding specific legislative or regulatory requirements reflects the expectations of the Institute but does not guarantee compliance under applicable legislation or regulations. Accordingly, Members should seek clarification from the relevant regulator and/or seek legal advice in the event they are unsure or require specific guidance regarding their legal or regulatory obligations.

Members should also refer specifically to the following Professional Practice Document:

- [PS 302 - Valuations of General Insurance Claims March 2021](#)

This TP does not override the requirements in this Professional Practice Document or in any other Professional Standards or Practice Guidelines that are relevant to this area of work.

5. This replaces the August 2013 version of this Technical Paper.

B. Introduction and scope

6. In October 2012, APRA released a suite of final prudential standards for life and general insurance companies. These final standards were the culmination of a period of research, review and consultation by APRA in a project that was known as the 'LAGIC (Life and General Insurance Capital) Review'.
7. Prudential Standard GPS 116 Capital Adequacy: Insurance Concentration Risk Charge ("GPS 116") deals with the requirement for general insurers and Level 2 insurance groups to maintain adequate capital against the risks associated with insurance concentration in their activities.
8. As explained in the preamble to GPS 116, the ICRC is the minimum amount of capital required to be held against insurance concentration risks. The ICRC for a regulated institution is intended to represent the net financial impact on the regulated institution from either a single large event, or a series of smaller events, within a one year period. The determination of the ICRC is based on the formulae and requirements set out in paragraph 8 of GPS 116 (January 2013). This charge is one of the components of the Standard Method for calculating the Prescribed Capital Amount ("PCA") for general insurers and Level 2 insurance groups (the ICRC is not relevant under the alternative 'Internal Model-based Method').
9. GPS 116 is of interest to actuaries for a number of reasons:
 - (a) Many actuaries are heavily involved in the calculation of the ICRC;
 - (b) the Prudential Standard CPS 320 (Actuarial and Related Matters) ("CPS 320") provides the Appointed Actuary with specific responsibilities with respect to the ICRC:
 - (i) where the insurer is required to determine either:
 - the natural perils horizontal requirement ("NP HR");
 - the OA VR; or
 - the Lenders Mortgage Insurance ("LMI") Concentration Risk Charge ("LMICRC")

for the purposes of GPS 116, the Appointed Actuary may, or in the case of NPHR, must determine the portion of net premiums liabilities relating to losses as described in the requirements of GPS 116, in order to determine any premium liability offsets that may be required (NP HR) or permitted (OA VR and LMICRC);

(ii) the Appointed Actuary must:

- provide the information above in a timely manner that allows the insurer to lodge reporting forms to APRA within the timeframes specified by reporting standards made under the Financial Sector (Collection of Data) Act 2001 (Cth); and
- comment in the Actuarial Valuation Report ("AVR") on the method and approach taken to calculate these amounts; and

(iii) the Appointed Actuary must provide an assessment of the adequacy of the calculation of the insurer's ICRC in the Financial Condition Report ("FCR") (Level 1) or AVR (Level 2). This assessment must include an assessment of the potential impact of multiple events in a year for an insurer with exposures to other accumulations as defined in GPS 116; and

(c) actuaries involved in capital management processes (including the Internal Capital Adequacy Assessment Process ("ICAAP")) will require a thorough understanding of the calculation of the PCA.

10. The determination of the ICRC is not exclusively reserved for the Appointed Actuary or actuaries in general, although there are clearly some statutory requirements of Appointed Actuaries as noted above. The ICRC calculation could be performed by a range of industry practitioners and the guidance and ideas presented in this Technical Paper are just as relevant to any industry practitioner involved with the determination of the ICRC.

11. GPS 116 sets out that the ICRC is the greatest of the following amounts:

- (a) the natural perils vertical requirement determined in accordance with paragraphs 18 to 26;
- (b) the NP HR determined in accordance with paragraphs 27 to 43;
- (c) the OA VR determined in accordance with paragraphs 44 to 52; and
- (d) where applicable, the LMICRC determined in accordance with paragraph 53.

12. The Prudential Practice Guide GPG 116 – Insurance Concentration Risk (GPG 116) was released in March 2013. It provides additional guidance to general insurers and Level 2 insurance groups in complying with the requirements of GPS 116, including some clarification around some areas of uncertainty.
13. Guidance is required in order to assist insurers, actuaries and other industry practitioners to meet the requirements. The methodology presented in this Technical Paper represents the collective view of the Working Group which comprised actuaries with significant experience in capital management and catastrophe risk modelling and has been an accepted approach since August 2013. The OA VR is, however, an area of actuarial involvement that requires ongoing review and development of the ideas presented here is encouraged.
14. This Technical Paper focuses on using a scenario-based approach for determining the OA VR. Separate papers are available dealing with the 'natural perils' vertical component of the ICRC. It is important to note that insurance companies will need to consider losses from both natural perils and other accumulations in order to determine their ICRC.
15. It should also be noted that the insurance concentration requirements for lenders mortgage insurers are far more prescriptive, with separate prudential standards being applicable and, as such, are beyond the scope of this Technical Paper.

C. High-level legislative review

C.1 What is OA VR? Legislative definitions

16. GPS 116 requires insurers to calculate and report their OA VR at each reporting date. Definitions of OA VR are taken from the APRA papers as stated below.
17. GPG 116 gives a holistic definition: the OA VR is the net loss to the insurer from the occurrence of claims from a common dependent source or non-natural perils. GPS 116 states that the OA VR for an insurer that has exposures to other accumulations is calculated as:
 - (a) **'OA PML'** less
 - (b) **'OA reinsurance recoverables'** plus
 - (c) **'OA reinstatement cost'**

where:

- (a) **OA PML**

1. The **OA PML** is the gross loss arising from the occurrence of a single event, where that loss has 0.5 per cent probability of occurrence over 12 months. An insurer must consider all classes of business and all business underwritten in those classes in determining the largest loss. OA PML must not include any allowance for potential reinsurance recoverables.
2. An insurer that has exposures to other accumulations may reduce OA PML for any losses within the other accumulations scenario that are already specifically allowed for in the premiums liability of the insurer. This amount must be determined by the Appointed Actuary and included in the AVR. APRA may require the insurer to modify the adjustment to OA PML.

(b) **OA reinsurance recoverables**

An insurer that has exposures to other accumulations must determine the level of potential reinsurance recoverables should there be the occurrence of OA PML ("OA reinsurance recoverables"). OA reinsurance recoverables may include any amounts due from aggregate reinsurance cover if the cover has reached its attachment point, or will as a result of the occurrence of OA PML. The reinsurance recoverables must then be applied until the cover has been exhausted by claims by the insurer or the date that the aggregate reinsurance treaty expires, whichever occurs first.

(c) **OA reinstatement cost**

An insurer that has exposures to other accumulations must determine the cost (if any) of reinstating all [catastrophe] reinsurance cover relating to the reinsurance recoverables determined above ("OA reinstatement cost"). In determining this cost, if the insurer does not have contractually agreed rates for the reinsurance cover, the insurer must estimate the cost based on current reinsurance market conditions. The amount must not be less than the full original cost of the cover, with no deduction for the expiry of time since the inception of the reinsurance arrangements, unless the insurer is able to demonstrate to APRA that the amount materially overstates the cost that would prevail.

18. GPG 116 gives more colour around the potential scenarios that may be considered when setting the OA PML, listing several within GPG 116. These scenarios are a guide only and do not constitute a checklist of scenarios to consider. Insurers should consider scenarios relevant to their specific risk profile.

- (d) When developing possible maximum event scenarios for its portfolio, an insurer is expected to consider historical experience as well as hypothetical scenarios. For example, factors such as the impact of an economic downturn; potential non-natural peril events such as terrorist attacks and pandemics; the impact of class actions or similar legal actions on liability classes; the effect of external

developments like medical advancements on relevant classes; and consequences of a major occurrence such as the closure of an air or seaport, are expected to be considered, as appropriate, for the classes of business written, to arrive at plausible scenarios that are relevant to the insurer.¹

19. GPG 116 also discusses how to deal with potential overlaps with other risk charges:

- (e) Plausible scenarios may include scenarios that an insurer considers have been sufficiently captured in other risk charges. For example, an economic downturn may be substantially covered by the insurer's asset and/or insurance risk charges. Where an insurer decides to adjust or omit a scenario on this basis, APRA expects the insurer to demonstrate the rationale for the decision, including discussion of the capital held within its PCA for the relevant scenario.²

C.2 High-level interpretation of GPS 116

- 20. At a high level, the aims of GPS 116 are fairly clear: to calculate the 1 in 200 year loss from a concentration of risk other than natural peril concentrations. This is clearly intended as a catch-all, acknowledging that there are risk concentrations that are not natural peril-related and which previously have not been specifically considered by other parts of the capital prudential standards. The specifics of GPS 116 are less clear, and what follows is a high-level interpretation of certain fundamental aspects of GPS 116.
- 21. Within the definition of Probable Maximum Loss ("PML"), this Technical Paper defines 'gross loss' as the gross claims costs arising from insurance risks only. This is consistent with how other components of the ICRC are defined. Not included are losses arising from the asset side of the balance sheet – the asset concentration risk charge aims to capture these risk concentrations.
- 22. The insurer should calculate the OA PML on a gross basis and then allow for a number of adjustment factors, including:
 - (a) any losses within the other accumulations scenario that are already specifically allowed for in the premiums liability of an insurer [(a2) above];
 - (b) scenario adjustment or omission based on an overlap of risk, as allowed under GPG 116 [(d) above];
 - (c) any available reinsurance recoverable [(b) above]; and

¹ GPG 116, paragraph 58, March 2013.

² GPG 116, paragraph 58, footnote 2, March 2013.

- (d) the cost (if any) of reinstating all [catastrophe] reinsurance cover relating to the reinsurance recoverables determined for the OA PML [(c) above].
23. The OA PML is to be calculated on a whole-of-portfolio basis and represent the 99.5th percentile of the estimated loss distribution for OA. This is equivalent to a 1 in 200 year non-exceedance probability (that is, there is a 0.5% probability of an event occurring of exactly that size or larger). Whilst either a scenario-based approach or the use of an estimated distribution of losses is acceptable, given the inherent difficulties in deriving and selecting the appropriate distribution, this Technical Paper concentrates on the scenario-based approach and notes that scenarios can be deterministic or stochastic.
 24. The timeframe to be considered for the occurrence of an OA PML event is 12 months. This is stated clearly by APRA in its definitions of 'whole-of-portfolio' (GPS 116, paragraph 6c), the ICRC (GPS 116, paragraph 8) and the OA PML (GPS 116, paragraph 47). The universe of possible OA PML scenarios that need to be considered, therefore, is limited only to those which could conceivably 'occur' during the next 12 months. This limits the potential size of OA events that need to be considered. For example, a prolonged economic depression needs only to be considered from the perspective of the 12 month impact it may have. This restriction needs to be applied in the process of constructing possible OA PML scenarios and in establishing the size of a 1 in 200 year OA event. It is clear that, similarly to the natural perils concentration charge, business not yet written but which will be earned in the following 12 months should be taken into account in assessing the potential cost of an event over a 12 month period.
 25. There are a significant number of risks that might be considered within an OA PML analysis that would simultaneously impact the outstanding claims and premium liabilities. Indeed, extreme risks to the outstanding claims reserves are likely to be systemic in nature – be it a bout of superimposed inflation, the impact of major legal changes or other issues affecting multiple lines of business. Such risks could be expected to simultaneously influence outstanding losses as well as losses arising from new exposures, and might be considered to fall into the OA PML definition.
 26. GPS 116 focuses on the 'occurrence' of an OA PML event during the next 12 months and makes allowance (via the Premium Liability Offset ("PL Offset")) for some potential sources of double-counting with the premium liability provision. No explicit mention is made of the outstanding claims liabilities, nor is there any allowance for an Outstanding Claims Liability Offset ("OCL Offset"). This Technical Paper's interpretation of this is that the OA PML scenario should only consider future claims costs incurred relating to future policy exposures, removing from consideration in the scenario any impact on existing outstanding claims reserves. This treatment is consistent with the approach required for natural perils events and other aspects of the ICRC calculation process.
 27. This Technical Paper's interpretation of this aspect of GPS 116 is that the risk margin held within outstanding claims provisions, together with the other capital charges imposed on the reserves, is intended to ensure that sufficient capital exists for systemic reserving risks.

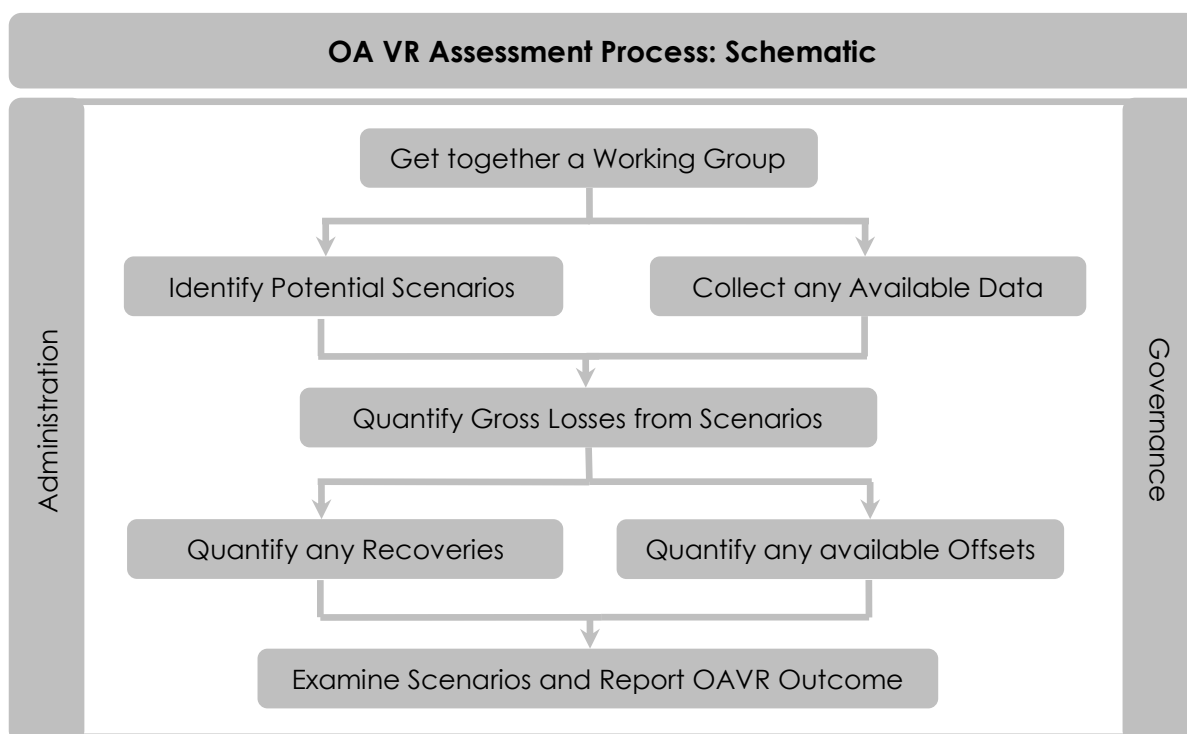
To consider these risks again within the OA VR would result in the double-counting of a significant amount of insurance risk – something which is undesirable and which the guidance in GPG 116 appears to be designed to avoid. More generally, the various other components of the ICRC uniformly relate to risks to the unearned or future new business – focusing on the impact of events that have not yet occurred. The interpretation given here ensures the OA VR is consistent with these other components.

28. APRA's use of the word 'occur' in the context of an OA PML event is a potential source of confusion. For those insured classes which operate on a 'claims made' basis (for example, medical indemnity), the OA PML should be based on events that are 'reported' rather than those which 'occur' – a distinction which is very important for these types of policies. Furthermore, the 12 month timeframe used to define the probability of 'occurrence' of an OA PML event in these classes needs to be interpreted as the timeframe within which claims could be 'reported'.
29. In the case of both claims occurring and claims made policies, the size of the OA PML event should include allowance for:
 - (a) any payments on claims associated with the event that are expected to be made during the course of the 12 month timeframe; and
 - (b) the estimated outstanding claims payments (in respect of reported and Incurred But Not Reported ("IBNR") claims, if any) that would be expected to be included in balance sheet provisions at the end of the 12 month timeframe. This, in effect, considers the financial cost of the event to be the amount that would be 'recognised' by the actuary within the 12 month timeframe.
30. There is no explicit guidance in GPS 116 on the topics of claims inflation, discounting, claims handling expenses or risk margins. This Technical Paper guides to the most appropriate way to treat these items when considering the cost of an OA event is as follows:
 - (a) full allowance for claims inflation and discounting. This could be based on an assumed payment pattern and the economic assumptions underlying the current premium liability estimate. In practice, given the uncertainty embedded in the OA PML event estimate, an explicit allowance for these components may not be necessary. Nevertheless, the final OA PML result should be considered to incorporate their net impact; and
 - (b) no allowance for claims handling expenses and risk margins, consistent with GPS 116's specification of the PML for natural perils and LMI exposures.
31. There is unlikely to exist any line of business where a definitive 1 in 200 OA PML risk measure is available. It is perfectly reasonable, therefore, for different professionals (employing different or potentially identical modelling techniques) to have a range of

different views. In all cases, however, sound actuarial and business judgment based on all of the available information is essential in order to produce a justifiable estimate.

D. Process to follow

32. Given the prudential standards and the interpretation above of them, it is recommended that practitioners follow a high-level process similar to that depicted below in order to assess the OA VR.



33. Each aspect of this process is discussed in the following sections.

D.1 Form a working group

34. It is important to engage key stakeholders in the assessment process for the ICRC OA VR as defined in GPS 116 for two reasons:
 - (a) to tap into the expertise required for the OA VR assessment, which is likely to require the involvement of several experts; and
 - (b) to assist with endorsement of the results of any analysis by achieving buy-in of stakeholders through direct involvement.
35. It is likely that a working group will include actuarial representation, underwriting/product experts, risk management experts, reinsurance experts, cat modellers and capital

modelling experts. When forming the working group, insurers should be pragmatic about the size of the group and the expertise required, and should note that certain individuals within the organisation will have multiple areas of expertise.

36. For specific elements of the process, it may be necessary to involve additional experts. For example, as part of the scenario identification process the insurer and actuaries may actively engage a number of stakeholders in key underwriting/product functions in order to understand their views on the OA scenarios already identified.
37. Drawing on these key stakeholders' input is an important part of the OA determination process. The involvement of the right team ensures that the results and risks are understood more broadly across the organisation which will hopefully enhance risk management activity in addition to the necessary quantification process.

D.2 Identify potential scenarios

38. The first task of the working group should be to determine a list of 'potential' scenarios for assessment. In the early phase of this process, the focus should be on identifying a sufficiently complete list of possible scenarios without too much emphasis on their relative significance. Subsequently, the working group can assess the full list of scenarios and narrow the list to only those that are considered to be most relevant for the insurer.
39. Accumulations from non-natural perils are complex to define and model. They can arise within a single class or across multiple classes of business. APRA has used the phrase "common dependent source or non-natural perils" within the prudential standards, and so the focus of the working group should be on accumulations of losses that are clearly instigated by a common factor that is not related to a natural peril. Consideration should be given to the type of factors that can form a common dependent source and hence should be considered as part of the OA VR assessment process.
40. GPS 116, paragraph 47, note 15 also notes:

"the determination of OA PML must consider the nature of products provided, losses that may lead to an aggregation of multiple per-risk or per-policy losses arising from one dependent source, the potential for multiple classes of insurance and/or portfolios to be impacted from this one dependent source and whether the upper limit of reinsurance cover purchased is sufficiently high to cover the OA PML."
41. This reinforces the fact that APRA expects insurers to consider all classes and all perils in their assessment and include the impact of a source of accumulations across all classes and perils.

D.2.1 Categorisation of risk sources

42. Based on the definition given, the working group will need to consider a very broad range of risk source categories (for example, a PESTEL+ analysis). This may include, but is not necessarily limited to:

- political (P);
- economic (E);
- social (S);
- technology (T);
- environmental (E);
- legal (L);
- terrorism;
- global event (for example, pandemic); and
- individual extreme events – for example, riots, airport or seaport shutdown, major accidents (for example, plane hitting infrastructure), major fire or explosion etc. (For example, the World Trade Centre attacks had losses in aviation, property, motor, liability and workers compensation insurance, amongst others.)

43. Within these categories, the working group can then start to envisage extreme scenarios. These will most likely vary by line of business and across multiple lines of business.

D.2.2 Scenarios already considered

44. Many organisations will already be aware of the risks they are running as part of general business activities. It is recommended that any current existing analysis be considered in the context of the GPS 116 guidance and given due consideration where appropriate. Many, if not all, scenarios will likely have been considered already by a range of individuals within an organisation:

- underwriters are likely to already have included a variety of casualty accumulation scenarios as part of pricing casualty business;
- reinsurance managers would already have factored exposures into the process of designing reinsurance structures;
- claims staff may have experience of actual OA claims;

- finance and investments staff are likely to be aware of historic economic scenarios and may have a view on the likelihood and severity of future economic scenarios;
 - senior risk and/or ERM managers may have considered OA scenarios as part of the Risk Management Framework. An insurer's risk register may also include sources of risk which include OAs;
 - CFOs are likely to have considered OA scenarios as part of the capital management plan when determining target capital levels and surplus capital levels;
 - OA scenarios may also have been considered in the examination of scenario and stress testing as part of an insurer's ICAAP;
 - realistic disaster scenarios ("RDS") processes (including both centralised ones and product specific) are likely to consider OA scenarios where appropriate; and
 - risk margins may be validated against a set of potential scenarios.
45. Whilst the scenarios already considered may not be of the required level of extremity for direct use in OA VR quantification, the themes, categories and ideas will be of great use in developing potential OA VR scenarios.

D.2.3 Scenario development

46. Based on the information gathered, aided by the imagination of the people involved, the working group should then develop a short-list of scenarios for potential inclusion in the quantification phase.
47. The relevant scenarios are likely to differ materially by class of business, despite the scope for overlap, for example:
- marine (excluding off-shore rigs) OA exposures arise from hull risks, marine liability and environmental pollution;
 - aviation OA exposures are likely to arise from hull risks, aviation liability and terrorism;
 - travel OA exposures are likely to arise from terrorism and pandemic risks; and
 - credit OA exposures, on the other hand, are impacted by economic downturns.
48. Given this, it is suggested that this scenario development phase be structured in the form of a two-way matrix of potential events. This table should consider risk categories by class of business, with a 'multi risk' and 'multi class' category available to assess the impact of

extreme events across multiple areas of a portfolio. An example of such a table, with potential events for consideration, is included in Annexure A to this Technical Paper.

49. For smaller insurers, or those with simpler portfolio structures, it is suggested that the size and complexity of the scenario identification process be appropriate to the size and complexity of the organisation.
50. The process of determining the common dependent sources and defining scenarios for these sources of risk may result in a sizeable list of OA scenarios. It is suggested that the focus should be on the material scenarios which have a significant impact on the entity's solvency and management decisions, as this is likely to reduce the list of scenarios to a manageable size. This note suggests that between 5 and 10 scenarios only should proceed to the quantification phase. In any event, best practice is to clearly document the decision-making process for scenario selection.
51. GPG 116 provides scope for scenario adjustments or omissions which should be carefully considered by an insurer. If an insurer considers that a scenario has already been sufficiently captured within other risk charges, it may adjust or omit a scenario on this basis. If an insurer decides to do this, APRA expects the insurer to demonstrate the rationale for this decision, including specific reference to the amount of capital held within its PCA for the relevant scenario.
52. This appears to be a 'catch all' statement designed to give an insurer sufficient flexibility in the calculation of the OA VR to avoid double counting of risk. Based on the guidance, an insurer should carefully consider whether a scenario would result in double counting of elements of the PCA, and adjust or omit the scenario accordingly if this is the case. The evidence and rationale for this decision should be appropriately documented. The example APRA gives in GPG 116 is of an economic downturn which clearly may substantially overlap with the existing asset and insurance risk charges. This is clearly an area where such adjustments should be considered, as other aspects of the capital regime are designed to assess specific economic risks (for example inflation).
53. The final set of scenarios selected should be specified in sufficient detail to enable appropriate data to be gathered and for quantification to occur.
54. A robust approach to identifying scenarios is needed. It is expected that, in the absence of significant portfolio changes, the scenarios chosen and the results of the analysis should be relatively stable from year to year. Material changes to assumptions from year to year and the resulting conclusions should be well explained and documented.

D.3 Collect the necessary data

55. Once the working group has determined the scenarios that will be assessed in detail, data should be identified for each scenario that will aid in the quantification phase of the analysis.

56. APRA has noted that, for exposures to non-natural perils and other accumulations from a common dependent source, a PML can be difficult to define. In determining the OA PML, GPS 116 requires an insurer to consider:
- (a) the nature of the insurance products provided;
 - (b) the losses that may lead to an aggregation of multiple per-risk or per-policy losses arising from a common dependent source (whether that source gives rise to losses once at a point in time or gradually over an extended period);
 - (c) the potential for multiple classes of insurance and/or portfolios to be impacted from a common dependent source; and
 - (d) whether the upper limit and/or reinstatements of reinsurance cover purchased is sufficient to cover the OA PML.
57. For the kind of risk envisioned, it may be hard to find the necessary data. In many cases the events envisioned may not have occurred in the past. Some potential sources of data are noted below.

D.3.1 Internal data

58. Using internal data, the working group should consider if certain scenarios are excluded directly by virtue of the policy wording, avoided through the underwriting process or significantly reduced through reinsurance. It is also possible that proactive risk management could be undertaken to mitigate the impact of any scenarios envisioned. Useful data may include:
- exposure data which may assist in quantifying the impact. This includes policy counts by region or locality, market share and policy limits;
 - as noted in section D.2.2, details of any scenarios/risks identified and quantified by other internal processes may be helpful;
 - policy wordings – specifically, terms of coverage and any exclusions;
 - reinsurance wordings – specifically, terms of coverage and any exclusions, noting how closely this aligns with the direct policy wordings and any resulting gaps in cover; and
 - any relevant claims from historic events.

D.3.2 External data

59. It is likely that data from outside the organisation, if readily available, will need to be sought out. Any events that have historically occurred should be considered in the

context of the entity's risk profile, risk management processes and lines of business. Data may include:

- Australian historical claims experience from industry sources. This data may give some insights into possible scenarios which have led to large OA losses for particular classes of business. For example, interest rates during the early 90's reached very high levels and past claims experience from this period will demonstrate how this might impact a consumer credit portfolio;
- international historical claims experience may contain a broader range of examples and a longer period of historical data;
- ancillary data, such as economic growth rates, interest rates, weather patterns etc; and
- industry claim curves for some classes of business may facilitate the fitting and selection of assumptions for a claims distribution.

D.4 Gross losses from scenarios: quantifying and process for quantifying

60. Having identified the shortlist of scenarios and collected any relevant data that may be available, it is then necessary to estimate the losses likely to arise from those scenarios. For each scenario, the working group should ensure appropriate engagement with experts specific to the risk and/or line of business in question.

61. To quantify the loss, it is suggested that the steps set out below should be followed:

Step 1 ensure the scenario is thoroughly specified;

Step 2 ensure relevant data is collected and collated;

Step 3 construct a method or model to value the loss;

Step 4 document the methodology, assumptions and results; and

Step 5 ensure the work is reviewed for reasonableness.

These are discussed further below.

D.4.1 Step 1: Ensure the scenario is thoroughly specified

62. First, work from the scenario identification phase should be reviewed to ensure the scenario is specified in enough detail to allow for quantification to occur. This should ensure thorough identification of the event itself and the resulting insurance losses that may occur. Items to identify should include lines of business affected, potential exposures (including contingent exposures) and potential claim types. This process should be

tailored to the scenario in question. For example, a terrorism scenario should specify the target(s) to be considered and how damage will be assessed (for example, distance from centre), whereas an economic scenario may use the output of historical analysis to specify macroeconomic stresses.

63. As noted in Section D.2 above, it should also be ensured that the scenario is specified in such a way as to avoid double counting of risks within the overall capital framework, and record any risks reduced or omitted and the rationale for this decision.

D.4.2 Step 2: Ensure relevant data is collected and collated

64. As noted in Section C above, it is possible that no data exists with which to quantify the OA VR. However, if data exists, it is important to ensure at this step of the process that it: (a) has been collected; (b) is appropriate; and (c) is fit for purpose. This may include both internal and external data.
65. It is expected that an insurer should be able to utilise internal data to determine potential exposure to the scenarios considered. Even if such data is not precise, it should be a good starting point for an estimate of the exposure.

D.4.3 Step 3: Construct a method or model to value the loss

66. Gathering all the available quantitative and qualitative information, the model is then built with various key assumptions. Example 1 in Annexure B presents a simple model for a travel portfolio. The model and key assumptions can be tested and discussed with the working group and any additional experts identified for the scenario before it is finalised.

D.4.4 Step 4: Document the methodology, assumptions and result

67. The model should be well documented, including:
- ▶ records of the scenario specification process and any adjustments to this;
 - ▶ sources of data used and their appropriateness;
 - ▶ the results of the calculation;
 - ▶ the results of any parameter testing, sensitivity testing or scenario testing; and
 - ▶ identification of any implicit assumptions separate from the explicit assumptions.

D.4.5 Step 5: Ensure the work is reviewed for reasonableness

68. Stress and scenario testing of key assumptions may be undertaken where appropriate in order to assess the sensitivity of the model to key parameters.

- 69. The results could be compared to any existing analysis conducted by the insurer or any external analysis collected in order to ensure the quantum appears reasonable.
- 70. Actual historical events (where they exist) could be used to assess the reasonableness of the estimated loss for the scenario, although adjustments would need to be considered for the different probability of occurrence for historical events.
- 71. The model and results should be peer reviewed by someone not directly involved in its construction, in line with good professional practice.

D.5 Quantify any reinsurance or other recoveries

D.5.1 Overview

- 72. Once the gross loss for each scenario has been determined, it remains to determine what, if any, reinsurance or other recoveries are available.
- 73. There is a wide variety of reinsurance covers available. The insurances and interactions of the covers can be complex and may not have been tested under the scenarios envisioned, as the OA event under consideration may never have occurred or even been envisioned. Typically, an insurer will have purchased excess of loss reinsurance to cover OA events as part of their usual reinsurance purchasing decision. In all cases, there needs to be clarity as to the assumptions that are being made around the response of the reinsurance contracts and the basis for such. Careful consideration of contract wordings will be required here. Insurers should be aware that RDSs are typically considered as part of the reinsurance purchase (and may have been used in determining OA scenarios), and work undertaken as part of this RDS process is likely to be of assistance in determining the response of any reinsurance.
- 74. If replacement cover or reinstatements have not been purchased in advance, then the insurer should calculate the cost of putting the appropriate cover in place and include that along with the expected recoveries within the scenario impact.
- 75. Complexity in the calculation is envisaged in certain situations:
 - (a) for a cross class event loss, the interaction of possible clash covers and aggregate covers with the individual class covers may be complicated. This is discussed further in Section D.5.2 below;
 - (b) if reinstatements have not been purchased in advance, then estimating the potential cost of the reinsurance cover subsequent to the event may be complex;
 - (c) even if reinstatements have been purchased, there may be limits to them;
 - (d) event limits on quota share contracts could be breached;

- (e) stop loss covers may give some relief to OA risks; and
 - (f) there may be inner aggregate deductibles in aggregate covers.
76. For situations where it is not clear how to determine the reinsurance recovery because of the complexity of the reinsurance arrangements, then it is appropriate to engage key stakeholders outside of the working group such as internal reinsurance managers, reinsurance brokers or possibly reinsurers. The OA VR scenario may be something that has not been considered previously, in which case seeking clarity before the scenario occurs may be beneficial.
77. GPS 116 states that “[a]n insurer may discount the retention on any aggregate reinsurance cover for the time value of money if the retention is fixed and not indexed for inflation. The discount period must not be greater than the average period of discount in determining the premiums liability provision. The discount rate must be the relevant risk-free discount rates used by the Appointed Actuary in the AVR.”³
78. Within the methodology suggested in this Technical Paper, the gross loss from the scenario has been estimated and then the relevant reinsurance recoveries deducted. This calculation is undertaken on an undiscounted basis. The remaining amount is the estimated retention for the insurer. In order to be able to benefit from the time value of money applied to this retention then the following criteria must be met:
- (a) the reinsurance recoveries must be from an aggregate cover;
 - (b) the discount period must not be greater than the average period of discount in determining the premiums liability provision; and
 - (c) the discount rate must be the relevant risk-free discount rates used by the Appointed Actuary in the AVR.

D.5.2 Aggregation of losses and clash cover

79. A particular area of consideration is the way in which the reinsurance responds to multiple losses. This may create issues around the ability to aggregate losses under reinsurance contracts. If aggregation is not permitted, an insurer may be liable for a large net loss.
80. Typical examples of events that lead to issues of clashing retentions are sudden events spanning multiple business lines. For example, a building collapse could result in any or all of the following:

³ GPS 116, paragraph 50 (March 2013)

- workers compensation losses from employees injured in the incident;
 - general liability loss from the builder involved in building the building;
 - engineering/construction loss if the building is still under cover;
 - products liability losses from sub-standard materials used in the build;
 - failure of critical information infrastructure; and
 - professional liability for errors or omissions made by architects, surveyors, engineers etc involved in the design and planning of the original build.
81. Here there would typically be an excess of loss structure in place to protect against individual large losses within each line of business. In order to determine the insurer's retained loss, the following questions also need to be asked:
- (a) Can individual losses within each class or across classes be aggregated, or does the reinsurance respond individually to each loss?
 - (b) If the response is the latter, is there any within class or across class clash cover, protecting against liability for multiple retentions both within and across classes?
82. Insurers will typically purchase additional 'clash cover' for retention aggregation issues as outlined above in order to protect their net position against scenarios leading to multiple losses within or across classes. Careful consideration of the operation of these covers will be required in assessing the reinsurance recovery under the OA scenario.
83. Other forms of clash can occur from any event giving rise to multiple claims, which need not be a sudden event as described above. Some examples include:
- (a) **systemic clashes:** when a process, industry or business practice proves erroneous and is repeated resulting in a series of losses. For example, a change in accounting standards could be misinterpreted by several accountancy firms. The professional indemnity policies of each accountant are then triggered by a common cause or similar error;
 - (b) **misalignment of policy wordings and reinsurance clauses:** an example could be an actuarial consultant building a flood model which is sold to several clients and which turns out to be inherently flawed. Some indemnity clauses could treat each contract between the actuary and client as separate losses for the purpose of reinsurance recoveries, whereas an insurer's policy wording and risk assessment may be aggregating such losses;
 - (c) **corporate failures** can cause aggregations of risk. Claims might come from accountants, actuaries, management consultants, solicitors, merchant bankers

and other advisers of the failed company who may have been negligent, thus contributing to the downfall. D&O claims may also emerge. Alternatively, the insurer might have a large exposure to financial advisers, many of whom had recommended the insolvent company to investors. The accumulation of loss involvements in these instances could be significant; and

- (d) **economic downturns:** an economic downturn would not generally be considered as an event by reinsurers. Professional risks underwriting results are closely linked to economic factors and an economic downturn typically results in increased claims activity. This needs to be a consideration within the insurer's original pricing.

D.6 Quantify any available offsets

84. GPS 116 allows an adjustment to the Gross OA VR for any losses within the chosen scenario which are already specifically allowed for in the premium liabilities of the insurer. If the insurer chooses to apply such an offset, the Appointed Actuary must determine the amount and include this amount within the AVR, as required by GPS 116 and CPS 320.
85. The concept of offsets has been discussed widely in a natural perils context, as there is a similar allowance for a PL Offset within the natural perils horizontal requirement. It is suggested that a similar process be followed for other accumulations, with an insurer identifying the portion of premium liabilities that relates to other accumulation scenarios and applying an offset accordingly.
86. Insurers need to be pragmatic in determining this amount. It is unlikely that the specific OA scenario under question is explicitly considered in determining the premium liabilities – this would require a premium liability determination process that considered a vast array of scenarios. This is clearly not practical – most premium liability estimates are constructed via a series of high level assumptions. Nevertheless, it is still possible to consider the amount within the premium liabilities that relate to an extreme OA event. This might be done by considering what the assessment of the premium liabilities would be if such an event could not occur. For example, if the OA scenario is an economic downturn on an economically exposed class, the revised parameter set that would result from the removal of this risk may be considered. The difference in the value of premium liabilities, therefore, is attributable to the risk in question.

D.7 Examine scenarios and report OA VR outcome

87. Once the gross and net losses for each event have been quantified, offsets have been determined and the results verified by the working group and other relevant experts, the largest gross and net loss are taken as the gross and net OA VR, respectively, and reported through the appropriate governance structures of the insurer. An example of this is shown in Example 2 in Annexure B.

88. A clearly written report should be prepared documenting all of the key aspects of the OA VR calculation. The amount of detail required in the report is likely to have a strong relationship with the materiality of the insurer's exposure to OA events - in the case that the OA VR is significantly less than the largest other component of the ICRC formula, and hence does not directly influence the final ICRC value, the report is likely to be more limited in nature. Nevertheless, clear documentation of the analysis and considerations supporting the insurer's opinion of the OA VR should be prepared.
89. The nature of the report need not be voluminous as long as it adequately covers the following areas:
- (a) a description of the OA exposures that were considered relevant to the insurer;
 - (b) a description of the investigations undertaken and information sources accessed;
 - (c) high-level documentation of the model structure for each scenario assessed;
 - (d) documentation of key assumptions and the rationale for them;
 - (e) quantification of key changes since the last assessment, including assumption changes and exposure changes; and
 - (f) sensitivity analysis where this is warranted, focusing on the impact of key parameters and assumptions.
90. This report, or a summary of it, should be reported through the appropriate governance procedures of the insurer. It may be appropriate to report this through the FCR in line with the responsibilities of the Appointed Actuary in this area, particularly if the OA VR is not material for an insurer's ICRC. However, if the OA VR is an important driver of the ICRC, a more significant presentation and discussion with board and/or senior management would be appropriate. This would be likely to focus on:
- (a) the nature of the material OA exposures to which the insurer is considered susceptible;
 - (b) an overview of the consultative process followed in deriving parameters for the OA VR;
 - (c) a summary of the key loss scenarios driving the OA VR result, the extent of dependency on judgment and the sensitivity of the result to key assumptions;
 - (d) a comparison of the results to any previous advice; and
 - (e) potential pro-active measures that can be taken to avoid, reduce or mitigate the losses from the scenarios considered.

D.8 Administration, governance and other matters

91. The process of establishing the OA VR should be subject to similar administrative and governance procedures to those which apply to other important components of an insurer's capital adequacy calculations. This includes ownership of the process, documentation, presentation and approval of the results and monitoring of the OA VR.
92. This Technical Paper recommends that any working group would be chaired by a suitable person responsible for delivering the OA VR to the internal committee or structure that is responsible for the overall capital calculation. It is possible that this chairperson will be the Appointed Actuary in many companies, due to the Appointed Actuary's other responsibilities within the AVR/FCR in this area, though this need not always be the case. It is strongly suggested that the Appointed Actuary should always be part of the working group.
93. As noted throughout this Technical Paper, the calculation of the OA VR requires multiple areas of expertise and it is likely that the working group will need to engage with additional stakeholders where appropriate. As well as ensuring the calculation involves appropriate expertise, this serves the additional purposes of achieving buy-in across the organisation for the calculation, and may also lead to some additional improvements in risk management if scenarios emerge that have not previously been considered.
94. At a minimum, the OA VR analysis should be updated annually. This process should ideally involve the reassessment of each step in the process identified at the start of Section D of this Technical Paper. More regular (quarterly) monitoring of this nature would be appropriate where the OA VR is material to the ICRC calculation.
95. Where the OA VR is not considered material, however, it should be feasible for annual reviews of the OA VR to be collapsed down to more simplistic approaches using rules of thumb. An example of such a situation would be where the OA VR is assessed as being driven by one key type of exposure (for example, sums insured, policy counts of a certain line of business) and the OA loss event is in effect proportional to the exposure measure. Re-assessment of the OA VR at subsequent dates could reasonably make use of this fixed relationship to the exposure measure without the need to completely reprise the OA VR estimation methodology. In such circumstances, the insurer should have in place an adequate monitoring regime to ensure the ongoing suitability of the chosen exposure measure.

E. Next steps

96. The purpose of this Technical Paper is to set out a practical approach to calculating the ICRC (as defined in GPS 116) for other accumulations for industry practitioners. In doing so, it acknowledges that there is no single correct method or approach, and it is reasonable (perhaps necessary) for insurers to use a range of alternative approaches

depending upon the specifics of each entity and the nature, scale and complexity of the business.

97. Feedback from the wider actuarial and insurance industry practitioner community is welcomed so as to:

- (a) correct any errors in the approach outlined in this Technical Paper that may lead to inconsistent or incorrect results;
- (b) provide alternative approaches or thoughts on how to calculate the ICRC for other accumulations; and
- (c) assist where necessary in explaining the concepts presented where more elaboration is required for the practitioner.

End of Technical Paper

Annexure A: Case study of scenario identification and categorisation

Below is an illustrative case study on identifying scenarios for a hypothetical multi-line insurer. The multi-line insurer is assumed to be writing the following classes of business and exposures:

- CTP
- Marine
- Aviation
- Construction/ Engineering
- PIDO
- Medical Indemnity
- Extended Warranty
- Consumer Credit
- Trade Credit
- Personal Accident
- Workers' Compensation
- Travel
- Cyber Insurance
- General Liability (public, products, other)

For each of these classes, the guidance is to consider identified scenarios under the following OA categories:

- Physical
- Terrorism
- Political
- Economic
- Social
- Technology
- Other
- Cross Class

The matrix of scenarios by source for each class is included below. The list of scenarios in the matrix is by no means exhaustive and would not apply equally to all insurers even for the same class of business. It is recommended that each insurer would need to consider its own classes and exposures. That said, the matrix presents an example of the thought process needed by a working party to identify the relevant OA scenarios.

Class	Terrorism	Political	Economic	Social	Technology	Other	Cross Class
CTP	Truck filled with explosives hitting high density population area	Increased access to common law	High inflation: medical, cost of care, legal awards	Increased propensity to claim	Better driver/passenger protection Increased survival rates Increased technology to assist longevity of the catastrophically injured		Large truck full of dangerous liquids hitting a train in one of Sydney's tunnels causing a car pile up, chemical spill and fire
Marine	Large oil tanker hitting Opera House Oil/gas rig leak, damaging environment	International incident sees foreign power seizing vessels of another country	Depressed economic situation causing increase in arson, fraud etc				Tanker hitting Sydney Harbour Bridge at peak hour
Aviation	Large passenger jet hitting CBD			Large passenger jet hitting CBD by human error	Major simultaneous technological failure (similar to the Y2K threat)		Plane hitting Sydney Harbour Bridge at peak hour
Construction/ Engineering	Event at current large projects underway Gorgon, Gladstone, Iron Ore and Coal Environmental risk						Large gas pipeline explosion affecting many downstream businesses (eg electricity generator) Business interruption Loss of profits Property loss
PIDO	A terrorist event (eg bombing)		Strong link to economic cycle.	A rapid change in	New emerging technologies may	New precedents greatly	Any situation where professionals or

Class	Terrorism	Political	Economic	Social	Technology	Other	Cross Class
	may be the trigger for claims (eg building architects)		Largest losses tend to emerge from underwriting periods immediately prior to investment market crashes or GDP downturns. Industry-specific exposures may have different timings.	community standards of duty of care leading to heavy losses not previously considered to be known exposures.	generate losses. Similarly, a failure to manage or replace old redundant technology may generate losses.	expanding scope of existing coverage retrospectively. Imposition of large 'punitive damages' as an additional head of damage.	company directors might be held accountable for losses that have arisen primarily in exposures that are primarily protected by another line of insurance.
Medical Indemnity	A deliberate act of harm to patients on a large scale by a 'doctor-terrorist'	Changes to coverage may be imposed retrospectively but government patronage is likely to ensure the effects are not catastrophic. Political pressure may result in a new class of claim not currently covered.	Propensity to claim rises in recession. Economic pressures may lead to lowering standards of medical care by individual doctors or pursuit of new care techniques which are flawed.	Demographic timebombs causing a surge in claims that are age-specific (births or aged care) or driven by over-stretched medical care resources.	Use of new untested technology or use of old redundant technology may generate losses on a large scale. Probable overlap with Product Liability covers.	Irresponsible actions by a single doctor or small medical practice causing harm to patients on a large scale (eg Chelmsford). Legal – new precedents greatly expanding scope of existing coverage retrospectively.	Product Liability for technology-related losses.
Extended Warranty			Recession causes increased propensity to claim, leading	Public expectations regarding quality of	Mass failure of a critical component (eg electronic).		Product recall in liability covers. A high failure rate good (eg defibrillator) being

Class	Terrorism	Political	Economic	Social	Technology	Other	Cross Class
			manufacturers to lower construction quality to save costs and sends manufacturers broke and hence unable to meet manufacturer's warranty period or supply parts for insured repairs.	goods and performance may change. Claimant behaviour may become more cynical where the cause of fault in a good can be hidden.			used by a professional (eg doctor) and generating losses (PIDO and Medmal).
Consumer Credit		Removal of protections or subsidies for a particular industry causes localised unemployment	Recessionary economic conditions causing high unemployment			Pandemic leading to significant unemployment due to impact on trade and commerce	
Trade Credit		Trade credit can cover political risk insurance for exporters	Recessionary economic conditions leading to high levels of insolvency				
Personal Accident	Major terrorism event					Major airline disaster	
Workers Comp			Downturn leads to high unemployment,	Increased propensity to claims through		Latent fronts (eg nanotechnology)	

Class	Terrorism	Political	Economic	Social	Technology	Other	Cross Class
			increasing claim frequency and period on claim	OH&S issues, or emerging claim types (eg psychological)			
Travel			Regional economic crisis Airline collapse	Pandemics Social/political unrest			
Cyber	Large scale cyber-attack by state/terrorist actor on critical infrastructure leading to significant business interruption and property damage		Depressed economic situation causing a rise in cyber-attacks for financial gain	Changes in working behaviour – remote/flexible working leading to greater exposure to cyber attack	Increased world-wide connectivity Improvements in technology leading to new/innovative ways to 'attack'		Widespread cloud breach or critical infrastructure shutdown
General Liability (public, products, other)		Tort legislation leading to increased claims Legal reforms creating new sources of claims	Burst of very high inflation Legal cost inflation	Changes in propensity to claim or new types of claim emerging	Product defect (eg pharmaceutical) Explosion Chemical spill		

Annexure B: Examples

Example 1 - Monoline Travel Insurer- numbers are illustrative only and not representative of an actual insurer

Travel insurance

Insurer has 5% market share of the travel market

Scenario: Touring group in premises which has a physical event
 (for example, explosion)

Number of Insureds	65
Death %	5
Intensive care and transport to Australia %	85
Minor injuries %	<u>10</u>
	100

Average cost (\$):

Death	45,000
Intensive care and transport to Australia	500,000
Minor injuries	<u>7,500</u>

Number of claims:

Death	3.25
Intensive care and transport to Australia	55.25
Minor injuries	<u>6.50</u>
	65.00

Estimated total cost (\$):

Death	146,250
Intensive care and transport to Australia	27,625,000
Minor injuries	<u>48,750</u>
Total gross	27,820,000

Retention 3,500,000

Premium liability adjustment 125,000

Net loss 3,375,000

This example sets out what would be the one in 200 year loss if a touring party which could be covered under the underwriting rules were to encounter an extremely unfortunate accident in a tourist attraction that they were visiting.

The assumptions derived would need to be discussed with the appropriate experts in their respective fields – number of injuries from historical experience (say tourist bus crashes) and the cost of injuries with medical staff.

This example is illustrative only and represents a hypothetical insurer. For the purposes of this Technical Paper, the example is simple and does not necessarily take into account the unique circumstances of an individual company's circumstances.

The conclusion from the example is that a one in 200 year event gross loss could cost \$27.8m as a single scenario and single point estimate. Alternatively, either a distribution curve could be fitted to this portfolio and a 99.5th percentile could be obtained or a simulation method could be adopted to generate, say, a thousand results and the 99.5th percentile obtained.

Taking into account the reinsurance recoveries and the premium liability adjustment, then the net loss for the one in 200 year event becomes \$3.375m.

Example 2 – Multi-class Insurer – numbers are illustrative only and not representative of an actual insurer

The multi-class insurer generally presents more complex issues. For each individual class, the one in 200 year event is estimated. The approach taken here has been to focus upon examining scenarios by class of business first and then building more complex scenarios from that starting point. It is sometimes easier to visualise losses by class of business and, generally, the structure of the company is set up by line of business or by product lines.

For this example the focus is upon APRA classes only for a hypothetical insurer which writes CTP, Workers Compensation, Motor TPPD, Personal Lines and Aviation. The total gross premium income is \$400m spread across the six major lines of business.

In addition, a cross class scenario is also to be developed. It is plausible that the cross class loss may incur the largest quantum of loss for the one in 200 year event (for example, Economic Downturn, Airport Shutdown, accident affecting a tunnel, CBD office block collapse, etc).

As stated earlier, the one in 200 year event is to be estimated on a whole of portfolio basis and so this requires the largest loss selected out of a number of one in 200 year event scenarios (individual classes or cross class).

For the purposes of understanding the new prudential standards, the likelihood of each event or a number of events occurring in the same 12 month reporting period has not been estimated (this scenario has been ignored in this section). It is noted that, in the FCR, the Appointed

Actuary is required to examine the scenario of a number of events occurring in a twelve month period.

Considerations

Each class of business is initially modelled separately with its individual stand alone estimated one in 200 year event. This could be modelled either by scenarios, curve fitting or simulations.

The next step is to estimate a cross class scenario which may in fact cause the largest loss at the one in 200 year event level. For the purposes of illustration, this could be a Sydney Airport explosion impacting CTP, Workers Compensation and Aviation policies.

At the individual class level, the net impact is a relatively straightforward calculation taking into account the individual class reinsurance arrangements and the indexation of retention.

The reinsurance recovery implications are possibly quite complex to model for a cross class scenario, as clash covers are typically involved in such scenarios. Set out on the next page is an illustrative example of the results of a scenario analysis.

Multi-class (Motor Third Party, Workers Compensation, Short Tail Home and Motor, Travel, Personal Accident and Aviation)

Multi-class – undiscounted OA VR

Gross Premium Income (1)	APRA Class (2)	Event Description (3)	Frequency (4)	Gross Impact (5)	Net Impact Less Premium Liability Adjustment and Recovery (6)
50,000,000	CTP	Sydney Harbour Tunnel crash	0.500%	100,000,000	12,500,000
60,000,000	Workers Comp*	CBD office building collapse	0.500%	125,000,000	13,500,000
100,000,000	Motor - TPPD	Petrol tanker hitting landmark	0.500%	75,000,000	1,500,000
100,000,000	Householders - Liability	Balcony collapse with large crowd	0.500%	50,000,000	2,500,000
55,000,000	Travel and PA	Tour group in building explosion	0.500%	20,000,000	3,075,000
<u>35,000,000</u>	Aviation	Pilot error hitting office block	0.500%	150,000,000	8,250,000
400,000,000					
	Cross class scenario#	Sydney Airport explosion	0.500%	275,000,000	9,500,000

* For example, the Workers Comp scenario may give rise to claims in other classes of business such as the CTP portfolio or the Motor-TPPD portfolio, but for the purposes of this Technical Paper, this issue is only raised as a matter for consideration. The OA VR is \$13.5m in this example.

This is the maximum of the cross class scenarios and many more cross class scenarios would be explored

(5) = obtained by modelling and engaging experts

(6) = gross impact less retention less premium liability adjustment

The premium liability adjustment may or may not exist for each class of business. This is an area that actuaries will likely spend more time considering a possible estimate of a one in 200 year event in the premium liability calculation. Some classes of business lend themselves naturally to a calculation of a one in 200 year event (for example, Trade Credit).

Again on a cross class scenario, the premium liability adjustment becomes more complex and how much of the premium liability could actually allow for the one in 200 year cross class scenarios is a question for the Appointed Actuary.

Set out in the table on the next page are the actual numbers underlying the results of the previous table. The premium liability adjustment is represented as a % of the gross premium income but in practice the % applicable will be calculated as a % of the actual premium liability.



Multi-class – undiscounted OA VR

Gross Premium Income (1)	APRA Class (2)	Gross Impact (3)	Net Impact Less Prem Liability Adj and Recovery (4)	Retention (5)	Net Impact (6)	Prem Liab Adj as % Gross Prem (7)	Prem Liab Adj \$ (8)
50,000,000	CTP	100,000,000	12,500,000	15,000,000	15,000,000	5.0%	2,500,000
60,000,000	Workers Comp*	125,000,000	13,500,000	15,000,000	15,000,000	2.5%	1,500,000
100,000,000	Motor - TPPD	75,000,000	1,500,000	5,000,000	5,000,000	3.5%	3,500,000
100,000,000	Householders - Liability	50,000,000	2,500,000	5,000,000	5,000,000	2.5%	2,500,000
55,000,000	Travel and PA	20,000,000	3,075,000	5,000,000	5,000,000	3.5%	1,925,000
<u>35,000,000</u>	Aviation	150,000,000	8,250,000	10,000,000	10,000,000	5.0%	1,750,000
400,000,000							
	Cross class scenario#	275,000,000	9,500,000	12,500,000	12,500,000		3,000,000

(4) = (3) – (5) – (8)

(8) = (7) * (1) for this illustration only and the premium liability adjustment may not be expressed this way in practice.

Based upon the above results, the selected one in 200 year event is derived by selecting the maximum number in column 4 above. For this example, the maximum number comes from the workers compensation portfolio scenario and the OA VR in this illustrative example is \$13.5m.

Example 3 - Blackout Scenario: Multi Line Insurer - major cyber-attack resulting in shutdown of State-wide power for period for 5 days.

This event results in losses across a variety of insurance classes:

- Business Interruption – under ISR and Standalone Cyber Insurance policies
- Incident response and remediation costs – under Standalone Cyber Insurance policies
- Speciality - Event Contingency losses
- Other losses

ASSUMPTIONS BELOW ARE FOR ILLUSTRATION ONLY

Cyber Attack causing an electricity blackout across NSW power grid for extended period of time

Number of days	5
Business Interruption	
Total revenue insured	\$200,000,000
Number of insureds	1000
% Companies in NSW directly or indirectly affected	75%
% Revenue lost/impact	10%
Estimated business interruption losses	\$15,000,000

Standalone cyber	
Number of insureds	400
Incident response/investigation/remediation costs - average cost	\$15,000
% insureds impacted	50%
Estimated incident response losses	\$3,000,000
Speciality - Event Contingency	
Number of events held per annum	200
% events impacted	1%
Average event cancellation loss	\$1,000,000
Estimated event contingency losses	\$2,000,000
Other Losses	
Motor - traffic collisions	\$
Aviation - airport shutdown	\$
Liability & Professional Lines - liability issues around risk management and decisions	\$
Trade Credit - disruption to imports and exports	\$
Homeowners - property damage (contents)	\$
	\$

Estimated Gross Loss	\$20,000,000 + Other

Reinsurance considerations

The OAVR is intended to be the net loss to the insurer from a PML event. When estimating the OAVR cyber event, there may be reinsurance (whether affirmative or silent) which may provide coverage. Some reinsurance policies will have explicit cyber exclusions or gaps in coverage (e.g. cover for certain losses, limits etc.). These must be considered when assessing the expected OA reinsurance recoverables for the calculation of the OAVR.