



1 December 2022

2022 CAPITAL AND SOLVENCY RETURN

STRESS/SCENARIO ANALYSIS – CLASS 4, CLASS 3B AND INSURANCE GROUPS

The Bermuda Monetary Authority (Authority or BMA) requires Class 4 and Class 3B insurers (insurers¹) and Bermuda Insurance Groups (groups) (i.e., groups for which the Authority is the group supervisor) to conduct prescribed stress/scenario testing and analysis. The results are to be submitted to the Authority as part of the 2022 year-end capital and solvency return.

The objective of stress testing within the 2022 year-end capital and solvency return is to assess the capital adequacy of the insurers and groups under adverse financial market and underwriting conditions and to provide a comprehensive understanding of the sector's general vulnerability to shocks. More specifically, the tests' purpose is to assess the impact of the losses, as determined using proprietary/vendor models, on the insurer's/group's statutory balance sheet (i.e., statutory admitted assets, admitted liabilities, and capital and surplus). Thus, these tests help determine the financial capacity of insurers/groups to absorb the manifestation of key financial risks, such as shocks to investment performance and projected losses arising from specific underwriting risks.

GENERAL INSTRUCTIONS

Measurement of impact: As noted above, the insurer/group is to provide the post-stress/scenario positions of the expected impact and effects on both statutory assets and liabilities.

Accounting treatment: The insurer/group is to use the accounting standard ordinarily used for statutory reporting so that the pre-stress/scenario statutory capital and surplus can be reconciled to the insurer's/group's 2022 year-end statutory balance sheet.

Timing of impact: The stress/scenario impact and effects reported are those that would be observed immediately upon the occurrence of the event (stress/scenario) as determined by the insurer's/group's internal or vendor model(s) (both with and without the effect of reinsurance and/or other loss mitigation instruments).

Balance sheet date: The insurer/group is to run the stress/scenario tests based on its balance sheet position and aggregate in-force exposures as of 1 January 2023.²

¹ In this document, the terms “insurer” and “insurers” include “reinsurer” and “reinsurers”, respectively.

² Where the fiscal year does not correspond to the calendar year, in-force exposures on the day following the fiscal year-end should be used rather than 1 January 2023.

Reporting currency: All amounts reported concerning the stress/scenarios tests must be shown in the reporting currency.

Vendor and/or internal model descriptions: To assist the Authority with comparability, the insurer/group is to describe the vendor model(s) used to perform the stress/scenario tests, identifying what model and version were used for each stress/scenario. The acquisition of a vendor package is not an obligation. Where an internal model is utilised, the description should also include information on the internal model's key assumptions and parameters.

Confirmation of no loss exposure: For instances where the insurer/group has no loss exposure to a particular financial market scenario(s), underwriting loss scenario(s) and/or “other underwriting loss scenarios”, the Authority has created a new section that allows for the confirmation that fields left blank/omitted are the result of no loss exposure.

A. FINANCIAL MARKET SCENARIOS

The financial market scenarios comprise capital market-related single-factor shocks triggered by specific risk factors (equity returns, credit spreads and defaults). The calibration of these shocks is based on historical data about the evolution of interest rates, exchange rates and equity markets. Further, in light of continued sovereign risk concerns and their implications on the investment performance of insurers/groups, the financial market scenarios include haircuts on sovereign bonds. In addition, the ongoing volatility due to political risk and the volatility of capital flows warrants shocks on foreign currency positions.

The insurer/group is to quantify the impact of the following stress events on its statutory balance sheet:

<u>Stress Event</u>	<u>Interpretation</u>
R1. Severe decline in equity prices	The stress test is a decrease of 40% of the value of equities in a portfolio. This stress scenario is consistent with the Black Monday crash of 1987. If there are hedging instruments for equity exposures, their hedging result should be recorded separately. If hedging is done through replication strategies or continuous rollover of assets, this should be mentioned in the stress test result. Short positions are considered hedging positions. Material equity derivative positions should also be included in the test.
R2. Alternative investments and real estate	This stress is related to investment holdings in hedge funds, insurance-linked securities, real estate, private placements, venture capital and other types of securities that cannot be characterised as equity, bonds, cash, foreign exchange and mutual funds in typical asset categories or participations to other corporations excluding venture capital. The usual characteristics of these assets are the low correlation with financial markets and the low or lower liquidity compared with typical financial assets. Such assets should be decreased in value by 40%. For assets such as hedge funds with lockup periods, venture capital and real estate in illiquid markets, the (re)insurer should report whether sudden decreases in their value could entail the inability for rapid sale and whether this effect has material consequences. Level Three Assets A shock of a 40.0% reduction in the value of level three assets should be performed. If level three assets can be found in alternative investments and real estate, equities or other categories, then those assets must be reported and stressed separately.
R3. Extreme US yield curve widening	This stress refers to an extreme movement upwards of the United States (US) yield curve. The (re)insurer will use the following risk-free yield curve for valuations of assets and liabilities. Corporates should be revalued as well, assuming constant credit spreads. For assets and liabilities with durations longer than 30 years, assume a constant rate of 5.0% from year 31.

Table 1 – Yield Curve (in per cent)

Year	1	2	3	4	5	6	7	8	9	10
	5.30	5.40	5.40	5.20	5.30	5.30	5.20	5.10	5.10	5.06
Year	11	12	13	14	15	16	17	18	19	20
	5.04	5.02	5.00	5.00	5.00	5.00	5.00	4.98	4.99	5.00
Year	21	22	23	24	25	26	27	28	29	30
	5.00	5.00	5.00	5.00	5.00	5.00	4.99	4.98	4.96	4.96

Source: BMA staff calculations and Bloomberg. Notes: This yield curve is a product of a bespoke BMA scenario generator. This yield curve represents the 99th percentile yield curve of all simulated paths of interest rates for each maturity.

R4. General widening of credit spreads

Credit spreads widen across different rating classes (see table 2). The widening reflects the increase of the perceived credit risk in the market. The table summarises the shocks.

Table 2. Credit Spread Widening						
<i>In basis points</i>						
Rating Category						
	AAA	AA	A	BBB	BB	Below BB
	199.6	249.0	241.5	276.4	947.5	3,113.6

Source: BMA staff calculations and Bloomberg. Notes: The 99.9th percentile was used for all but two scenarios. For AAA, the BMA used the 99th percentile; for junk bonds (ratings Below BB), the BMA used the 99.99th percentile. The spreads in these rating classes show high (for AAA) or low (for Below BB) variability compared to the intermediate rating classes. The 99th percentile would overestimate the reasonable stress scenario for AAA assets, and it would underestimate a reasonable stress scenario for Below BB. The BMA used Moody's bond indices for ratings from AAA to BBB and the J. P. Morgan bond indices for BB and Below BB rating classes. The reference risk-free rate was the 10-year US treasury rate.

All positions including those available for sale and held to maturity should be stressed. Structured finance products, asset-backed securities, agency and non-agency Mortgage-Backed Securities (MBS) must be included as well. If there is no rating for an asset, the (re)insurer must assume that the rating is Below BB. Catastrophe (Cat) Bonds are treated as alternative investments and not as assets susceptible to credit spread changes.

R5. Combine R1, R2, R3 and R4

Combine the extreme yield curve of table 1 and the credit spread widening of table 2. This means that corporate bonds must be revalued using the risk-free curve of table 1, the prevailing credit spread over today's curve, plus the widening of credit spreads in table 2. Together with corporate bonds, sovereigns are to be shocked as well, using the yield curve in table 1.

R6. Foreign currency shocks

An equal percentage of depreciation and/or appreciation of Foreign Exchange (FX) positions in both assets and liabilities when these shocks reduce the value of assets and increase the value of liabilities. When a FX liability is passed on to the party claiming the liability, the shock can be excluded for such positions. The following table provides the percentage depreciations/appreciations. Hedging of FX positions should be reported separately, especially if hedging is done with rollover strategies.

Table 3. Exchange Rate Shocks (in per cent)						
	EUR/USD	JPY/USD	GBP/USD	CHF/USD	AUD/USD	Avg.
Shock	24.9	27.6	41.0	22.4	31.8	29.5

Source: BMA staff calculations and Bloomberg. Notes: The average appreciation/depreciation (rightmost column) should be used for currencies other than those indicated. The scenario estimation horizon covers daily exchange rate movements from 2000 up to 2021. A GARCH(1,1) model was used to generate the scenarios. Due to Brexit, the GBP/USD shock increased by considering the 99.9th percentile of projected depreciation.

R7. Escalation of sovereign risk

In this test, assume that the weakest sovereigns will have to undergo a haircut in the face value of their debt. Both available for sale and held to maturity bonds should be stressed.

Table 4. Reductions in Current Value of Sovereign Bonds

	Time to Maturity				
	<1 year	<3 years	<5 years	<7 years	>7 years
Greece	50.0	50.0	50.0	50.0	50.0
Italy	50.0	50.0	50.0	50.0	50.0
Portugal	50.0	50.0	50.0	50.0	50.0
Ukraine	100.0	100.0	100.0	100.0	100.0
Argentina	50.0	50.0	50.0	50.0	50.0
Turkey	50.0	50.0	50.0	50.0	50.0
Russia	100.0	100.0	100.0	100.0	100.0

Source: BMA staff calculations and Bloomberg. The haircuts are based on the realisation of a prolonged pan-European banking crisis in Europe, which will cause sovereign defaults.

R8. Inflation and monetary policy risk

Inflation risk stems from the general increase of prices. Inflation decreases the value of loans and debts while it may increase the value of indemnities and claims. Simulate a scenario similar to the 1973 inflationary scenario. The (re)insurer should apply each inflation scenario (low, medium, high, severe) for three years, assuming no initial action to curb inflation from the Federal Reserve. In year four, the Federal Reserve changes its stance and increases rates to maintain the current real interest rate. Therefore, the reinsurer should raise the yield curve across maturities for one year by 700, 1,000 and 1,500 basis points, respectively, for the medium, high and severe inflation scenario. From year five onwards, inflation and interest rates return to current levels. All assets and liabilities are to be shocked. If the (re)insurer holds TIPS or other inflation-sensitive securities, these securities should be indexed to the inflation scenarios.

Scenario	Inflation rate
Low inflation	6.0
Medium inflation	7.0
High inflation	10.0
Severe inflation	15.0

Source: BMA staff calculations and expert judgement.

B. MORTGAGE INSURANCE

The insurer/group is to quantify the impact of the following stress events on its statutory balance sheet:

Mortgage Loan Shock 1 Part 1 - (Re)insurers that write mortgage business are to shock their exposure for this business by increasing the default rate to 9.47% (equivalent to approximately 99.5% Tail Value at Risk (TVaR)) for their mortgage book and applied instantaneously. Assets and liabilities subject to mortgage-related default risk should be shocked.

Part 2 - (Re)insurers holding agency MBS and real-estate securities as investment assets subject to prepayment risk are to shock these investments by assuming that the MBS will prepay at an annual Constant Prepayment Rate (CPR) of 40% instantaneously. If the 40% CPR produces capital gains, the insurer is to stress the CPR at 0%, 5% and 10%. The expectation is that if using a CPR of 40% produces a gain, then applying a substantially lower MBS prepayment shock rate of 10% or less will likely produce capital losses. If a registrant still reports capital gains even after applying the lower MBS prepayment rates, the registrant should provide sufficient comments.

Part 1 - (Re)insurers that write mortgage business are to shock their exposure for this business by assuming the default rate to be 5.5% (equivalent to approximately 90.0% TVaR) for their mortgage book and applied instantaneously. Assets and liabilities subject to mortgage-related default risk should be shocked.

Mortgage Loan Shock 2 Part 2 - (Re)insurers holding agency MBS and real-estate securities as investment assets subject to prepayment risk are to shock these investments by assuming that the MBS will prepay at an annual CPR of 40% instantaneously. If the 40% CPR produces capital gains, the insurer is to stress the CPR at 0%, 5% and 10%. The expectation is that if using a CPR of 40% produces a gain, then applying a substantially lower MBS prepayment shock rate of 10% or less will likely produce capital losses. If a registrant still reports capital gains even after applying the lower MBS prepayment rates, the registrant should provide sufficient comments.

C. UNDERWRITING LOSS SCENARIOS

The insurer/group is to run the Lloyd's-developed Realistic Disaster Scenarios (RDS) as specified in Lloyd's Handbook on "Realistic Disaster Scenarios – Scenario Specification 2022" using aggregates in force of 1 January 2023³.

This document provides details on ultimate industry-wide settlement values and key assumptions, and the insurer/group is to utilise its knowledge of its market share and other pertinent details to arrive at its expected losses. Details of all key assumptions and calculations utilised to arrive at final results must be presented.

Further, certain non-peak perils that do not currently exist in vendor models are included in this document, along with the details of key assumptions.

1) ***Modelled RDS***

Provided the insurer/group has one or more of the commercially available models (Risk Management Solutions (RMS), AIR Worldwide (AIR), and/or Catastrophe Risk Management (EQECAT)) or other proprietary models, it is to use the model(s) to evaluate its expected losses emanating from the specified RDS catalogue described below. The insurer/group must disclose the model(s) specifications and model version used under each circumstance.

Return Periods:

The insurer/group is to run all the events from each of the scenario groupings (US Windstorm, US Earthquake, Non-US Windstorm, and Non-US Earthquake) described below and calculate and submit both:

- a) Occurrence return period of each event (e.g., 1-in-50 year event, 1-in-100 year event), i.e., the likelihood of an event occurring in a given year; and
- b) Relative return period (or "aggregate return period"), i.e., use the underlying loss distribution of the aggregate net probable maximum loss (as submitted in the Bermuda Solvency Capital Requirement (BSCR) Risk Management Schedule V item (i) for group insurance companies and Risk Management Schedule V item (h) for Class 4 and 3B insurers) to calculate the corresponding return period (e.g., 1-in-50 year event, 1-in-100 year event) of each event.

³ Where the fiscal year does not correspond to the calendar year, in-force exposure on the day following the fiscal year-end should be used rather than 1 January 2023.

For example, the return period for a UW1 Northeast Hurricane loss event of US\$78 billion industry loss event may occur once every 300 years (i.e., occurrence basis). The stress scenarios are specifically selected to be extreme events with a low probability of occurring. For the occurrence return period, the Authority is seeking a comparison to how the insurer's losses under the stress scenarios compare to the insurer's loss for the overall peril. For this relationship, looking at the insurer's stressed loss compared to the insurer's occurrence return period (OEP⁴) curve for the event is the most helpful. For UW1 Northeast Hurricane, the modelled events are selected based on the definitions below. This may be a single event from the catalogue or a small subset of events. The losses from these events are then simulated based on the exposures of the insurer. This will produce an expected loss cost to the insurer under the stress scenario. (i.e., US\$400 million). This US\$400 million loss is compared to the insurer's OEP curve for all Northeast Hurricane events and is found to be at the 98th percentile. The occurrence return period would be given as 1 in 50 years.

For the aggregate return period (AEP⁵), the Authority is trying to assess how the insurers' losses in a stress scenario will compare to the overall AEP curve of the company. The AEP curve used should be the same curve used to inform the calculation of the net probable maximum loss and reported in the Cat returns of the BSCR. For this same event, comparing the US\$400 million loss to the insurers' net AEP curve for all perils combined would be at the 92nd percentile. This would be reported as a relative return period of 1 in 12.5 years.

For the OEP, the net loss impact of the stress scenario modelled using the selected events should be compared to the insurer's net OEP curve for the specified peril using all events. For the relative return period, the net loss impact of the stress scenario modelled using the selected events for a specific peril should be compared to the insurer's overall net AEP curve that was used to inform the net probable maximum loss and reported in the Cat returns in the BSCR.

The insurer/group is to include demand surge and storm surge for storm events and demand surge and fire following for earthquakes. All lines of business and exposures should be included in the final estimates; any deviations from this requirement should be noted.

a) US Windstorm

UW1. Northeast Hurricane

The insurer/group should assume an US\$81 billion industry property loss, considering demand surge and storm surge from a northeast hurricane making landfall in New York State. The hurricane also generates significant losses in the States of New Jersey, Connecticut, Massachusetts, Rhode Island and Pennsylvania.

In assessing its potential exposures, the insurer/group should consider exposures in:

- a) Both main and small ports that fall within the footprint of the event
- b) Both main international and small airports that fall within the footprint of the event

⁴ The OEP represents the probability of seeing any single event within a defined period (one year in this case) with a particular loss size or greater.

⁵ The AEP represents the probability of seeing total annual losses of a particular amount or greater.

The insurer/group should assume the following components of the loss:

- | | |
|-------------------------|-------------------|
| a) Residential property | US\$49.50 billion |
| b) Commercial property | US\$31.50 billion |
| c) Auto | US\$1.75 billion |
| d) Marine | US\$0.75 billion |

The insurer/group should consider all other lines of business that would be affected by the event.

Exclusion: The insurer/group should exclude contingent business interruption losses from this event.

UW2. Carolinas Hurricane

The insurer/group should assume a US\$39 billion industry property loss, including consideration of demand surge and storm surge from a hurricane making landfall in South Carolina.

In assessing its potential exposures, the insurer/group should consider exposures in:

- a) Main and small ports that fall within the footprint of the event
- b) Main international and small airports that fall within the footprint of the event

The insurer/group should assume the following components of the loss:

- | | |
|-------------------------|-------------------|
| a) Residential property | US\$26.00 billion |
| b) Commercial property | US\$13.00 billion |
| c) Auto | US\$0.53 billion |
| d) Marine | US\$0.27 billion |

The insurer/group should consider all other lines of business that would be affected by the event.

Exclusion: The insurer/group should exclude contingent business interruption losses from this event.

UW3. Miami-Dade Hurricane

The insurer/group should assume a US\$131 billion industry property loss, including consideration of demand surge and storm surge from a Florida hurricane making landfall in Miami-Dade County.

The insurer/group should assume the following components of the loss:

- | | |
|-------------------------|-------------------|
| a) Residential property | US\$66.00 billion |
| b) Commercial property | US\$65.00 billion |
| c) Auto | US\$2.25 billion |
| d) Marine | US\$1.00 billion |

The insurer/group should consider all other lines of business that would be affected by the event.

Exclusion: The insurer/group should exclude contingent business interruption losses from this event.

UW4. Pinellas Hurricane

The insurer/group should assume a US\$134 billion industry property loss, including consideration of demand surge and storm surge from a Florida hurricane making landfall in Pinellas County.

The insurer/group should assume the following components of the loss:

- a) Residential property US\$94.50 billion
- b) Commercial property US\$39.50 billion
- c) Auto US\$2.00 billion
- d) Marine US\$1.00 billion

The insurer/group should consider all other lines of business that would be affected by the event.

Exclusion: The insurer/group should exclude contingent business interruption losses from this event.

UW5. Gulf Windstorm (onshore)

The insurer/group should assume a US\$111 billion industry property loss, including consideration of demand surge, storm surge and offshore energy insured losses from a Gulf of Mexico hurricane making landfall.

In assessing its potential exposures, the insurer/group should consider exposures in:

- a) Main and small ports that fall within the footprint of the event
- b) Main international and small airports that fall within the footprint of the event

The insurer/group should assume the following components of the loss:

- a) Residential property US\$67.50 billion
- b) Commercial property US\$43.50 billion
- c) Auto US\$1.00 billion
- d) Marine US\$1.00 billion

The insurer/group should consider all other lines of business that would be affected by the event.

Exclusion: The insurer/group should exclude contingent business interruption losses from this event.

b) US Earthquake

UE1. Los Angeles Earthquake

The insurer/group should assume a US\$78 billion industry property (shake and fire following) loss, including consideration of demand surge.

The insurer/group should assume the following components of the loss:

- a) Residential property US\$36.00 billion
- b) Commercial property US\$42.00 billion
- c) Workers compensation US\$5.50 billion
- d) Marine US\$2.25 billion
- e) Personal accident US\$1.00 billion
- f) Auto US\$1.00 billion

The insurer/group should consider all other lines of business that would be affected by the event. For

example, for personal accident and workers compensation losses, the insurer/group should assume that there will be 2,000 deaths and 20,000 injuries as a result of the earthquake and that 50% of those injured will have personal accident cover.

Exclusion: The insurer/group should exclude contingent business interruption losses from this event.

UE2. San Francisco Earthquake

The insurer/group should assume an US\$80 billion industry property (shake and fire following) loss, including consideration of demand surge.

The insurer/group should assume the following components of the loss:

a) Residential property	US\$40.00 billion
b) Commercial property	US\$40.00 billion
c) Workers compensation	US\$5.50 billion
d) Marine	US\$2.25 billion
e) Personal accident	US\$1.00 billion
f) Auto	US\$1.00 billion

The insurer/group should consider all other lines of business that would be affected by the event. For example, for personal accident and workers compensation losses, the insurer/group should assume that there will be 2,000 deaths and 20,000 injuries due to the earthquake and that 50% of those injured will have personal accident cover.

Exclusion: The insurer/group should exclude contingent business interruption losses from this event.

UE3. New Madrid Earthquake

The insurer/group should assume a US\$44 billion industry property (shake and fire following) loss, including consideration of demand surge.

The insurer/group should assume the following components of the loss:

a) Residential property	US\$30.50 billion
b) Commercial property	US\$13.50 billion
c) Workers compensation	US\$2.50 billion
d) Marine	US\$1.50 billion
e) Personal accident	US\$0.50 billion
f) Auto	US\$0.50 billion

The insurer/group should consider all other lines of business that would be affected by the event. For example, for personal accident and workers compensation losses, the insurer/group should assume that there will be 1,000 deaths and 10,000 injuries due to the earthquake and that 50% of those injured will have personal accident cover.

For business interruption, the insurer/group should assume that the overland transport systems are severely damaged, and business impacted, leading to significant business interruption exposure for a period of 30 days. This is restricted to the inner zone of maximum earthquake intensities.

c) Non-US Windstorm

IW1. European Windstorm

This event is based upon a low-pressure track originating in the North Atlantic basin, resulting in an intense windstorm with maximum/peak gust wind speeds in excess of 20 metres per second (45 miles per hour or 39 knots). The strongest winds occur to the south of the storm track, resulting in a broad swath of damage across southern England, northern France, Belgium, Netherlands, Germany and Denmark. The insurer/group should assume a €24 billion industry property loss.

The insurer/group should assume the following components of the loss:

- | | |
|-------------------------|----------------|
| a) Residential property | €16.00 billion |
| b) Commercial property | €6.50 billion |
| c) Agricultural | €1.50 billion |
| d) Auto | €0.75 billion |
| e) Marine | €0.40 billion |

The insurer/group should consider all other lines of business that would be affected by the event. The loss amount should be reported in Bermuda equivalent as noted under the general instructions above.

IW2. Japanese Typhoon

This event is based on the Isewan (Vera) typhoon event of 1959. The insurer/group should assume a ¥1.7 trillion industry property loss.

In assessing its potential exposures, the insurer/group should consider exposures in:

- a) Main and small ports that fall within the footprint of the event
- b) Main international and domestic airports, as well as small airports, that fall within the footprint of the event

The insurer/group should assume the following components of the loss:

- | | |
|-------------------------|--------------|
| a) Residential property | ¥750 billion |
| b) Commercial property | ¥950 billion |
| c) Marine | ¥50 billion |

The insurer/group should consider all other lines of business that would be affected by the event. The loss amount should be reported in Bermuda equivalent as noted under the general instructions above.

d) Non-US Earthquake

IE1. Japanese Earthquake

This event is based on the Great Kanto earthquake of 1923. The insurer/group should assume an ¥8 trillion insured industry property loss from this event.

In assessing its potential exposures, the insurer/group should consider exposures in:

- a) Main ports, as well as smaller ports, that fall within the footprint of the event
- b) Main international and domestic airports, as well as smaller airports, that fall within the footprint of the event

The insurer/group should assume the following components of the loss:

- | | |
|-------------------------|---------------|
| a) Residential property | ¥2.5 trillion |
| b) Commercial property | ¥5.5 trillion |
| c) Marine | ¥150 billion |
| d) Personal accident | ¥50 billion |

The insurer/group should consider all other lines of business that would be affected by the event. The loss amount should be reported in Bermuda equivalent as noted under the general instructions above.

For personal accident losses, the insurer/group should assume that there will be 2,000 deaths and 20,000 injuries as a result of the earthquake and that 50% of those injured will have personal accident cover. Liability exposures should also be considered.

For business interruption, the insurer/group should assume that the overland transport systems are severely damaged, and business impacted, leading to significant business interruption exposure for a period of 60 days. This is restricted to the inner zone of maximum earthquake intensities.

e) Aerospace/Aviation Event

AI. Aviation Collision

The insurer/group should assume a collision between two aircrafts over a major city, anywhere in the world, using the insurer's or group's two largest airline exposures.

The insurer/group should assume a total industry loss of up to US\$4 billion, comprising up to US\$2 billion per airline and any balance up to US\$1 billion from a major product manufacturer's product liability policy(ies) and/or traffic control liability policy(ies), where applicable.

Consideration should be given to other exposures on the ground, and all key assumptions should be stated clearly.

The information should include:

- a) The city over which the collision occurs;
- b) The airlines involved in the collision;
- c) Each airline's policy limits and attachment points for each impacted (re)insurance contract (policy);
- d) The maximum hull value per aircraft involved;
- e) The maximum liability value per aircraft involved;
- f) The name of each applicable product manufacturer and the applicable contract (policy) limits and attachment points (deductibles); and
- g) The name of each applicable traffic control authority and the applicable contract (policy) limits and attachment points (deductibles).

f) Marine Event

The insurer/group is to select one scenario from below that would represent its largest expected loss.

M1. Marine Collision in Prince William Sound

A fully-laden tanker calling at Prince William Sound is involved in a collision with a cruise vessel carrying 500 passengers and 200 staff and crew. The incident involves the tanker spilling its cargo and the loss of lives aboard both vessels.

Assume 70% tanker owner and 30% cruise vessel apportionment of negligence and that the collision occurs in US waters.

Assume that the cost to the tanker and cruise vessel owners of the oil pollution is US\$2 billion. This would lead to oil pollution recoveries on the International Group of P&I Associates' General Excess of Loss Reinsurance Programme of US\$1 billion from the tanker owner and US\$0.55 billion from the cruise owner.

Assume: 1) 125 fatalities with an average compensation of US\$1.5 million for each fatality, 2) 125 persons with serious injuries with an average compensation of US\$2.5 million for each person, and 3) 250 persons with minor injuries with an average compensation of US\$0.5 million for each person.

M2. Major Cruise Vessel Incident

A US-owned cruise vessel is sunk or severely damaged with attendant loss of life, bodily injury, trauma and loss of possessions. The claims were to be heard in a Florida court.

Assume: 1) 500 passenger fatalities with an average compensation of US\$2 million, 2) 1,500 injured persons with an average compensation of US\$1 million, and 3) assume additional protection and indemnity loss of US\$500 million to cover costs such as removal of wreck and loss of life and injury to the crew.

2) Non-Peak Perils

For each of the events below, the insurer/group is to calculate and submit both:

- a) Occurrence return period (e.g., 1-in-50 year event, 1-in-100 year event) of the loss; and
- b) Relative return period (i.e., use the underlying loss distribution of the aggregate net probable maximum loss (submitted in the BSCR) to calculate the corresponding return period (e.g., 1-in-50 year event, 1-in-100 year event) of the loss).

N1. US Oil Spill

The insurer/group is to assume an oil spill releasing at least five million barrels of crude oil into the sea. In addition to property, the insurer/group is also to consider in its assumptions the following coverage: business interruption, workers compensation, directors and officers, comprehensive general liability, environmental/pollution liability and other relevant exposures. Assume 1) 15 fatalities, 2) 20 persons with serious injuries and 3) an estimated insured industry loss of US\$2.1 billion.

All key assumptions, including demand surge, should be stated clearly and submitted to the Authority.

N2. US Tornadoes

The insurer/group is to assume an EF5 multiple-vortex tornado touching down in several heavily populated cities and towns in the south and mid-west regions of the US. Assume 1) 125 fatalities, 2) 600 persons with mild-to-serious injuries, 3) 20,000 people are displaced and left homeless, 4) 50% to 75% of the 10,000 buildings (commercial, residential and other outbuildings included) have been damaged by the tornado's wind field and 5) an estimated insured industry loss of US\$5.0 billion. Consideration should be given to the cumulative effect of such a large number of total losses.

All key assumptions, including demand surge, should be stated clearly and submitted to the Authority.

N3. Australian Flooding

The insurer/group is to assume heavy rainfalls across major cities in Australia, causing severe flooding and/or repeated flash flooding. Assume 1) 40 fatalities, 2) 200,000 people are affected and displaced, 3) 190 persons with mild-to-serious injuries, 3) 70% of the 8,500 homes and businesses that are flooded could not be recovered, 4) suspension of all agricultural and mining operations and 5) an estimated insured industry loss of US\$2.2 billion. The insurer/group is to include landslides following the flood.

All key assumptions, including demand surge, should be stated clearly and submitted to the Authority.

N4. Australian Wildfires

The insurer/group is to assume a series of bushfires during extreme bushfire-weather conditions across Australian states affecting populated areas. Assume 1) 180 fatalities, 2) 500 people with mild-to-serious injuries, 3) displacement of 7,600 people, and 4) destruction of over 5,000 buildings (commercial, residential and other outbuildings included). Assume an estimated insured industry loss of US\$1.3 billion.

All key assumptions, including demand surge, should be submitted and stated clearly to the Authority.

3) Pandemic Scenarios (domestic health writers only)

P1. Contaminated food exposure

The insurer/group is to assume a shipment of a contaminated food item reaches Bermuda ahead of a public holiday. The food item is contaminated with a highly toxic chemical agent, whose effects are made worse when consumed with alcohol; the chemical agent affects the renal system and liver. Assume 1) 80% of the resident population is exposed, 2) 30% of those are severely ill requiring medical attention, 3) 15% of those are ill enough to require hospitalisation, and 4) 5% of those have to be transported for emergency overseas intensive care. Also, assume that due to the worsening effect of alcohol consumption, 90% of the affected are adults aged 18 to 64.

Further, assume 1) the pandemic and occurrences arise evenly over a six-day period, but after four days the contaminant agent is confirmed, physicians cease assessing patients and advice is offered publicly, 2) 50 physicians are available and that 75% of them are unaffected by the illness, 3) two emergency response centres are set up on the island to significantly increase the number of beds available to supplement hospital beds, and 4) capacity at overseas hospitals is assumed to be available and those residents affected are not restricted from being transferred to overseas hospitals.

Assume an estimated insured industry loss of US\$100 million.

All key assumptions should be submitted and stated clearly to the Authority.

D. OTHER UNDERWRITING LOSS SCENARIOS

Where the underwriting scenarios under Section III above either do not apply or partially apply to the insurer/group resulting in de minimis loss projections, the insurer/group should submit to the Authority three of its own underwriting loss scenarios and also use these in the calculation under Section G. Worst-Case Annual Aggregate Catastrophe Loss Scenario below.

While primarily property writers would qualify if they meet this description, insurers/groups writing a

significant amount of casualty business where the potential arising from casualty losses exceeds that from property definitely meet this criteria.

The insurer/group is to submit the following for each of the three scenarios:

- a) Description of the scenarios and related key assumptions; and
- b) The post-stress/scenario positions on aggregate statutory assets and statutory liabilities that would be observed immediately upon the occurrence of the event (stress/scenario) (both with and without the effect of reinsurance and/or other loss mitigation instruments).

In addition, for each of the scenarios above, the insurer/group is to calculate and submit both:

- a) Occurrence return period (e.g., 1-in-50 year event, 1-in-100 year event) of the loss; and
- b) Relative return period (i.e., use the underlying loss distribution of the aggregate net probable maximum loss (submitted in the BSCR) to calculate the corresponding return period (e.g., 1-in-50 year event, 1-in-100 year event) of the loss).

E. LIABILITY LOSS ACCUMULATION SCENARIOS

The insurer/group must complete the following scenarios, which estimate potential insurance loss accumulations relating to liability exposures. The scenarios aim to capture risk on liability exposures that are generally not adequately reflected by historical claims experience. Such risks tend to materialise slowly and impact many exposure years.

a) Scenario 1 - New latent liability

The scenario aims to cover a “mass tort” event, for example, following a court decision, a general and potentially legally enforceable opinion emerges that a specific product or substance causes observed or potential future adverse effects, such as bodily injury, property damage or environmental damage. This is expected to lead, during the year and later, to claims on the product liability insurance of the producers, followed by mass litigation against companies that are distributing or using or have distributed or used the product or substance, leading to an accumulation of potentially worldwide claims on general commercial liability and workers compensation/employers liability insurance policies. Losses not only arise from the current policy year but also prior years not excluded by policy terms such as “claims made” coverage or statutes of limitations. The scenario takes into consideration that the amount recognised at the end of the one-year time horizon is smaller than the maximum possible ultimate loss from the scenario due to the incompleteness of available information and uncertainty on the subsequent development.

The exposure measure for the scenario is the net written premium for the most recent underwriting year, onto which the following risk factors are applied.

Selected Factors	product liability	product liability	gen comm liability	gen comm liability	empl liab/ workers comp	empl liab/ workers comp
	P	NP	P	NP	P	NP
EEA and Switzerland	45%	90%	25%	50%	25%	50%
US/Canada	65%	130%	35%	75%	15%	30%
Japan	35%	65%	20%	35%	20%	35%
China	25%	50%	15%	30%	15%	30%
Other developed markets	30%	60%	15%	35%	15%	35%
Emerging markets	25%	50%	15%	30%	15%	30%

The risk factors are calibrated based on a 1-in-200 year market loss event that assumes to affect the eight most recent policy years for all latent liability segments with the exception of the line of business Employers' Liability/Workers Compensation (EL/WC) and the region "USA and Canada" (US/CA), for which it is three years, reflecting local statutes of limitations.

An adjustment is made to the loss calculation by applying a historical premium adjustment factor to reflect the number of prior years' exposed (subject to the pre-specified cap) and the material changes in exposures across the impacted policy years. This is approximated using the following two inputs:

1. Average annual growth in net written premium over the years affected
2. Specifying the years over which the annual growth is affected

The approximation assumes a constant growth factor year on year. If insurers have been writing business for a period of less than eight years (or three for US/CA EL/WC), this should be reflected in their inputs to the stress.

Insurers whose primary business is not writing "live" business (e.g., active runoff insurers), therefore, do not have material premium/Cat risk and do not need to calculate this scenario.

b) Scenario 2 - Deterioration in existing US Asbestos and Environmental (A&E) and UK Asbestos reserves

The scenario aims to reflect potential deterioration in existing US Asbestos, US Environmental and UK Asbestos reserves and is calculated over a number of steps detailed below. Insurers with total US A&E and UK Asbestos net reserves less than US\$50 million do not need to calculate this scenario.

Calculation of US and A&E stress

1. Potential underserving in US A&E reserves – Studies of US market A&E reserves, performed by various parties (e.g., Fitch, AM Best) over a number of years, have identified potential underserving in the industry for both risks. The survival ratio is a widely used industry benchmark to assess US A&E reserve strength. Step one uses the insurer's own survival ratios and uplifts their latest year-end reserves to target survival ratios of 15 and 12 for A&E reserves, respectively. The information required is as follows:
 - a) Insurer's own survival ratio for their latest year-end net Generally Accepted Accounting Principles (GAAP) reserves (companies should strive to minimise any distortions in their survival ratio calculation; for example, the acquisition of a new block of A&E reserves in the most recent year is likely to overstate the survival ratio if the annual payment amounts used to estimate the denominator do not also account for these newly acquired exposures)
 - b) Net GAAP reserves for US Asbestos and US Environmental for the three most recent year ends
 - c) Net paid over the last three years for US Asbestos and US Environmental and relating only

to reserves/exposures present on the insurer's books at the beginning of the year⁶. Material commutations should also be excluded from the paid in order to prevent distortions, which would be “washed away” in the industry statistics.

2. Increase in projected claims due to medical advances – Over the last few years there have been developments in immunotherapy drugs that could potentially prolong the life expectancy of mesothelioma sufferers. As a result, more claimants have been requesting this treatment, which could potentially increase the mesothelioma claim severity (e.g., treatment, temporary accommodation, prolonged care costs). The stress applies a small uplift (10%) to explicitly allow for such medical advances. Insurers who already have an explicit loading for medical advances may use it to offset this uplift. Unless medical developments are explicitly considered in the derivation of the insurer's future medical inflation assumption, then this item is not considered to be part of the medical inflation parameter. The following information is required:
 - a) Any explicit loading the insurer has included in their reserves for medical advances.
3. Increase in projected claims inflation for US A&E reserves – Assume an additive increase of 4% in the annual inflation applicable to all future claim payments. There are several potential sources of this increase, including an increase in the base indices, superimposed inflation, court inflation, etc. The following information is required:
 - a) Latest year-end net GAAP reserves recalculated assuming an additive increase of 3% in the annual inflation applicable to all future claim payments for US Asbestos and US Environmental
 - b) Effective duration of US Asbestos and US Environmental liabilities.
4. Converting to one-year loss – Insurers should provide an appropriate emergence factor to convert the stress loss from ultimate view to one-year view. The following information is required:
 - a) Ultimate to one-year emergence factorThe one-year emergence factor is only applied to the claims inflation stress (3) component.

Calculation of UK Asbestos stress

1. New claims arising beyond 2050 - UK Asbestos models have historically understated the period over which new asbestos claims may arise. The initial models projected the cutoff date for new claims at 2040; this was later revised to 2050, while the latest studies suggest a further pushback of the cutoff date to 2060. This stress applies an uplift of 15% to account for new claims arising beyond 2050. Insurers who already reserve for new claims arising beyond 2050 may use this portion of the reserves to offset the stress factor. The following information is required:
 - a) The insurer's proportion of Asbestos reserves relating to new claims arising beyond 2050.
2. Deterioration in the projected number of claims up to 2050 – The nature of the Asbestos risk makes it difficult to quantify with great certainty the number of future claims arising. An example of this uncertainty is the repeated revision of the peak year of mesothelioma deaths to a later year. This stress applies an uplift of 15% to account for an increase in claims reported up to 2050. No inputs from the insurer are required for this component.
3. Increase in projected claims due to medical advances – Over the last few years, there have been developments in immunotherapy drugs that could potentially prolong the life expectancy of mesothelioma sufferers. As a result, more claimants have been requesting this treatment, which could potentially increase the mesothelioma claim severity (e.g., treatment, temporary accommodation, prolonged care costs). The stress applies a small uplift (10%) to explicitly allow for such medical advances. Insurers who already have an explicit loading for medical advances may use it to offset this uplift. Unless medical developments are explicitly considered in the derivation of the insurer's future medical inflation assumption, then this item is not considered

⁶ This ensures that the payments are 'matched' to the opening reserves.

- to be part of the medical inflation parameter. The following information is required:
- a) Any explicit loading the insurer has included in their reserves for medical advances.
 4. Increase in projected claims inflation for UK Asbestos reserves – Assume an additive increase of 3% in the annual inflation applicable to all future claim payments. There are several potential sources of this increase, including an increase in the base indices, superimposed inflation, court inflation, etc. The following information is required:
 - a) Latest year-end net GAAP reserves recalculated assuming an additive increase of 3% in the annual inflation applicable to all future claim payments for UK Asbestos
 - b) Effective duration of UK Asbestos liabilities.
 5. Converting to one-year loss – Insurers should provide an appropriate emergence factor in order to convert the stress loss from ultimate view to one-year view. The following information is required:
 - a) Ultimate to one-year emergence factor
 The one-year emergence factor is only applied to the claims inflation stress (4) and the claims count stress (2) components.

c) **Scenario 3 – Insurer specific A&E reserve deterioration scenario**

Insurers with material A&E reserves should develop their own loss scenario(s) and include it in the “Other Underwriting Loss Scenarios” section. The assumptions underlying the scenario should also be attached.

F. RATING DOWNGRADE

The insurer/group is to submit detailed qualitative disclosure of the impact upon both its statutory statement of income and liquidity positions of a ratings downgrade of its Bermuda legal entity or group by two notches or below A-, whichever is lower. The disclosure should cover and provide an indication of the relative impact/severity of collateral requirements, loss payment triggers on in-force policy contracts, claw-backs, and/or other adverse financial and liquidity implications of the downgrade.

Upon reviewing the disclosure, the Authority may request additional information relating to the liquidity impact and potential losses.

G. WORST-CASE ANNUAL AGGREGATE CATASTROPHE LOSS SCENARIO

The insurer/group is to submit the following:

1. A combination of a financial market scenario and three largest underwriting scenarios

The aggregate impact of:

- a) A financial market scenario under Section A above, which would result simultaneously in the occurrence of R5; and
- b) An aggregation of the three largest net underwriting losses under Sections III or IV above, as applicable.

It is assumed that the underwriting loss events follow in quick succession, and there is the inability to engage in capital or other fundraising activities. Further, it is assumed that there is no geographic correlation between these non-economic events. The insurer/group is to disclose its assumptions, including any magnified demand surge, if applicable, from the multiple events.

The insurer/group is to calculate and submit both:

- a) Occurrence return period (e.g., 1-in-50 year event, 1-in-100 year event) of the loss; and
- b) Relative return period (i.e., use the underlying loss distribution of the aggregate net probable maximum loss (submitted in the BSCR) to calculate the corresponding return period (e.g., 1-in-50 year event, 1-in-100 year event) of the loss).

2. *Either one of the following scenarios that it would consider a worst-case scenario:*

a) A series of loss simulations or results of other analysis performed related to extreme tail events

The insurer/group is to run a series of loss simulations, or other analyses performed related to extreme tail events that include all in-force policies for 1 January 2023⁷. The insurer/group must also submit its underlying assumptions, inter alia, risk measure, return period and time horizon.

The underlying assumptions are to include, but are not limited to, assumptions relating to reinstatement premiums and/or vendor model(s). Where proprietary or vendor model(s) are used for and serve as inputs to the simulation, the insurer/group must disclose the model(s) specifications (e.g., AIR, RMS, EQECAT, proprietary), model version and the assumptions used (e.g., inclusion or exclusion of demand surge, standard versus near-term).

b) Insurer/group-specific worst-case scenario

The insurer/group is to submit a description of its own worst-case annual aggregate loss scenario and the underlying assumptions. The scenario should be at a level considered extreme but plausible by the insurer/group.

In all cases, the insurer/group is to calculate and submit both:

- a) Occurrence return period (e.g., 1-in-50 year event, 1-in-100 year event) of the loss; and
- b) Relative return period (i.e., use the underlying loss distribution of the aggregate net probable maximum loss (submitted in the BSCR) to calculate the corresponding return period (e.g., 1-in-50 year event, 1-in-100 year event) of the loss).

H. REVERSE STRESS TEST SCENARIO

If an insurer/group performs reverse stress testing (as outlined in the CISSA/GSSA IX(b) question 2), then the insurer/group is to provide the key assumptions, which includes specific market risk scenarios, loss figures and return period that would cause such business failure. Such scenarios should be reported and should be contrasted with the scenarios in the current guidelines (i.e., whether worse or better scenarios than those provided by the BMA cause the (re)insurance company to fail).

If the insurer/group does not perform reserve stress tests, then insurers are to calculate the clearance between their available economic statutory capital and surplus and Enhanced Capital Requirement (ECR) to

⁷ Where the fiscal year does not correspond to the calendar year, in-force exposure on the day following the fiscal year-end should be used rather than 1 January 2023.

determine the size of loss that would cause them to breach their ECR and provide the occurrence and relative return period of such event.

I. TERRORISM

The insurer/group is to submit the estimated top 10 losses in descending order arising from explosion of a two-tonne bomb based upon policies in force at 1 January 2023⁸, including the vendor or internal model description and vendor model version, if applicable. For each of the projections, provide the following:

- a) State/province
- b) Country
- c) Total gross loss estimate
- d) TRIP9 or other recoverable if any
- e) Reinsurance recoveries if any
- f) Total net loss estimate
- g) Target location¹⁰ if known

Details of all key assumptions and calculations utilised to arrive at final results must be presented. The insurer/group is encouraged to consult the Authority's Catastrophe Return Guidance Note for additional guiding principles in relation to terrorism.

J. TECHNOLOGY RISK

Section a) Cyber risk - underwriting

- a) If the (re)insurer writes affirmative cyber risk policies, provide details for the policies written during the reporting period;
- b) If the (re)insurer does not write any affirmative cyber policies, skip item 1 and proceed to item 2 to provide details of non-affirmative cyber exposures in all other policies written. This section must be completed by affirmative cyber writers as well, in addition to a).
- c) For (re)insurers, unconsolidated results relate to the Bermuda standalone operations (excluding subsidiaries), and consolidated results relate to Bermuda entity level results (including subsidiaries).
- d) For (re)insurers, answering item 1 below, please specify if you are consolidated by another Bermuda (re)insurer:

Below is additional guidance to complete this for **affirmative cyber underwriting risk**:

⁸ Where the fiscal year does not correspond to the calendar year, in-force exposure on the day following the fiscal year-end should be used rather than 1 January 2023.

⁹ TRIP is the Terrorism Risk Insurance Programme enacted on 26 December 2007 when the Terrorism Risk Insurance Programme Reauthorization Act of 2007 was signed into law. This extends the Terrorism Risk Insurance Act through 31 December 2022.

¹⁰ In this context target location can be considered the nearest target location as defined by any of the vendor models or other internal/external databases of locations perceived particularly prone to terrorism risk. Often these are considered "trophy" locations (such as the Rockefeller Center, Trump Tower, US Capitol building etc.) or have other factors which make them significant from a terrorism perspective (such as bridges, power stations etc.).

Line	Item	Description/Guidance
I	Cyber risk	<p>If a (re)insurer/group writes affirmative cyber risk (re)insurance policies, it shall provide the number of policies written, premiums (on a gross and net basis) for the reporting period, details of the policy limit (on a gross and net basis) and if the policy has no limit, the estimated maximum loss for that business, and confirmation if the insurer/group is a reinsurer on the underlying policy.</p> <p>(Re)insurers that have (re)insurance policies that include cyber risk exposure by reason of not containing a cyber-exclusion clause (such as directors and officers policies that include cyber risk) shall provide an attachment in the BSCR model detailing the (re)insurance products that have these exposures.</p>
I.a).1.d).	Name of the parent Bermuda (re)insurer	Please specify the immediate parent, which is another commercial (re)insurer.
(i)	Total number of cyber policies in force (units)	All information in relation to policies in force must be as of the first day of the month following year-end. For example, for the year ended 31 December 2022, the policies in-force date will be 1 January 2023.
	Reinsurance policies	For RAD policies, the group/(re)insurer is expected to make the necessary assumptions in relation to general terms of the policies written.
	Package	For cyber risk written as part of a package, indicate the data related to the cyber risk alone. In cases where the premium or other amounts specific to cyber risk are not broken out separately, indicate your best estimate amounts.
(ii)	Gross exposure for policies in force ('\$000)	The amount reported should be the group/(re)insurer's total gross exposure for policies in force. Where a group/(re)insurer participates in syndicated policies, only the group/(re)insurer's share should form part of the reported amount.
(iii)	Net exposure for policies in force (\$'000)	The amount reported should be gross exposure less reinsurance (to include QS and retro).
(vii)	Net loss reserves (\$'000)	The amount reported should be gross loss reserves less reinsurance.
	Package	For cyber risk written as part of a package, indicate the data related to the cyber risk alone. In cases where the premium or other amounts specific to cyber risk are not broken out separately, indicate your best estimate amounts.
	Related party business	A (re)insurer must provide details related to the proportion of the business written in relation to related parties.
	Unrelated business (third party)	A (re)insurer must provide details related to the proportion of the business written in relation to unrelated parties.
(ii)	Gross exposure for policies in force ('\$000)	The amount reported should be the group/(re)insurer's total gross exposure for policies in force. Where a group/(re)insurer participates in syndicated policies, only the group/(re)insurer's share should form part of the reported amount.

(iii)	Net exposure for policies in force (\$'000)	The amount reported should be gross exposure less reinsurance.
	Location	This is the location where coverage is provided for. For example, if a policy is written in Bermuda to provide coverage for the US, then the location should be the US.
	Cyber underwriting risk appetite and limits	Please include as part of the BSCR attachments a document that shows the risk appetite and limits. If this is already included in the GSSA/CISSA, you do not need to attach a separate document.
	Location	This is the location where coverage is provided for. For example, if a policy is written in Bermuda to provide coverage for the US, then the location should be the US.
	Cyber underwriting risk appetite and limits	Please include as part of the BSCR attachments a document that shows the risk appetite (both affirmative and non-affirmative) and limits. If this is already included in the GSSA/CISSA or other attachments, you do not need to attach a separate document.

For all other non-cyber specific (re)insurance policies issued, provide the following on a **consolidated** basis (applicable to all insurers whether or not they write affirmative cyber policies):

Line	Item	Description/Guidance
2	Estimated potential gross exposure	<p>A group/(re)insurer must provide an estimate of the potential exposure for each line of business exposed to non-affirmative cyber claims. Examples include: where there is a sublimit related to technology risks, the potential exposure may be the total sublimit, and for an all-risk policy, potential exposure might be the total limit for such a policy. All of this will be the group/(re)insurer's share only.</p> <p>Note: The BMA is aware that there are instances where it is not straightforward to make these estimates, given the nature of the risk and how policies are structured. In this case, companies are encouraged to use any other reasonable basis to come up with the potential exposure. A document specifying how the company determined the potential exposure should be included in the filing as an attachment.</p>
	Cyber losses exclusion clause by line of business	If the entity has exclusion clause for a particular line of business, confirm if the exclusion is a full exclusion, partial exclusion or no exclusion available“”“”“”.

BMA Prescribed Cyber Stress Scenarios for insurers writing affirmative cyber covers or those that have material non-affirmative cyber exposures:

Line	Item	Description/Guidance
3	For the purpose of cyber stress scenarios, this section is applicable if at least one of the following is met:	<ol style="list-style-type: none"> 1. Affirmative cyber gross written premiums represents 15% or more of the total gross written premiums for the current year 2. Gross estimated affirmative cyber loss accounts for 10% of the current Capital and Surplus (C&S) 3. Gross estimated non-affirmative cyber loss accounts for 5% of the current C&S 4. Cyber-related loss events (either arising from affirmative cyber policy or non-affirmative policy responding to a cyber-loss event) constitute 15% of the total losses incurred for the most recent year-end.
	Assume cyber underwriting scenarios are generated by a perpetrator that is not a nation-state and that these scenarios do not trigger any cyberwar or other similar exclusions.	
	For reinsurers, please calculate separately on the basis that these attacks are deemed both as one event and as 10 separate events, returning whichever causes the largest net loss.	
	Cloud outage	<p><u>Event Definition:</u></p> <ol style="list-style-type: none"> a) A cyber-attack leading to the loss of availability of a company's cloud hosting services (i.e., the cloud-hosted services that a company uses), resulting in loss of availability of critical services and functions, and that disaster recovery is assumed to have failed to recover services; b) Impacts multinational organisations across industrial sector with the intention of causing major disruption and financial loss to organisations;

		<p>c) The attacks target vulnerabilities in the cloud hosting systems, web-based applications and/or software used by these organisations; and</p> <p>d) Multiple systems and/or multiple organisations using the same cloud hosting providers are affected.</p> <p><u>Stress Test Assumptions:</u> Assume the denial of service affects your top 10 policyholders (based on largest cyber net loss) due to an attack on a single cloud hosting company worldwide. The impact of the loss availability of all Information Technology (IT) services is for 72 weekday hours. All IT services mean both services hosted internally and externally by cloud hosting companies.</p>
	Ransomware	<p><u>Event Definition:</u></p> <p>a) A widespread malicious software attack that infects many policyholders' operations, resulting in ransom payments to recover compromised computer systems and internal data;</p> <p>b) Policyholder's operations are disrupted and may result in loss or corruption of sensitive data;</p> <p>c) All IT services become entirely unavailable for 72 weekday hours. All IT services can be taken to mean both services hosted internally and also those hosted externally by cloud hosting companies;</p> <p>d) Assume that disaster recovery efforts have failed to prevent the outage of services; and</p> <p>e) These outages cause severe disruption of the IT operations of the policyholders (severe is defined as no desktops, servers or IT services being available).</p> <p><u>Stress Test Assumptions:</u> Assume the impact affects the top 10 policyholders based on the largest cyber net loss. Assume that all client data at these organisations is lost, pursuing class actions, resulting in the insurer facing first and third-party liability claims.</p>
	Data breach	<p><u>Event Definition:</u> Both of the following two categories of data are exfiltrated from the company in large volume:</p> <p>a) Sensitive internal data; and</p> <p>b) Confidential client data, such as personally identifiable information (PII) at these organisations, are lost, and the company faces third-party liability claims.</p> <p>The organisation impacted face financial penalties arising from:</p> <p>a) Contracts with customers (customers can be taken to be both private individuals and companies);</p> <p>b) Fines from international regulators.</p> <p><u>Stress Test Assumptions:</u> Impacts the top 10 policyholders by largest cyber net loss worldwide. The attack disrupts the policyholder's operations for a duration of 24 hours.</p>

	Estimated gross loss	The amount reported should be the group/(re)insurer's total estimated loss impact from the prescribed stress scenario for both affirmative and non-affirmative covers <u>before</u> reinsurance/retrocession recoveries. Where a group/(re)insurer participates in syndicated policies, only the group/(re)insurer's share should form part of the reported amount.
	Estimated net loss	Gross exposure less any recoveries from reinsurance or retrocession.
	Total gross loss - affirmative cyber cover	Take into consideration the following: <ul style="list-style-type: none"> • First-party loss notification, associated costs and breach management costs, including crisis management • Business interruption (excluding physical damage) • Contingent business interruption • Third-party liability losses • Regulatory defence, legal fees and fines covered amounts • Other losses specified in the cyber policy
	Total net loss - affirmative cyber cover	Net loss relating to the portion of the total stress scenario, covered by affirmative covers, after reinsurance benefits
	Cyber gross premium written	Gross premiums written relating to a portion of the loss covered by affirmative cyber policies
	Cyber net premium written	Net premiums written relating to a portion of the loss covered by affirmative cyber policies
	Occurrence return period	Of each event (e.g., 1-in-50 year event, 1-in-100 year event), i.e. the likelihood of an event occurring in a given year. In this case, specify the return period of the estimated gross loss from the specific scenario against an insurer's own gross cyber catastrophe distribution.

Line	Item	Description/Guidance
4	Worst-case annual aggregate loss scenario description	Provide details of specific scenarios used to derive the “worst-case scenario loss” worst-case scenarios used, including average gross policy limits, the frequency and average severity assumptions used to develop the loss estimate. Scenarios should be used for affirmative cyber coverage only.