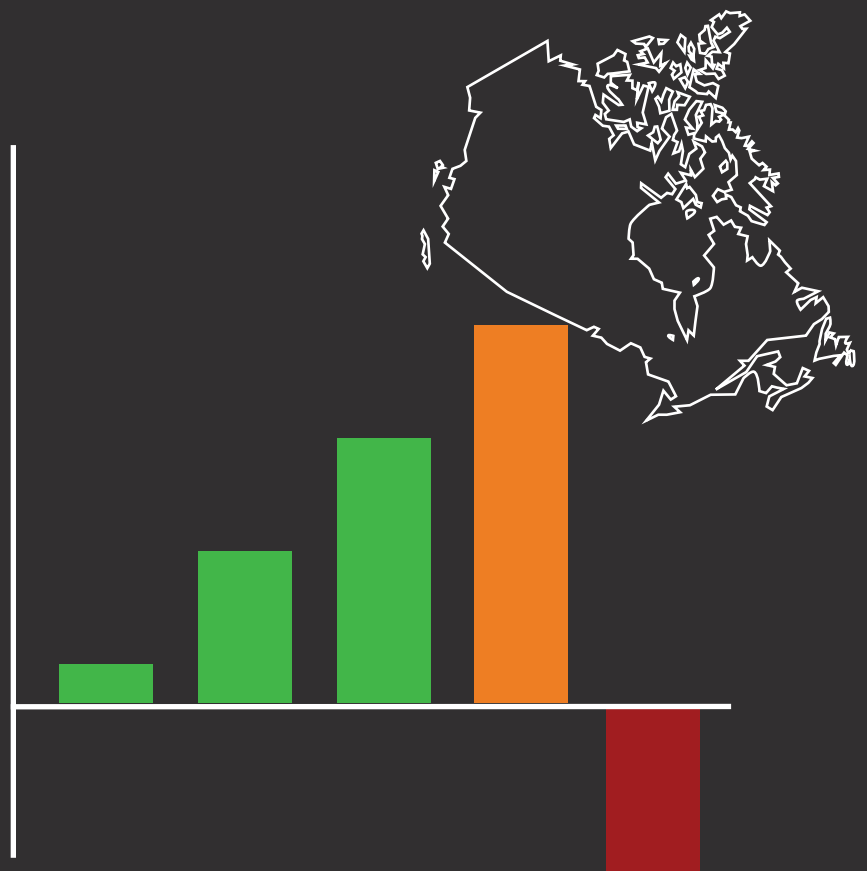
PACICC

Property and Casualty Insurance Compensation Corporation
Société d'indemnisation en matière d'assurances IARD

How Big is Too Big?

Update to the PACICC P&C Industry Model

The Tipping Point for Systemic Failure



By

Grant Kelly

The latest installment in the PACICC *Why insurers fail* series

2021

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PACICC's Mission and Principles

Mission Statement

The mission of the Property and Casualty Insurance Compensation Corporation (PACICC) is to protect eligible policyholders from undue financial loss in the event that a Member insurer becomes insolvent. We work to minimize the costs of insurer insolvencies and seek to maintain a high level of consumer and business confidence in Canada's property and casualty (P&C) insurance industry through the financial protection we provide to policyholders.

Principles

- In the unlikely event that an insurance company becomes insolvent, policyholders should be protected from undue financial loss through prompt payment of covered claims
- Financial preparedness is fundamental to PACICC's successful management support of insurance company liquidations, requiring both adequate financial capacity and prudently managed compensation funds
- Good corporate governance, well-informed stakeholders and cost-effective delivery of member services are foundations for success
- Frequent and open consultations with members, regulators, liquidators and other stakeholders will strengthen PACICC's performance
- In-depth P&C insurance industry knowledge – based on applied research and analysis – is essential for effective monitoring of insolvency risk

Contents

Acknowledgements

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Facts, observations and conclusions in this report are drawn from publicly available information. The author is solely responsible for all points made in this study, as well as any errors and/or omissions.

Data used in this analysis are from MSA Research, unless otherwise noted.

Executive Summary

In 2013, the Property and Casualty Insurance Compensation Corporation (PACICC) published a study that determined the threshold above which some form of catastrophic event (e.g. earthquake, grid failure, asteroid strike) would trigger the systemic failure of Canada's property and casualty (P&C) insurance industry – and to establish as accurately as possible, the "tipping point." The 2013 report used 2011 industry data. This tipping point was updated in a follow-up paper in 2016, which used 2015 industry data. The primary purpose of this paper is to update those earlier estimates using information about the state of the industry in 2019.

PACICC is a consumer protection agency, whose mission is to assist Canadian policyholders in the unlikely event that their insurance company becomes insolvent and is closed by regulators. Both the previous research studies highlighted the threshold above which Canada and Canadian policyholders would be exposed due to systemic failure. This paper shows that, despite strong regulation and the best efforts of highly capitalized and well re-insured private insurers to anticipate a very large event (such as a major earthquake), there are clear and definable limits to the capacity of the private insurance market and a clear and compelling requirement for the creation of a federal backstop mechanism to protect Canadians from the impact of a severe "tail-risk" event.

Key findings

Our modelling indicates that Canada's P&C insurers are ready to respond (with no impact expected on the solvency of well-run, healthy insurance companies) to a large disaster resulting in insurance claims of up to $30 billion. This level of preparedness is seven-times larger than any catastrophe ever experienced in Canada to date. It is of course possible that at this scale of event, an insurer will prove to have underestimated exposure and accumulated too much risk in a particularly damaged region. However, for a single insurer failure of this nature, the industry backstop – PACICC – would be entirely capable of responding to protect policyholders.

Our study shows that the industry would also likely survive a larger event, resulting in insured losses of up to $35 billion. However, at this scale of event, multiple insurers would become insolvent. PACICC has never previously been required to respond to multiple Member insolvencies as a result of a single event. The majority of insurers would experience significant financial impairment. PACICC's industry Assessment mechanism has a cap on what can be collected in any 12-month period, so claims settlement for many consumers

would almost certainly be delayed. At this level of disaster, Canada's insurance industry and its policyholders would experience significant problems – as would the Canadian economy.

Our research confirms that a catastrophe resulting in insurance claims exceeding $35 billion would likely overwhelm the capacity of Canada's insurance industry. This is the tipping point. Multiple insurers would be distressed and could fail, including both smaller regional insurers and large national insurers. These failures would cause contagion in the industry, as PACICC Assessments to address losses from failed insurers would trigger the default of other surviving insurers. Simply put, PACICC was not designed to protect insurance consumers from this magnitude of risk. At this level of catastrophe, the Canadian economy could be permanently damaged without an effective Federal Government backstop.

Importantly, mechanisms exist to manage the risk of loss from unlikely but high-consequence events. They are in place in many, if not most, other developed nations with significant earthquake exposure. Backstop programs can be designed such that the insurance industry is responsible for most catastrophic events, but there exists a role for government in responding to catastrophic losses above a defined threshold. It is a fundamental gap in the public infrastructure of our nation that we do not have such a pre-defined mechanism today – so that we are properly prepared for a rare, but quite certain, peak peril event.

Environment Canada issues more than 10,000 severe weather warnings in Canada each year. None of these extreme weather events have caused an insurer to fail over the past 60 years. Canada's largest natural catastrophe was a wildfire in Fort McMurray, Alberta in 2016 that resulted in approximately $3.6 billion in insured losses. Many other industrialized nations, however, have experienced very large catastrophes, much worse than anything experienced in Canada, with severe knock-on effects for the insurance industry. Some of these failures occurred in modern, well-functioning societies. Examples of these types of events include:

- In 1906, an earthquake struck San Francisco. About 3,000 people died, 80 percent of San Francisco was destroyed, and 12 insurance companies were declared insolvent.[1]
- In 1992, Hurricane Andrew made landfall in Homestead, Florida as a Category 5 storm.[2] More than 730,000 houses and buildings were damaged or destroyed and nine insurance companies were declared insolvent.

[1] Winchester, Simon, A Crack in the Edge of the World, Harper Perennial, 2005, p.324.

[2] http://www.caclo.org/perl/index.pl?document_id=833faedca1f77bcbabdb6db8e1644ea5

- In 2011, Christchurch, New Zealand experienced a powerful earthquake that killed 185 people, severely damaging the city and causing two insurance companies to become insolvent.[3]
- In 2018, California's Camp Fire killed dozens of people and destroyed thousands of homes. It also left an insurance company in financial ruins, unable to pay millions of dollars to policyholders. Merced Property & Casualty Co. assets were roughly $23 million.[4] The company faced approximately $64 million in outstanding liabilities just in the city of Paradise alone.[5]

This paper seeks to determine how large a catastrophic event Canada's insurance industry could handle and what would be the tipping point for systemic failure.

[3] https://www.owlapps.net/owlapps_apps/articles?id=33845294&lang=en

[4] https://www.owlapps.net/owlapps_apps/articles?id=33845294&lang=en

[5] https://www.cnn.com/2018/12/03/us/paradise-students-school-wildfire/index.html

Background

Preparedness of Canada's P&C insurers

Insurance companies across Canada are currently well capitalized and financially sound. Insurers have adapted pricing, refined the coverage offered and developed tools to better anticipate future costs. Some tools that insurers use to mitigate the solvency risk of natural disasters include:

- Measuring and managing "Aggregation" – Insurers manage down excessive exposure to particular geographic areas by carefully deciding on which consumers to insure. For example, insurers avoid covering every home on a single street if they are concerned about concentration of damage following a hailstorm, tornado or extreme rainfall event.
- Using computer models – Insurers have been using models to assess their potential exposure to a severe earthquake for several decades. Recently, models have been developed to help insurers better manage the risk associated with severe weather events, including hurricanes and summer storms.
- Applying an explicit "cat load" – Insurers anticipate future losses when setting the price of homeowners' and commercial insurance policies in territories particularly prone to catastrophic events.
- Diversifying catastrophic risk through the purchase of reinsurance – Insurers use catastrophe models to calculate their probable maximum loss (PML) by modelling the impact of thousands of simulated earthquakes. They then purchase reinsurance to ensure that the combination of their capital and purchased reinsurance protection will leave them in a position to honour their obligations after such a catastrophic event.

In catastrophe models, a smaller event has a higher probability of occurring each year. Larger, more expensive catastrophes will occur less often. The PML is the average loss that the model expects each year. The potential severity and likelihood of a natural disaster in these models is defined by "return period." The worst-case storm or earthquake that occurs in a "1-in-100-year" return period (or once every 100 years) is bigger, and results in much more damage than a storm that occurs in a "1-in-10-year" return period (or every 10 years).

Reinsurance is a critical tool used by Canadian insurers to reduce their solvency risk. In fact, following a major natural disaster, reinsurers are expected to provide the majority of the funds that insurers will use to pay claims of Canadian policyholders. The Office of the Superintendent of Financial Institutions (OSFI) has a Reinsurance Guideline B-3.[6] The Guideline states that every insurer must develop a Reinsurance Risk Management Plan and

[6] https://www.osfi-bsif.gc.ca/Eng/fi-if/rg-ro/gdn-ort/gl-ld/Pages/b3_Sound.aspx

"should perform a sufficient level of due diligence on its reinsurance counterparties, on an on-going basis, to ensure that the insurer is aware of its counterparty risk and is able to assess and manage such risk."[7] The Guideline also states that insurers should not rely on rating agencies, reinsurance brokers or other reputable agents or intermediaries to undertake this analysis on behalf of the company.

Canada's regulatory system

A robust and effective regulatory system is the second layer of defense for Canadian policyholders. Canada's regulatory framework specifically recognizes the solvency risk associated with natural disasters – especially earthquake – as Canada is exposed to such risk on our West Coast, as well as in Central Canada. During the 1990s, the companies that provide Canada's home, auto and business insurance worked with their prudential regulator (OSFI) to build earthquake risk into the supervisory system. The goal of this system is to ensure that insurers have the money to pay legitimate claims resulting from a major urban earthquake.

OSFI, Quebec and British Columbia updated the Guidelines on Earthquake Risk in 2013 to take into account emerging knowledge and best practices. The key components of the regulatory framework for insurers are:

1. Risk-based minimum capital tests called Minimum Capital Test (MCT) and Branch Adequacy of Assets Test (BAAT)[8]
2. Own Risk and Solvency Assessments (ORSA)
3. Stress testing
4. Earthquake Exposure Sound Practices (Guideline B-9)

Of these, the most relevant for this paper is OSFI Guideline B-9. This document sets out sound practices for the management and measurement of earthquake exposures. The policy objective of the Guideline is to improve the safety and soundness of Canada's financial services sector by increasing the insurance industry's capacity to handle a large earthquake. The Guideline places responsibility for managing earthquake risk on insurers by holding Boards of Directors responsible for reporting their readiness to OSFI.

[7] https://www.osfi-bsif.gc.ca/Eng/fi-if/rg-ro/gdn-ort/gl-ld/Pages/b3_Sound.aspx

[8] There are two types of insurers incorporated in Canada. A Canadian incorporated insurer is required to complete the MCT. A branch insurer is required to complete the "Branch Adequacy of Assets Test." In this paper, the term MCT encompasses both tests. http://www.osfi-bsif.gc.ca/app/DocRepository/1/eng/guidelines/sound/guidelines/B3_e.pdf.

Insurers must annually estimate their PML arising from a major earthquake using forecasting models. Although all federally regulated insurers and reinsurers are encouraged to comply with the Guideline, only those with earthquake exposures in the British Columbia and Quebec markets are required by OSFI to do so. Companies must demonstrate to OSFI that they have financial resources to pay the estimated claims resulting from an earthquake from the following sources:

1. Up to 10 percent of the company's capital
2. Reinsurance
3. Dedicated earthquake reserves

These reports must be presented to the company's Board of Directors or Chief Agent annually. In 1998, regulators required insurers to report their preparedness for a 250-year earthquake. Each year, regulators increase the "return period" benchmark slightly, with the goal of having insurers ready for a 500-year earthquake by 2025. In 2021, insurers must prove that they have enough capital and reinsurance to pay for claims resulting from a 460-year earthquake.

The role of the Court system

If a regulator loses confidence in the ability of a P&C insurer to fulfill the promises it is making to policyholders, then they can have the Attorney General of Canada petition the Court for a judicial winding-up order to close the company. In Canada, the *Winding-Up and Restructuring Act (WURA)* will be applied. Once this happens, any decisions about who gets paid and how much any creditor receives will be made by the Court. Under *WURA*, the Court will appoint an independent Liquidator to assist it in making these decisions.

This means that, if an insurer does fail as a result of a natural disaster, a court-appointed Liquidator will manage the winding-up of the company. PACICC will support the Liquidator as they settle the estate of the insolvent insurer, including the provision of the funds required to settle eligible policyholder claims and to refund unearned premiums. Settling the estate of an insurance company is a complicated and expensive process that can take 10-15 years, or more, to resolve. PACICC's payments to policyholders of a failed insurer ensure the timely return of unearned premiums and the efficient settlement of claims, but only within established limits.

There are three notable things to appreciate about the Court system in the context of our study:

1. The funds within the estate of each failed insurer are frozen in order to give the Liquidator and the Court sufficient time to assess their value
2. In the legal process, it takes a very long time before creditors (including policyholders and claimants, unless compensated by PACICC) receive any payments from the estate. Final resolution normally takes 15 or more years.
3. Canadian Courts have never dealt with an estate with hundreds (and maybe many thousands) of catastrophe claims requiring immediate funding

The role of PACICC

PACICC's mission is to ensure that Canadian P&C insurance policyholders do not experience undue financial hardship in the unlikely event that a Member insurer fails. The cost of settling claims against a failed insurance company is paid by PACICC through Assessments charged to Member insurance companies. Insurance legislation requires companies operating in Canada to be PACICC Members, unless they are members of a farm mutual guarantee organization or operate exclusively in the provision of specialty lines of insurance not covered by PACICC, such as mortgage, marine or aviation insurance. PACICC coverage applies to approximately 95% of all P&C insurance written in Canada.

PACICC's policyholder compensation process has been in place for more than 30 years and has successfully responded to the needs of policyholders of more than a dozen failed insurance companies, without imposing undue hardship on the insurance industry. PACICC's policyholder protection extends to insurers that may fail as a result of a natural disaster, or other subsequent events (e.g. extensive fires following an earthquake). For the policyholders of these companies, PACICC would pay:

- Up to $500,000 per homeowner's policy
- Up to $400,000 per auto and commercial insurance policy
- Up to $1,750 of unearned premiums

Subject to these limits, PACICC provides funds to the Liquidator to pay eligible claims of policyholders of a failed insurer, but is granted priority to later reclaim those funds from the estate, as well as a portion of the costs it incurs. The costs ultimately incurred by PACICC Members reflect both the shortfall in the estate of the insolvent insurer and the delay of

many years between when it makes its payments and the subsequent recovery of funds from the estate. PACICC therefore supports both the financial shortfall, and the liquidity of the insurer in wind-up.

PACICC's Memorandum of Operation sets out three steps that PACICC will take when a Member insurer experiences an involuntary wind-up:

I. "The board of directors shall estimate an amount (the "Total Assessment") which reflects the maximum exposure of the Corporation anticipated by the board of directors in respect to the Insolvency of a particular Member." (Paragraph 14(1))

II. "The board shall then allocate the Total Assessment among each of the Participating Jurisdictions in which the insolvent Insurer was writing policies." (Paragraph 14(1))

III. "The Corporation shall levy assessments on each Member which is licensed... in a Contributing Participating Jurisdiction." (Paragraph 15)

The Court-appointed Liquidator provides the Board with a detailed analysis of the estate as a basis for determining the Total Assessment. The Assessment process timeframe is partly determined by the circumstances of the failed insurer.

PACICC determines the expected shortfall in the estate, with a provision for adverse claims development and possible challenges in realizing asset values. The Assessment is based on a determination of the cash flow and liquidity needed to ensure the timely payment of eligible claims.

There is a legal limit on the amount that PACICC can assess Member insurers in a given year. Assessments are limited to 1.5 percent of covered Direct Premium Written by an insurer in the prior year. However, there is no limit on the number of years that the Member insurer can be required to pay this amount. The Member is responsible for paying the full Assessment over time, but is only required to pay the annually-limited portion in any 12-month period. If a Member is at this maximum and another insolvency occurs, the cost of that new insolvency would be added to future payments. It is critical to appreciate that under modern accounting rules, the full amount owed would be booked as a contingent liability of the books of each Member insurer – with potentially devastating impact on their solvency under the MCT monitored by their prudential supervisor.

With this context established, we can now turn to a discussion of our Model.

The PACICC Model

Key Assumptions

To determine the threshold above which Canada's P&C industry would fail, it is important to determine a realistic worst-case scenario for a mega-catastrophe for Canada's P&C insurance industry.

The Model used in this paper makes the following assumptions:

1. Following a large catastrophic loss, impacted insurers will use all of their available financial resources to pay earthquake claims. These resources are defined to be:

   Resources = Dedicated earthquake reserves on the balance sheet + Reinsurance + All available capital above an MCT score of 100%

2. In a normal situation, the rules suggest that a Canadian prudential Supervisor would intervene with any insurer that reports a MCT score below 150%. However, we anticipate that, following a catastrophic event, Canadian regulators would exercise significant "regulatory forbearance." Thus, in our Model, any insurer that reports a MCT of less than 100% following a catastrophic event is deemed only to be "distressed," but is allowed to continue operations. A MCT score less than 100% indicates that the insurer's total liabilities are greater than its assets. Following a mega-catastrophe, we have assumed that regulators will allow companies with MCT scores above 100% to continue operations, if the company can access additional reinsurance or capital from a related regulated entity, or if the required capital injection for a branch insurer is less than 10% of the parent company's global capital base.

3. Our Model assumes that there would be capital and reinsurance inflows from related companies that are regulated in Canada, and these would allow some distressed insurers to increase their MCT score back above 100%. In our Model, these transfers "save" the distressed insurer, unless and until the capital inflow required exceeds the total capital and reinsurance available at the related entities. If the required capital exceeds this amount, then the distressed insurer and all related entities are deemed to be insolvent.

4. A "branch insurer" operates in Canada as a licensed company but retains ties to a parent insurer in another country. When establishing a branch in Canada, the parent company must pledge 10% of its total capital base to the Canadian operation. It is likely that a distressed branch would not fail if its foreign parent had enough capital. However, our Model assumes there is a practical limit beyond which foreign parents would simply cease to provide further capital to pay PACICC Assessments to fund policyholder compensation after the failure of other insurers.

5. If PACICC cannot identify sources of additional reinsurance or capital available at a related insurer regulated in Canada, or by a foreign parent (as defined above), the distressed insurer is deemed to have failed. We then assume that the regulator will seek to liquidate the insurer under *WURA* – as described previously.
6. In our Model, PACICC estimates that Canadian insurers purchased approximately $29.5 billion in catastrophic reinsurance in 2019. This estimate is based on discussions with OSFI and Canadian reinsurance brokers.
7. PACICC assumes that all claims made under these reinsurance contracts will be honoured and cash will flow into Canada in a timely manner following a mega-catastrophe. The rationale for this assumption is that the global reinsurance industry has a demonstrated history of paying claims following mega-catastrophes outside Canada.
8. Member insurers do not disclose their specific reinsurance purchases to PACICC. A small number of Canadian insurers do disclose reinsurance information in their financial statements. Where possible, PACICC used reinsurance purchase information disclosed by insurers in their 2019 financial statements. For insurers that do not disclose this information, the Model allocated reinsurance to each insurer based on their market share of total Direct Written Premiums in British Columbia for covered lines.
9. Catastrophic losses in British Columbia are distributed across lines of insurance as follows:

Table 1 – Breakdown of catastrophic losses by line of business

	Personal Property	Auto	Commercial Property	Liability
$20B	51.8%	0.4%	30.0%	17.8%
$25B	52.0%	0.4%	31.0%	16.6%
$30B	53.7%	0.5%	31.0%	14.8%
$35B	54.1%	0.6%	32.0%	13.3%
$40B	54.4%	0.6%	33.0%	12.0%
$45B	54.4%	0.6%	33.0%	12.0%
$50B	54.8%	0.7%	34.0%	10.5%

Source: PACICC

N.B. These are the same allocations that were used in the 2016 report.

10. Catastrophic losses in Quebec were shared across lines of business according to the following table:

Table 2 – Breakdown of catastrophic losses by line of business

	Personal Property	Auto	Commercial Property	Liability
$20B	54.3%	0.4%	30.0%	15.3%
$25B	52.2%	0.5%	31.0%	16.3%
$30B	52.2%	0.5%	31.0%	16.3%
$35B	51.4%	0.5%	31.5%	16.6%
$40B	50.6%	0.6%	32.0%	16.8%
$45B	54.4%	0.6%	33.0%	12.0%

Source: PACICC

11. Catastrophic losses are distributed across insurers based on market share by line of business, either in British Columbia or in Quebec as appropriate.

12. Any claims resulting from the catastrophic losses remain with the company. If modeled losses exceed the amount of reinsurance available, then these excess claims must be paid by the insurer directly out of the company's capital. This impacts the MCT score of the insurer.

13. PACICC assesses Member insurers to protect policyholders using the methodology prescribed in the Corporation's Memorandum of Operation (detailed in Box 1)

Box 1 – PACICC's Assessment Methodology

The Assessments required by PACICC to protect policyholders reflect both the shortfall in the insolvent insurer's estate due to the catastrophe, plus all existing claims on the books of the insurer. In a normal liquidation, PACICC would seek to reduce the amount of the Assessment by accessing funds within the failed insurer. However, when an insurance company enters into liquidation – whether it is an insolvent insurance company or a solvent subsidiary of a distressed foreign parent company – the assets of the estate are frozen by the Court until the Liquidator has had an opportunity to assess the claims against the insurer's estate. Following a large disaster, it is also unclear what will become of the bonds and stocks on the insurer's balance sheet. It is likely that some of these assets could be impaired, at least temporarily, if not permanently.

PACICC Assessments are allocated to the surviving insurers that participated in the same markets as the failed insurer, based on market share, by line of business. For example, if the insolvent insurer only sold personal property insurance in BC, then PACICC would assess the cost of the insolvency to the remaining companies that sold this product in BC. If they also sold insurance in Alberta, PACICC would assess the costs to insurers in both Alberta and BC, based on the relative share of premiums in each market.

The accounting impact of PACICC's Assessment on insurers is governed by the guidance in International Accounting Standard 37, *Provisions, Contingent Liabilities and Contingent Assets*. This Standard outlines the accounting treatment for provisions (liabilities of uncertain timing or amount), together with contingent assets (possible assets) and contingent liabilities (possible obligations and present obligations that are not probable or not reliably measurable).

An obligating event is an event that creates a legal or constructive obligation and, therefore, results in an entity having no realistic alternative but to settle the obligation [IAS 37.10]. A PACICC Assessment would meet these criteria. Insurers that survived the earthquake would therefore be required to recognize the full liability on their balance sheet when presented with a PACICC Assessment. In summary, the accounting impact of the PACICC Assessment is to lower the MCT of any Member onsurer receiving the Assessment.

14. PACICC assesses Member insurers to protect policyholders using the methodology prescribed in the Corporation's Memorandum of Operation (detailed in Box 1). PACICC then uses these funds to:

    - Return unearned premiums to all policyholders to the PACICC maximum;
    - Pay existing non-catastrophe claims up to the PACICC limits; and
    - Pay catastrophe claims up to the PACICC limits

15. Our Model assumes that PACICC is asked by regulators, governments, courts and liquidators to fulfil its mission to protect policyholders, and becomes involved in the estates of multiple failed Member insurers. Further, we assume that the PACICC Board would, acting in good faith, seek to address policyholder obligations even above the Corporation's defined "Risk-Appetite Limit" of two times its Annual Assessment Limit.[9]

16. Our Model assumes that when a Member insurer fails, the Regulator and the Court freeze the assets of the failed insurer. This is consistent with PACICC's experience in dealing with failed insurers.

17. There will be substantial public expectation that insurers will attempt to pay ALL outstanding insurance claims following a large catastrophe. While PACICC will certainly be asked to pay claims above the Corporation's limits, this Model assumes that PACICC will not pay claims that exceed the stated benefit limits. This assumption increases the conservativism of the Model results. If PACICC were to make payments exceeding the defined benefit levels, required industry Assessments would be even greater and the threshold for systemic failure would be correspondingly lower.

18. PACICC will make Assessments on Member insurers that survive the catastrophic event. These Assessments will be calculated as:

    Assessments = unearned premiums to be reimbursed + non-catastrophe claims below PACICC limits + catastrophe claims below the PACICC limit

19. Non-catastrophe claims below the PACICC limit are calculated based on:

    Total unpaid claims = unpaid claims in the current year + assumed claims as disclosed on the year-end 2019 annual filings made by Member insurers

    The PACICC estimate for these claims is based on a claims distribution profile in a 2019 survey of 400,000 industry claims conducted for PACICC by an actuarial consultancy. PACICC reduced the estimated Assessment required to reflect that the unpaid claims number reported on the financial statements of Member insurers includes claims exceeding PACICC claims limits. The estimated PACICC Assessment was reduced to reflect this fact by the following percentages:

    a. Personal Property – 85.3%
    b. Commercial Property – 76.8%
    c. Auto – 76.9%
    d. Liability – 74.6%.

[9] http://www.pacicc.ca/wp-content/uploads/2020/06/Risk-Management-Report-June-2020.pdfx

This assumption increases the conservativism of the Model results. If PACICC were to make payments exceeding the defined benefit levels, required industry Assessments would be even greater and the threshold for systemic failure would be correspondingly lower.

20. Estimates for non-catastrophe claims were further reduced to reflect that in Ontario, accident benefit claims of policyholders of a failed insurer are to be handled by the province's Uninsured Motorist Fund. This amount was calculated by reducing the amount described in Assumption 15 by the share of Ontario Accident Benefit claims reserves reported in the 2019 financial statement of Members.

    Similar to above, this assumption increases the conservatism of the Model results.

21. The assessment of catastrophe claims resulting from the failure of a Member insurer were reduced to reflect the share of those expected claims which would be below PACICC benefit limits. PACICC expects that, following a mega-catastrophe, a significant number of Canadians would experience losses that exceed those limits. Our Model assumes that PACICC only pays up to its stated policy limits. The share of expected losses that will be below the PACICC limit to pay catastrophe claims of failed insurers is based on a study from a global catastrophe modelling firm. PACICC is not permitted to disclose these percentages under the terms of our purchase agreement with that firm.

    This assumption further increases the conservatism of the Model results

22. PACICC will declare the total Assessment required, as dictated by the Corporation's Memorandum of Operation.

23. All Assessments are shared across the PACICC Members that survive the catastrophic event, based on their national market share.

24. Member insurers pay the annual maximum PACICC Assessments within 30 days. Any Assessment requiring funds above this amount will see Members pay this maximum amount on January 2nd of each following year until the total required Assessment is paid, or until all available capital is exhausted.

25. Catastrophe claims will develop according to the Reinsurance Association of America's claim development curve.

26. No additional insurers become insolvent for other reasons, as we deal with insurers that became insolvent due to the catastrophe.

The PACICC Model – Total resources available to insurers

It is possible to measure the resources (in dollars) available to Canadian P&C insurers in responding to catastrophes. We have assumed that:

Total resources available =
Capital in excess of the regulatory minimum + reinsurance purchased

Capital

The first pool of money available to protect Canadian P&C insurance consumers is the capital held by P&C insurance companies. Capital is the amount of money that would be left over if all the insurers in Canada sold all of their assets and honoured all of their liabilities. In total, P&C insurers currently hold approximately $60 billion of capital to support their business. This is the pool of money that underpins all of the insurance underwritten in Canada – from auto insurance in Prince Edward Island to home insurance in British Columbia. Over time, Canadian insurers have continued to increase the amount of capital that they hold, relative to the size of the insurance market. In 1975, for example, insurers held 50 cents in capital for every dollar in P&C insurance premiums collected. Today, this ratio is $1.05 in capital held for every dollar of insurance written. As a consequence, the capital base supporting the financial capacity of Canada's insurance industry to pay claims has never been stronger.

Canada's regulatory system, like that in other developed nations, seeks to maintain the solvency of P&C insurers by requiring that they hold a minimum level of capital. The most important metric for gauging this is the Canadian Council of Insurance Regulators' Minimum Capital Test (MCT). The MCT is risk-based, meaning that it requires an insurer to assume that its assets are worth less, and its liabilities are greater than those recorded on the insurer's balance sheet.

In the Canadian regulatory system, insurance companies must maintain a MCT score in excess of 150%. This is the threshold level below which, in normal circumstances, regulators would intervene. An insurer with a MCT score below 100% is severely distressed and urgently in need of additional capital. Insurers typically report MCT scores much higher than 150%. In 2020, for example, the average MCT reported by insurers in the industry was approximately 254%. The difference between the 150% minimum MCT and the industry average of 254% is critical. This is the maximum amount of capital that insurers could draw upon to pay claims resulting from a catastrophe, without impairing their solvency or their ability to provide all of the other insurance that supports the Canadian economy.

Reinsurance

Reinsurance is an important tool that Canadian insurers use to reduce their solvency risk. Primary insurers use reinsurance to ensure access to additional capital to pay for large catastrophic losses. (There are other reasons that insurers might buy reinsurance; however, these are outside the scope of this paper.) When a catastrophe strikes, the primary insurer pays claims up to a certain dollar level – called an "attachment point." Reinsurers pay claims above the attachment point – up to a maximum determined in the reinsurance contract. The primary insurer is responsible for paying claims above this maximum level.

The global reinsurance industry is vital to Canada's ability to rebound from a major disaster. Following such an event, reinsurers will provide the majority of the funds that primary insurers will require to pay the disaster claims of Canadians.

Global reinsurers have historically honoured their commitments following large disasters and catastrophes in Canada and in other countries. In this Model, PACICC assumes that all reinsurers will honour their contracts and provide promised funds to Canadian primary insurers following a mega-catastrophe event in Canada.

Experience shows, however, that the damage burden will not be shared equally across insurance companies. Insurers have different risk profiles and exposures. They each decide on how much reinsurance to purchase. Solvency risk arises when the claims from a catastrophe prove to be greater than the financial resources available to an individual insurance company.

The PACICC Model – Results

Measuring the size of a natural disaster by dollar value of damage allows PACICC to overcome the uncertainty within earthquake models. For example, the models estimate the "average" earthquake that will occur in a given time period. As a guarantee fund, PACICC must be concerned about a worse-than-average earthquake. For example, large earthquakes can result in broken gas lines causing fires, but "fire-following" an earthquake is difficult to model. Nor do the models estimate business interruption claims or damage from tsunamis. By using a single dollar figure for total insured losses, the PACICC Model seeks to avoid these uncertainties.

Our Model estimates three distinct event thresholds for Canada's P&C insurance industry:

1. Green Zone: Estimated size of a catastrophic loss that P&C insurers could handle before the first insurer is expected to fail
2. Orange Zone: Estimated size of a catastrophic loss that could cause the failure of multiple insurers and thus place extreme stress on PACICC's ability to fulfil its mission to protect consumers
3. Red Zone: Estimated size of a catastrophic loss that would overwhelm Canada's insurance industry – the tipping point

PACICC modelled hypothetical major catastrophic losses in British Columbia and Quebec – and the resulting impact on PACICC Member insurers.

PACICC Model Results for a Major Catastrophic Event in British Columbia

Our Model indicates that, for an event in British Columbia causing less than $20 billion in insurance claims, no insurers become severely distressed. Of course, it is entirely possible that a single insurer could fail due to an even smaller event, if its mix of policies sold was concentrated in an area particularly hit hard by the event. However, PACICC has experience in dealing with the insolvency of a single insurer and this should not cause significant problems for PACICC or for the industry as a whole. The solvency, regulatory and judicial systems would capably protect policyholders and claimants.

PACICC estimates the event thresholds for British Columbia are as follows:

$25 billion event

- 25 insurers exhaust all of their reinsurance
- $1 billion of the industry capital base is eroded
- Five insurers report a post-event MCT below 150%
- No insurers report a post-event MCT below 100%
- No insurers fail
- No PACICC Assessment required

$30 billion event

- 41 insurers exhaust all of their reinsurance
- $5 billion of the industry capital base is eroded
- 25 insurers report a post-event MCT below 150%
- Eight insurers report a post-event MCT below 100%
  (These insurers are financially "distressed")
- A distressed insurer may not fail. Many insurers in Canada operate as part of an insurance group. This "group" of insurers normally operates in a holding company structure. It is conceivable that sufficient capital exists within the group to "save" the distressed insurer. Saving the insurer here means transferring money and raising the MCT score for all insurers within the group above 100%, by securing additional capital from other members of their group or from their parent. It is only after this route has been exhausted that PACICC would become involved.
- PACICC is able to identify additional capital and/or reinsurance for seven of the eight distressed insurers within the regulatory system that, when transferred, would enable them to increase their MCT score above 100%. The Model assumes regulators would allow them to continue to operate.
- PACICC is not able to identify additional capital and/or insurance for one PACICC Member insurer. **The Model assumes regulators would then petition the Court to close this insurer under *WURA***.

- The resulting PACICC Assessment would be approximately $320 million. PACICC would assess this amount on the Member insurers that operate in the same provinces and territories as the failed insurer. This would be a direct call on their capital and would cause their MCT scores to decline. The Model finds that a PACICC Assessment of this size, following a $30 billion catastrophic loss, does not increase the number of distressed insurers or cause any additional failures.

The required Assessment to PACICC Members after a $30 billion catastrophe in British Columbia would be larger than any Assessment that PACICC has ever imposed on its membership. Our Model shows that PACICC Member insurers would still be able to fully meet their Assessment obligations – although there is a risk that the payment of claims made by policyholders of insurance companies that fail may be delayed.

$35 billion event

- 67 insurers exhaust all of their reinsurance
- $6.5 billion of the industry capital base is eroded
- 58 insurers report a post-event MCT below 150%
- 13 insurers report a post-event MCT below 100%
  (These insurers are financially distressed)
- PACICC is able to identify additional capital and/or reinsurance for seven of the 13 distressed insurers within the regulatory system that, when transferred, would enable them to increase their MCT score above 100%. The Model assumes regulators would allow them to continue to operate.
- PACICC is not able to identify sufficient additional capital and/or insurance for six PACICC Member insurers. **The Model assumes regulators would then petition the Court to close these six insurers under *WURA*.**
- Several of these insurers are part of insurance groups. The capital needed to save the distressed insurer in these groups exceeds the total capital and reinsurance available within this group of companies. This means that all insurers within the group fail. **This Model assumes regulators would then petition the Court to close seven additional PACICC Member insurers due to group-level problems under *WURA*.**

- **In total, 13 Member insurers fail**. The required PACICC Assessment is $6.7 billion. PACICC would assess this amount on the Member insurers that operate in the same provinces and territories as the failed insurer. This would be a direct call on their capital and cause their MCT scores to decline.
- **A PACICC Assessment of $6.7 billion would result in 13 additional failures. The resulting multi-billion-dollar PACICC Assessment from the additional failures results in a systemic collapse of Canada's P&C insurance industry.**

This is the tipping point for the industry and a systemic problem has arisen. A catastrophic event causing $35 billion in insurance claims in British Columbia simply exceeds the capacity of Canada's P&C insurance industry to respond.

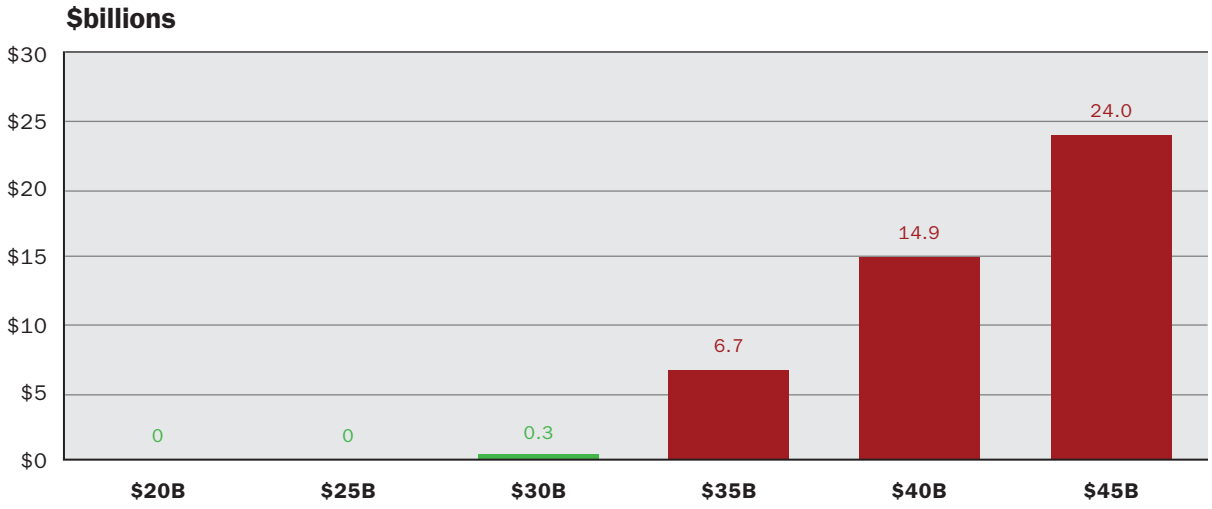
$40 billion event

- 75 insurers exhaust all of their reinsurance
- $10.8 billion of the industry capital base is eroded
- 71 insurers report a post-event MCT below 150%
- 18 insurers report a post-event MCT below 100%
  (These insurers are financially distressed)
- Nine of the 18 distressed insurers receive cash injections from related entities and continue operations
- PACICC is not able to identify sufficient capital and/or reinsurance for nine Member insurers. **The Model assumes regulators would then petition the Court to close these nine insurers under *WURA***.
- Several of these insurers are part of insurance groups. The capital needed to save the distressed insurer in these groups exceeds the total capital and reinsurance available within this group of companies. **The Model assumes regulators would then petition the Court to close seven additional PACICC Member insurers due to group-level problems under *WURA*.**
- **The required PACICC Assessment for the 16 failed insurers is estimated to be $14.9 billion. This level of PACICC Assessment results in the systemic collapse of Canada's P&C insurance industry.**

$45 billion event

- 75 insurers exhaust all of their reinsurance
- $15.6 billion of the industry capital base is eroded
- 102 insurers report a post-event MCT below 150%
- 27 insurers report a post-event MCT below 100%
  (These insurers are financially distressed)
- 13 of the 27 distressed insurers receive cash injections from related entities and continue operations
- PACICC is not able to identify sufficient capital and/or reinsurance at 14 of the 27 distressed insurers. **The Model assumes regulators would then petition the Court to close these 14 insurers under *WURA*.**
- Several of these insurers are part of insurance groups. The capital needed to save the distressed insurer in these groups exceeds the total capital and reinsurance available within this group of companies. **The Model assumes regulators would then petition the Court to close 13 additional PACICC Member insurers due to group-level problems under the *WURA*.**
- **Required PACICC Assessment is $ 24.0 billion. This level of PACICC Assessment results in the systemic collapse of Canada's P&C insurance industry.**

Figure 1 – Required Assessment on PACICC Members – British Columbia



PACICC Assessments are calculated as: outstanding catastrophe claims + outstanding non-catastrophe claims + return of premiums paid in advance by policyholders.

Source: PACICC

Impact of the PACICC Assessment

After a $30 billion event, the estimated Assessment required is approximately $320 million. This would be larger than any Assessment that PACICC has ever imposed on its membership, but PACICC Member insurers would still be able to fully meet their Assessment obligations.

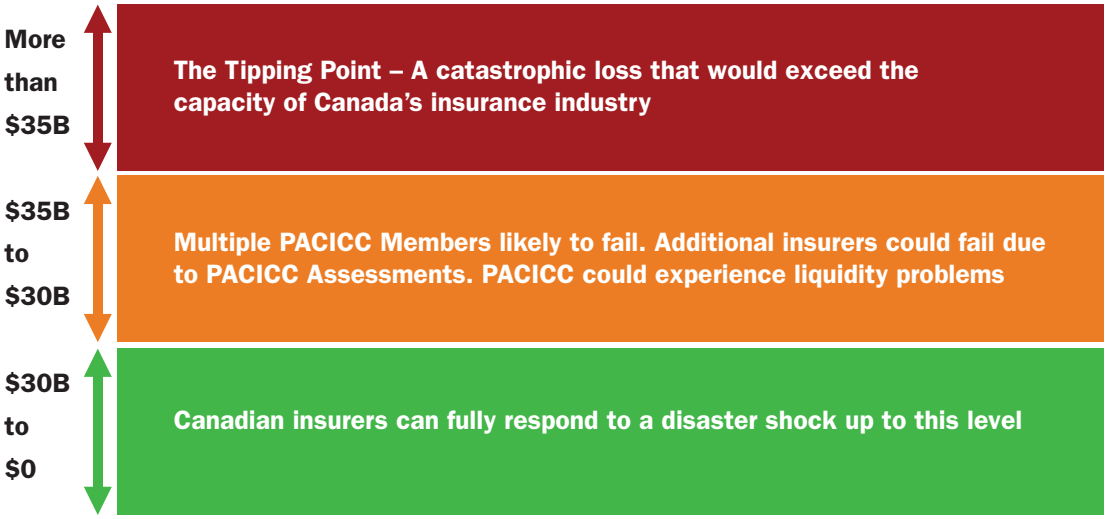
However, our Model also shows that once claims reach $35 billion, the required $6.73 billion PACICC Assessment causes 13 additional insurers (already weakened by the catastrophe) to fail. PACICC could assess the remaining insurers for these additional insolvencies, but it would be hopeless because at this point, the system would be unable to raise sufficient funds to pay the claims of policyholders of insurers that fail. A systemic problem has arisen. A catastrophic event causing $35 billion in insurance claims in British Columbia simply exceeds the capacity of Canada's P&C insurance industry to respond.

Summary – British Columbia

- **Up to $30 billion –** Modelling undertaken by PACICC indicates that Canada's insurers can fully respond up to a $30 billion disaster shock, with little or no impact on the solvency of well-run, healthy insurance companies.
- **Between $30 billion and $35 billion –** The insurance industry appears to have sufficient financial capacity to respond to a large natural disaster generating insurance claims of up to $35 billion. Several otherwise healthy insurance companies are expected to fail. PACICC would need to establish an emergency response capacity because it has never been required to respond to multiple Member insolvencies. However, the required Assessment would not cause systemic contagion.
- **Greater than $35 billion –** A catastrophic loss of this size would exceed the existing capacity of Canada's insurance industry and would exceed PACICC's ability to address the needs of policyholders. This is the point where a PACICC Assessment causes otherwise healthy insurers – even those not exposed to the initial catastrophe – to fail regulatory solvency tests.

Figure 2 – PACICC Model Summary – British Columbia

Billions of insured losses



Source: PACICC

PACICC Model Results for a Major Catastrophic Event in Quebec

Our Model indicates that, for an event in Quebec causing less than $20 billion in insurance claims, no insurers become severely distressed. Of course, it is entirely possible that a single insurer could fail due to an even smaller event, if its mix of policies sold was concentrated in an area hit hard by the event. However, PACICC has experience in dealing with the insolvency of a single insurer and this should not cause significant problems for PACICC or for the industry as a whole. The solvency, regulatory and judicial systems would capably protect policyholders and claimants.

PACICC estimates the event thresholds for Quebec as follows:

$25 billion event

- 35 insurers exhaust all of their reinsurance
- $2.3 billion of the industry capital base is eroded
- 21 insurers report a post-event MCT below 150%
- Six insurers report a post-event MCT below 100%
  (These insurers are financially "distressed")
- PACICC is able to identify additional capital and/or reinsurance for all of the distressed insurers within the regulatory system that, when transferred, would enable them to increase their MCT score above 100%. The Model assumes that regulators would allow them to continue to operate.
- No insurers fail
- No PACICC Assessment required

$30 billion event

- 58 insurers exhaust all of their reinsurance
- $4.6 billion of the industry capital base is eroded
- 50 insurers report a post-event MCT below 150%
- 12 insurers report a post-event MCT below 100%
  (These insurers are financially distressed)

- PACICC is able to identify additional capital and/or reinsurance for 11 of the 12 distressed insurers within the regulatory system that, when transferred, would enable them to increase their MCT score above 100%. The Model assumes regulators would allow them to continue to operate.
- PACICC is not able to identify additional capital and/or insurance for one PACICC Member insurer. **The Model assumes regulators would then petition the Court to close this insurer under *WURA*.**
- The resulting PACICC Assessment would be approximately $210 million. PACICC would assess this amount on the Member insurers that operate in the same provinces and territories as the failed insurer. This would be a direct call on their capital and cause their MCT scores to decline. The Model finds that a PACICC Assessment of this size following a $30 billion catastrophic loss does not increase the number of distressed insurers or cause any additional failures.

$35 billion event

- 75 insurers exhaust all of their reinsurance
- $8.4 billion of the industry capital base is eroded
- 63 insurers report a post-event MCT below 150%
- 25 insurers report a post-event MCT below 100%
  (These insurers are financially distressed)
- PACICC is able to identify additional capital and/or reinsurance for 18 of the 25 distressed insurers within the regulatory system that, when transferred, would enable them to increase their MCT score above 100%. The Model assumes regulators would allow them to continue to operate.
- PACICC is not able to identify additional capital and/or reinsurance for seven PACICC Member insurers. **The Model assumes regulators would then petition the Court to close these seven insurers under *WURA*.**
- Several of these insurers are part of insurance groups. The capital needed to save the distressed insurer in these groups exceeds the total capital and reinsurance available within these groups of companies. **The Model assumes regulators would then petition the Court to close eight additional PACICC Member insurers due to group-level problems under *WURA*.**
- **Required PACICC Assessment is $14.9 billion. This level of PACICC Assessment results in the systemic collapse of Canada's P&C insurance industry. This is the tipping point.**

$40 billion event

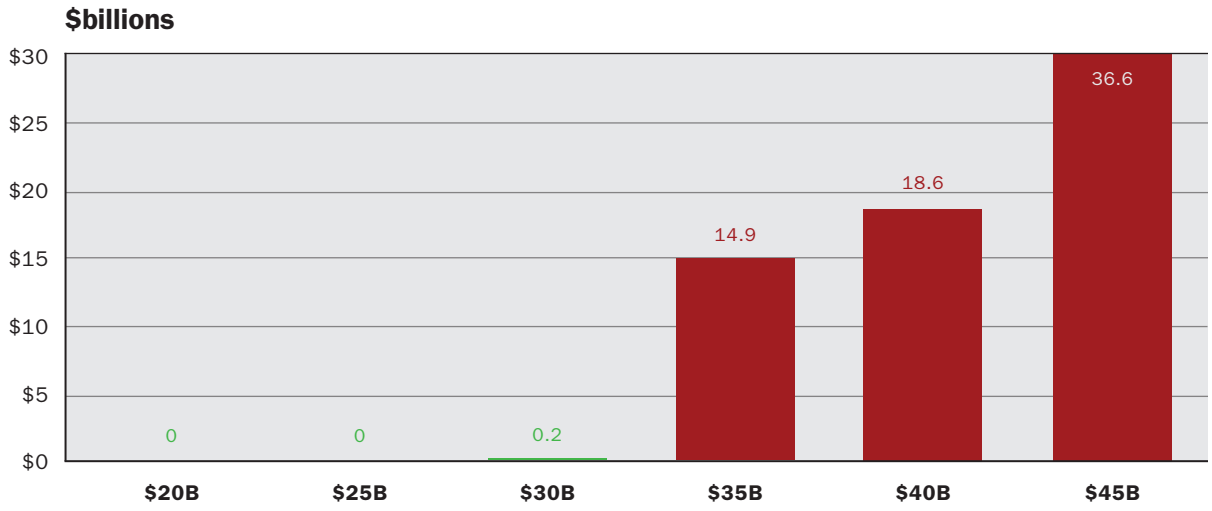
- 79 insurers exhaust all of their reinsurance
- $13.0 billion of the industry capital base is eroded
- 70 insurers report a post-event MCT below 150%
- 33 insurers report a post-event MCT below 100%
  (These insurers are financially distressed)
- PACICC is able to identify additional capital and/or reinsurance for 23 of the 33 distressed insurers within the regulatory system that, when transferred, would enable them to increase their MCT score above 100%. The Model assumes that regulators would allow them to continue to operate.
- PACICC is not able to identify additional capital and/or reinsurance for 10 PACICC Member insurers. **The Model assumes regulators would then petition the Court to close these 10 insurers under *WURA*.**
- Several of these insurers are part of insurance groups. The capital needed to save the distressed insurer in these groups exceeds the total capital and reinsurance available within these groups of companies. **The Model assumes regulators would then petition the Court to close nine additional PACICC Member insurers due to group-level problems under *WURA*.**
- **Required PACICC Assessment for the 19 failed insurers is estimated to be $18.6 billion. This level of PACICC Assessment results in the systemic collapse of Canada's P&C insurance industry.**

$45 billion event

- 83 insurers exhaust all of their reinsurance
- $15.6 billion of the industry capital base is eroded
- 72 insurers report a post-event MCT below 150%
- 38 insurers report a post-event MCT below 100%
  (These insurers are financially distressed)

- PACICC is able to identify additional capital and/or reinsurance for 27 of the 38 distressed insurers within the regulatory system that, when transferred, would enable them to increase their MCT score above 100%. The Model assumes regulators would allow them to continue to operate.
- PACICC is not able to identify additional capital and/or reinsurance for 11 PACICC Member insurers. **The Model assumes regulators would then petition the Court to close these 11 insurers under *WURA*.**
- Several of these insurers are part of insurance groups. The capital needed to save the distressed insurer in these groups exceeds the total capital and reinsurance available within these groups of companies. **The Model assumes regulators would then petition the Court to close nine additional PACICC Member insurers due to group-level problems under *WURA*.**
- **The required PACICC Assessment for the 20 failed insurers is estimated to be $36.6 billion. This level of PACICC Assessment results in the systemic collapse of Canada's P&C insurance industry.**

Figure 3 – Required Assessment on PACICC Members – Quebec



PACICC Assessments are calculated as: outstanding catastrophe claims + outstanding non-catastrophe claims + return of premiums paid in advance by policyholders.

Source: PACICC

Impact of the PACICC Assessment

After a $30 billion event, the estimated Assessment required is approximately $175 million. This would be larger than any Assessment that PACICC has ever imposed on its membership, but PACICC Member insurers would still be able to fully meet their Assessment obligations.

However, once claims reach $35 billion, the required $14.9 billion PACICC Assessment causes 78 additional insurers (already weakened by the catastrophe) to fail. This is the tipping point. PACICC could assess the remaining insurers for these additional insolvencies, but it would be hopeless because at this point, the system would be unable to raise sufficient funds to pay the claims of policyholders of insurers that fail. A systemic problem has arisen. A catastrophic event causing $35 billion in insurance claims in Quebec simply exceeds the capacity of Canada's P&C insurance industry to respond.

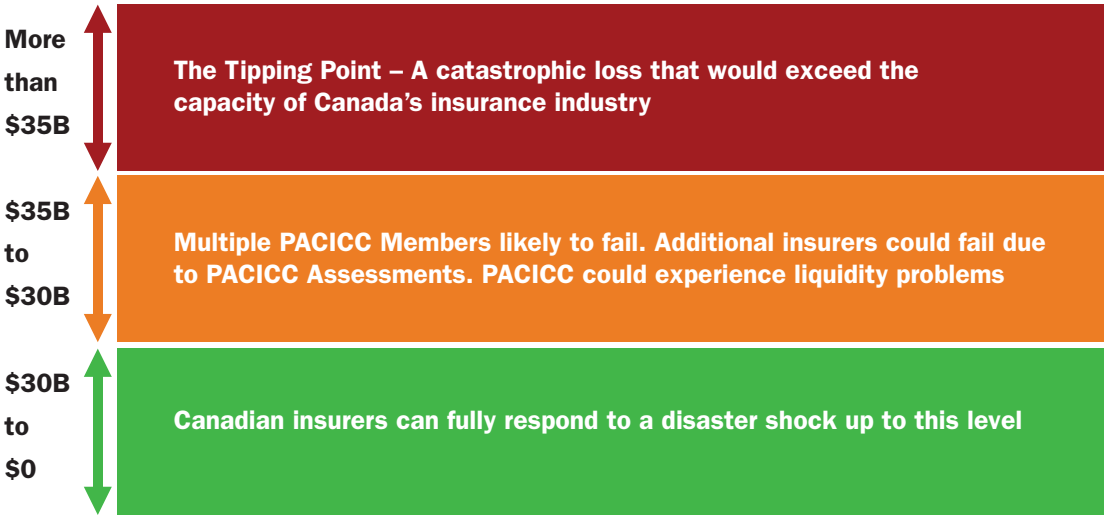
It is important to note that the dollar thresholds estimated in this paper are not based on probabilities. According to experts in the field of catastrophe modelling, the odds of an earthquake happening in any single year are higher in British Columbia than the same-sized event happening in Quebec. However, one of the key findings of this paper is that the capacity of Canada's insurance industry is the same across both quake-exposed jurisdictions in Canada.

Summary – Quebec

- **Up to $30 billion –** Modelling undertaken by PACICC indicates that Canada's insurers can fully respond up to a $30 billion disaster shock, with little or no impact on the solvency of well-run, healthy insurance companies.
- **Between $30 billion and $35 billion –** The insurance industry appears to have sufficient financial capacity to respond to a large natural disaster generating insurance claims of up to $35 billion. Several otherwise healthy insurance companies are expected to fail. PACICC would need to establish an emergency response capacity because it has never been required to respond to multiple Member insolvencies. However, the required Assessment would not cause systemic contagion.
- **Greater than $35 billion –** A catastrophic loss of this size would exceed the existing capacity of Canada's insurance industry and would exceed PACICC's ability to address the needs of policyholders. This is the point where a PACICC Assessment causes otherwise healthy insurers – even those not exposed to the initial catastrophe – to fail regulatory solvency tests.

Figure 4 – PACICC Model Summary – Quebec

Billions of insured losses



Source: PACICC

The PACICC Model – Evolution in Insurance Capacity over Time

This is the third time that PACICC has estimated the capacity of Canada's insurance industry to withstand a mega-catastrophe event. In this section, we examine changes in PACICC's estimates over time.

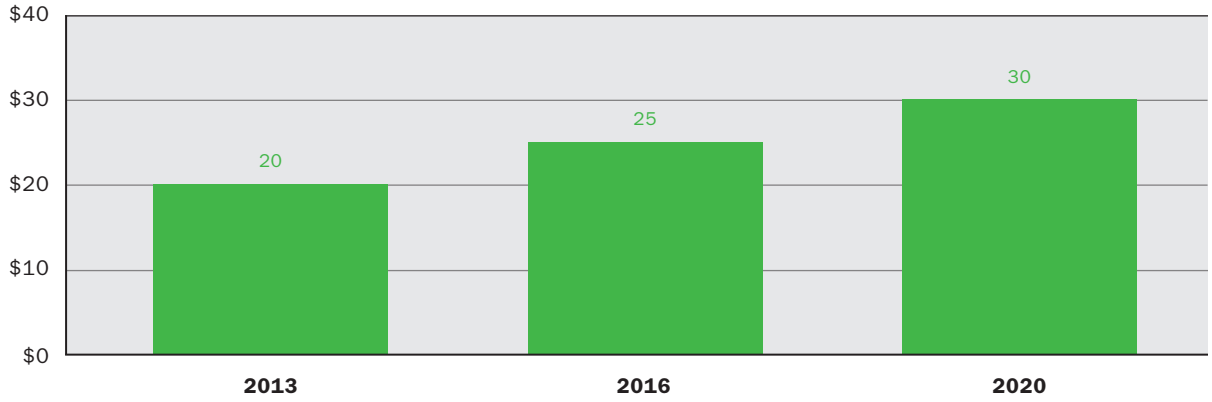
Estimating the Green Zone: PACICC modelling of potential failures due to catastrophes

An event causing less than $30 billion in insurance claims is unlikely to cause Canada's P&C insurers to become significantly distressed. This is not to say that insurers would escape such an event unscathed. It would result in significant stress and financial losses for insurers and would likely result in future price increases for policyholders.

It is also possible that a single insurer could fail if its mix of policies sold was concentrated in an area hit hardest by the event. However, PACICC has experience dealing with the insolvency of a single insurer and this should not cause problems for PACICC or the industry as a whole.

Figure 5 – PACICC Model – Evolution in estimated "Green Zone"

Size of catastrophic loss that Canadian insurers should be able to handle before any modelled failures, $billions of insured losses



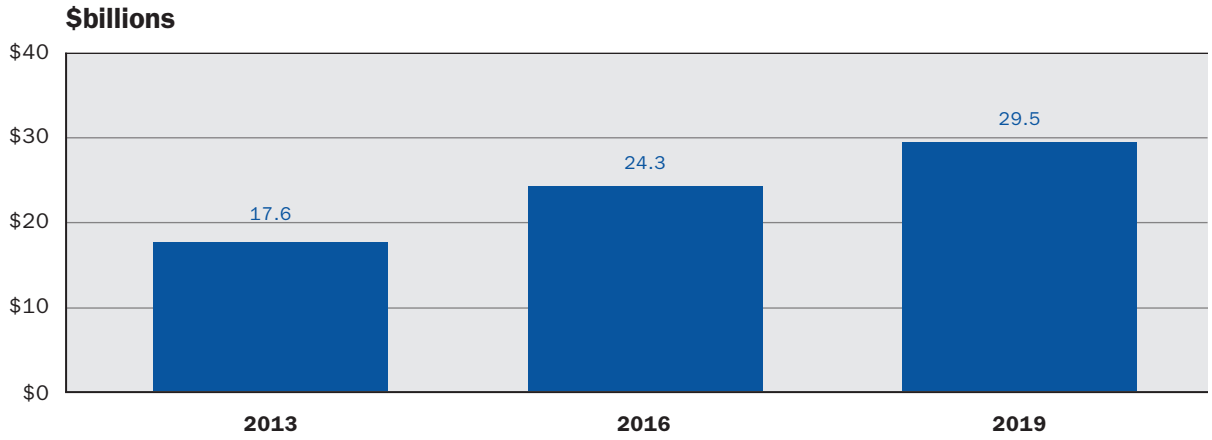
The Canadian P&C Industry continues to build capital and purchase greater amounts of reinsurance – and can thus handle ever larger events.

Source: PACICC

The key point here is that Canada's insurance system is well-positioned to assist policyholders in quickly rebounding from a catastrophic loss seven-plus times larger than anything yet experienced in our nation's history. The industry has the financial resources to pay catastrophe claims and would be able to continue to underwrite the other risks of policyholders in Canada.

It is also important to note that the size of catastrophic loss that Canada's insurers are capable of handling has significantly increased over the past seven years. In 2013, PACICC estimated that insurer failures were likely to occur for catastrophic losses greater than $20 billion. This level has now significantly increased – to approximately $30 billion.

Figure 6 – PACICC Model – Reinsurance purchased by PACICC Members



PACICC Member Insurers purchased $29.5 billion in reinsurance capacity in 2019. This is 71% greater than 2013.

Source: PACICC

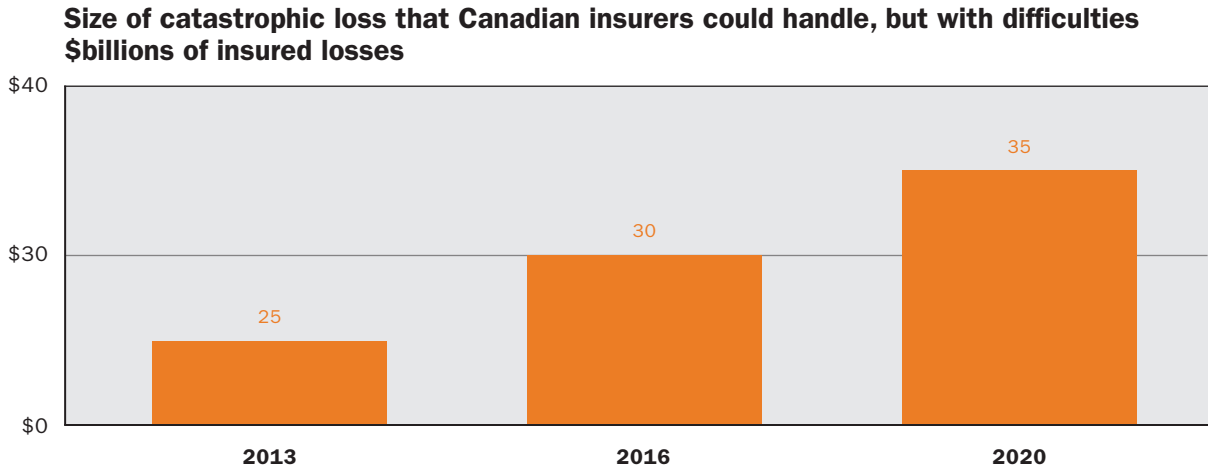
The most significant reason for the increase in the resilience of Canada's insurance industry is a significant increase in the purchase of reinsurance by insurers. In 2013, PACICC estimated that the industry's total reinsurance purchase was approximately $17 billion. In 2016, the same sources estimated the industry's reinsurance capacity at approximately $24 billion.

Based on information collected in confidence from reinsurance experts, we now estimate that Canadian insurers currently purchase some $29.5 billion in reinsurance. This represents a 71% increase in reinsurance capacity over just the past eight years. This includes reinsurance purchased from licensed and unlicensed reinsurers. A registered reinsurer is one that is either incorporated in Canada or a foreign company that has been authorized by OSFI. All other reinsurers are considered unregistered.

Orange Zone: Estimated size of catastrophic losses that could cause extreme stress to PACICC's ability to fulfil its mission to protect consumers (i.e. multiple insurers failing)

The "Orange Zone" represents PACICC's estimate of the absolute maximum-sized events that Canada's P&C insurance industry could stretch to handle. In the Orange Zone, multiple PACICC Member insurers would fail. A small number of additional insurers would fail due to the resulting PACICC Assessment. There are significant liquidity concerns in the Orange Zone. At this level of catastrophic loss, consumers would need to wait, possibly years, for PACICC to collect the cash needed to pay the resulting insurance claims. There would be significant economic hardship for many policyholders waiting so long to see their claims paid. There would also be significant other challenges to be overcome by PACICC and the surviving Member insurers, but the system would continue to function. Policyholders would have their claims paid over a period of time – and even unearned premiums could be reimbursed, eventually.

Figure 7 – PACICC Model – Evolution in estimated "Orange Zone"



Multiple PACICC Members likely to fail. Some additional insurers could fail due to PACICC Assessments. PACICC could experience liquidity problems. Consumers may have to wait to have claims paid or premiums reimbursed.

Source: PACICC

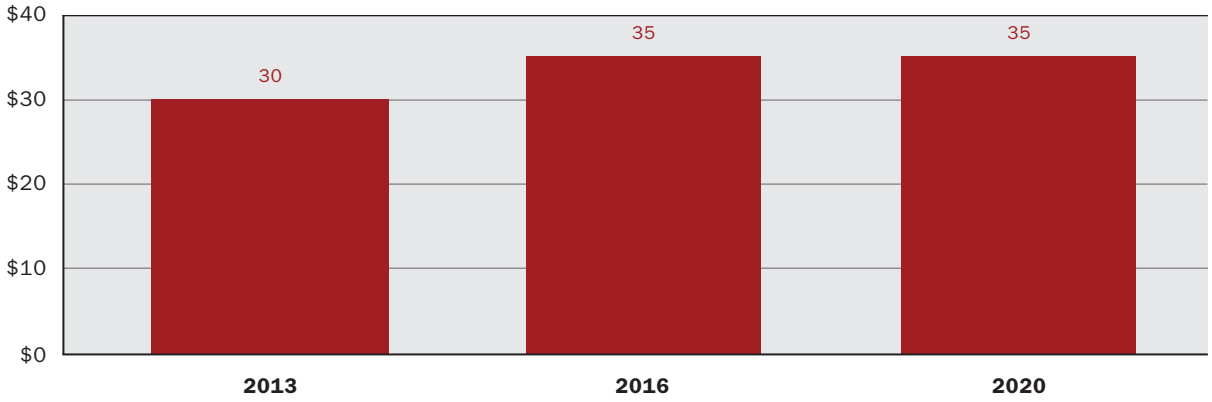
In 2013, PACICC estimated that these problems would occur with a catastrophic event resulting in insured losses between $20 billion to $25 billion. This range has increased significantly over the past seven years. PACICC now estimates that the industry's Orange Zone has a higher threshold and insurers could now handle a catastrophic event generating between $30 billion to $35 billion of insured losses. This means that Canada's P&C insurers are prepared to manage a catastrophic event $10 billion larger than in 2013.

Red Zone: Estimated size of catastrophic loss that would overwhelm Canada's insurance industry resulting in contagion

PACICC's 2013 estimate of the size of a catastrophic event that would overwhelm Canada's P&C insurance industry was $30 billion. This estimate was increased to $35 billion in 2016, primarily due to OSFI's changes to Guideline B-9 that significantly increased the size of earthquake for which insurers were required to prepare.

Figure 8 – The Tipping Point

Size of catastrophic loss that causes Canada's P&C insurance industry to fail
$billions of insured losses



Canada's P&C insurers can handle a catastrophic event $10 billion greater than in 2013.
BUT…this increased preparedness has not changed the tipping point!

Source: PACICC

The "Red Zone" has remained at this level in our latest update to the Model – despite the dramatic increase in reinsurance purchased by P&C insurers. This finding powerfully demonstrates that, while the Canadian P&C industry has materially increased its capacity to handle a truly massive loss, there remains a threshold above which the capacity of the private sector is simply exhausted. Even more important to note is that while the Green and Orange Zone thresholds in our Model have climbed significantly over time, the Red Zone threshold – the tipping point – above which the Canadian P&C insurance industry would experience systemic failure, has not.

The PACICC Model – Sensitivity to changing key assumptions

The next section of this paper examines the impact of changes to some of the key assumptions made in the PACICC Model. The purpose of this analysis is to determine if changing key assumptions has a significant impact on the Green-Orange-Red Zones estimated above.

The alternative scenarios that we modelled include:

1. What would happen if PACICC did not get involved to protect policyholders following insurance failures caused by mega-catastrophes?
2. How large a prefund would PACICC need to avoid making an Assessment for 12 months following a mega-catastrophe?
3. What if the scope of regulatory forbearance increased? What if regulators do not close insurers until their MCT is negative? Or if regulators allow the other parts of the group to continue, even if one insurer in the group fails?
4. Could PACICC's new Resolution Protocol – allowing intervention to disburse industry funds to actually prevent an insurer failure – materially impact the Green/Orange/Red Zones? If PACICC intervened to "rescue" some insurers temporarily, would this mitigate systemic risk?
5. If PACICC was to borrow funds required to pay policyholder obligations (from Government or elsewhere), how much money would be needed?

Alternative Scenario #1: What would happen if PACICC did not get involved?

PACICC's Memorandum of Operation states that the Corporation's involvement in the estate of a failed Member insurer is "voluntary." There have been cases in the past where Canadian regulators have closed an insurer that had sufficient assets to meet the claims of policyholders and there was no practical purpose for PACICC choosing to engage. For the purposes of this scenario, we assume that, since PACICC's payments are "voluntary," our Board would choose not to engage – because PACICC was simply never designed to act as the insurer of last resort for Canadian disaster risk.

To further emphasize this point, Paragraph 36 of PACICC's Memorandum of Operation states:

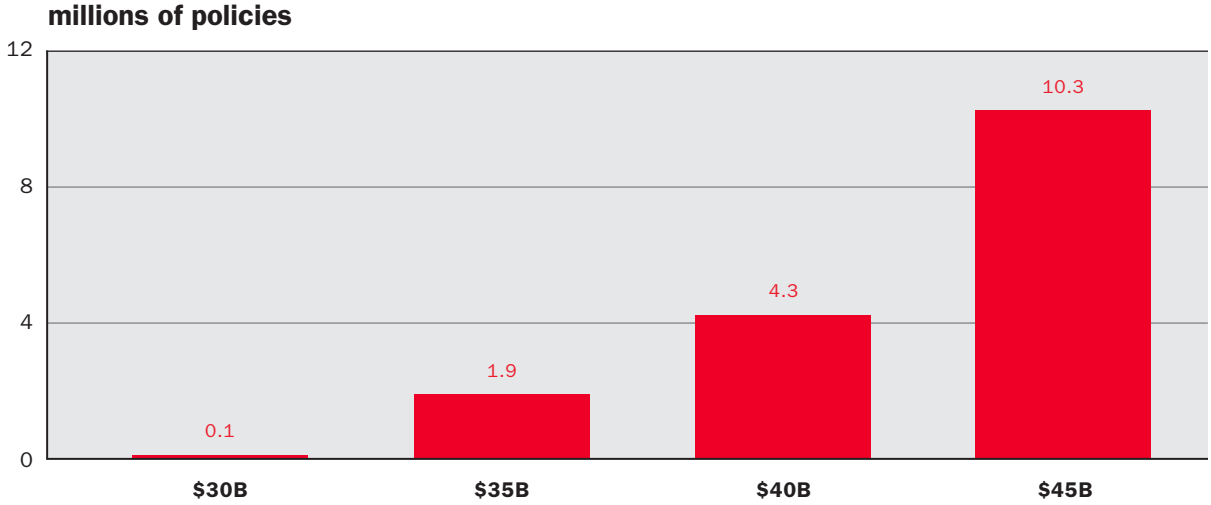
> *If the making of Compensation Payments, either actual or anticipated, is at any time likely to cause financial difficulties for the property and casualty industry in a Participating Jurisdiction, or for the Corporation, to the detriment of the public, the Corporation shall participate in discussions with the Insurance Regulatory Authority of that Participating Jurisdiction or all Participating Jurisdictions, as the case may be, with a view to an appropriate modification of the Compensation Payment arrangements provided for herein, and while such discussions take place, the Corporation may defer the making of Compensation Payments as is appropriate in the circumstances.*

This is sometimes referred to as the PACICC "circuit-breaker." Following a "mega-catastrophe," the PACICC Board of Directors could choose to activate this circuit-breaker. This would not be an unreasonable action, as PACICC was simply not designed to address serial insurer failures after a natural catastrophe. In fact, the original purpose of developing the PACICC Model was to determine the threshold above which PACICC would not be able to perform its mission to protect policyholders, and to clearly demonstrate the need for an alternative solution to protect Canadians. Since that time, we have made persistent efforts to engage in discussion with the Federal Government so that this worst-case scenario could be better anticipated and planned for properly – prior to a mega-catastrophe.

If PACICC "pulled" the circuit-breaker and did not get involved to protect policyholders following insurance failures caused by a mega-catastrophe, the Model results would indeed change significantly, as follows:

1. The estimate for the Green Zone would remain unchanged. Insurers are prepared to pay catastrophe claims from an event up to approximately $30 billion.
2. The Orange Zone would still begin at approximately $30 billion, but would in fact rise to approximately $40 billion. This is because no insurer would fail as a result of a PACICC Assessment, and thus contagion would not occur at the originally modelled $35 billion threshold. However, 16 to 18 insurers would fail and their policyholders would be exposed to severe economic hardship.
3. The estimate for the Red Zone would increase to approximately $40 billion. At $40 billion in insured losses, multiple national insurance carriers would fail, even without a PACICC Assessment.

Figure 9 – Number of policies at failed insurers



The PACICC Model indicates that for a catastrophic event of $35 billion, 1.9 million Canadians would hold policies with a failed insurer. This number increases to 10.3 million policies for a $45 billion event.

Source: PACICC

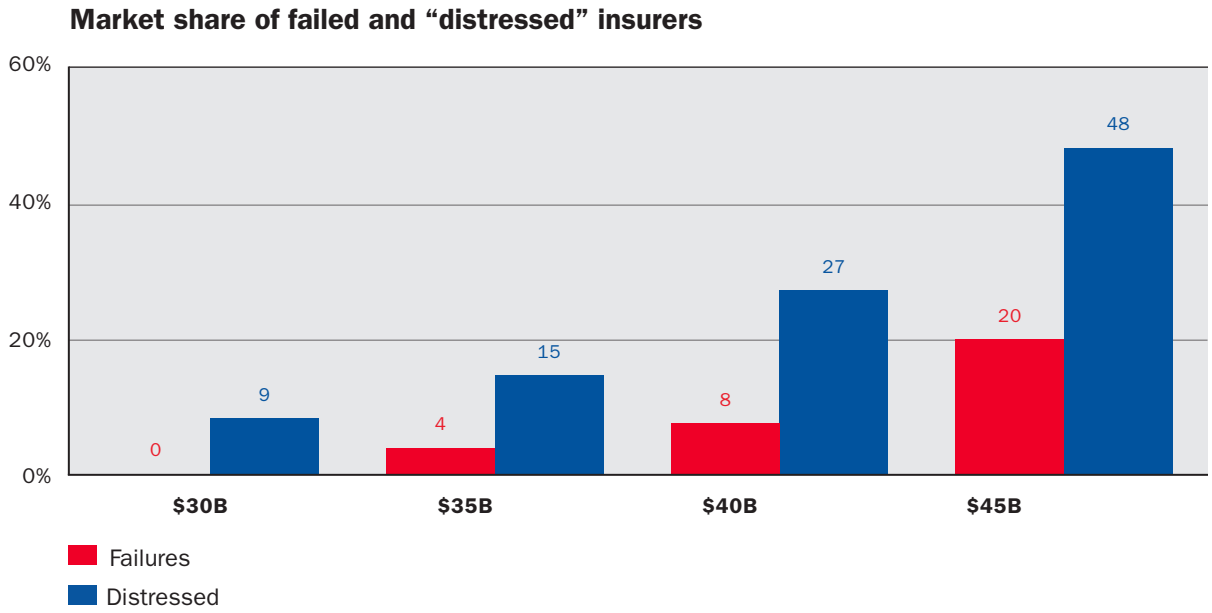
Policyholders of all the failed insurers would be forced to retain legal counsel and make a claim on the estate of their insurer under *WURA*. Most of these claims would be small. However, PACICC estimates that for a catastrophic event of $35 billion, approximately 1.9 million policyholders would hold policies with failed insurers. More than four million policyholders would be exposed with a $40 billion dollar event. This number increases to 10.3 million policyholders for a $45 billion event. Their claims would likely take years (possibly decades) to resolve and would not be resolved at face value.

Such a failure to respond in a timely manner to the needs of policyholders would be disastrous. Consumer confidence in Canada's insurance industry would be severely (and probably permanently) shaken.

Insurance consumers would likely appeal to government officials and regulators, who would be compelled to respond in real-time under crisis circumstances, despite the lack of systems or mechanisms to address these types, or this scale, of claims.

In addition to the large number of policyholders at the failed insurers, those companies hold significant market share across Canada. There would be significant problems with the availability and affordability of insurance all across Canada. A large catastrophic loss in one part of the country would impact every province and territory in Canada.

Figure 10 – Reduced availability of insurance



Following a catastrophe, there will be a void in the insurance marketplace. Failures impact the availability of insurance in all provinces in Canada.

Source: PACICC

The core finding of this change in Model assumption is that, unless a better alternative presents itself, simply resolving that PACICC should not attempt to protect policyholders does not produce a better outcome for Canada's insurance industry, Canada's insurance consumers or Canadian federal and provincial governments.

Alternative Scenario #2: How large an "ex ante" fund would PACICC need in order to avoid making an Assessment for 12 months following the mega-catastrophe?

PACICC is just one part of the safety net protecting consumers in Canada's financial services sector. The Canadian Deposit Insurance Corporation (CDIC) protects bank consumers. Assuris protects life insurance consumers. These other members of the safety net have two primary funding mechanisms, in the event that an institution were to fail and funds were needed to resolve the failure. The first is an "*ex ante*" fund – collecting money before a failure. The second is "*ex post*" funding – borrowing or applying Assessments after the failure.

PACICC's ex ante funds currently amount to approximately $60 million, held in the Corporation's Compensation Fund. PACICC's ex ante fund is much smaller than the ex ante funds of these other members of the safety net. For example, CDIC (a Crown Corporation) has a prefund of more than $6 billion.

PACICC's Fund was established via a capital levy of Member insurers over a period of three years, between 1998 and 2000 ($10M a year, assessed by market share of covered lines). The primary purpose of the Fund is to ensure that the Corporation is in a position to rapidly refund Unearned Premiums to policyholders affected by an insolvency, and thus enable PACICC to materially reduce the number of adversely impacted consumers in the days/weeks immediately following an insolvency. While the Fund has been earning a steady return since its initial founding (and has doubled in size), recent actuarial analysis indicates that it would not be adequate to handle the timely refund of Unearned Premiums after the failure of any of Canada's 70 largest insurers.

In Scenario #2, we asked, how large would the PACICC ex ante fund need to be in order to prevent the Corporation from making a post-event Assessment for 12 months following a mega-catastrophe?

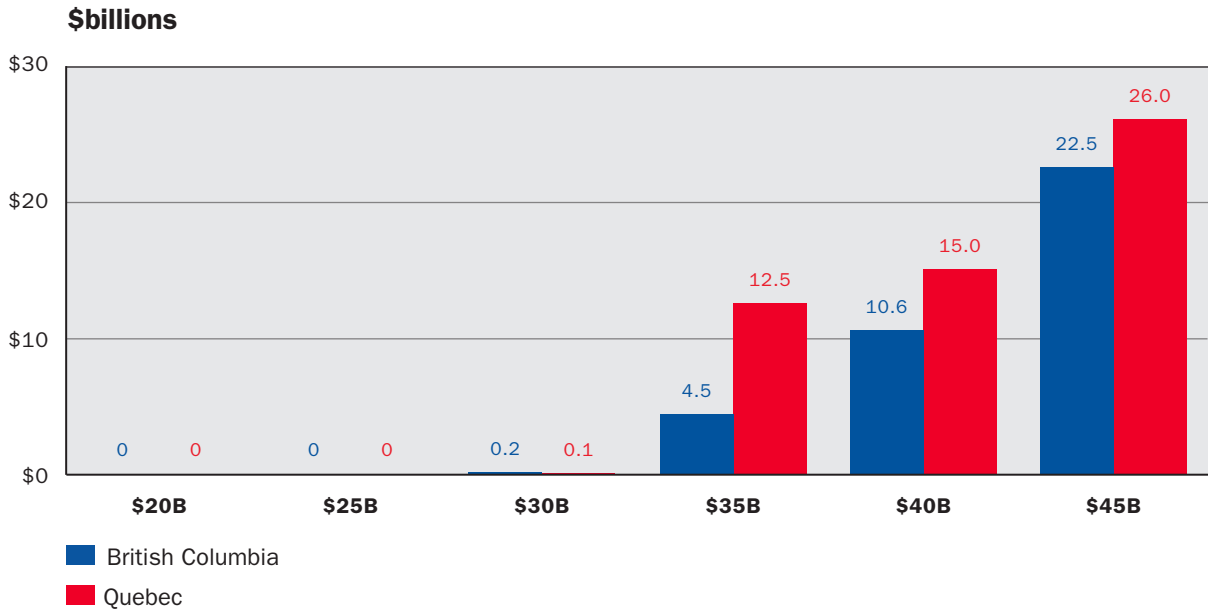
Assumptions:

1. PACICC would pay cat claims and non-cat claims as they develop, according to the American Reinsurance Association catastrophe claim development curve.
2. PACICC would seek to return all unearned premium back to consumers within one year

Under these assumptions, PACICC would require a fund of $200 million to cover expected cash requirements following an event resulting in claims of $30 billion in British Columbia. This is 0.4% of the total capital base of Canada's P&C insurers. Such a Fund would enable PACICC to avoid sending an Assessment to "surviving" Member insurers during a period in which many, if not most, would already be struggling to pay their own policyholder obligations. The corresponding figure for Quebec is 0.2 percent of P&C industry capital. Over a period of some years, a series of relatively small capital levies could readily enable PACICC to achieve this level of ex ante fund.

However, the required amount rises to $4.6 billion following a $35 billion event in BC and $12.6 billion in Quebec (7.7% of total insurer capital in BC and 20.8% of capital in Quebec) and $10.4 billion in BC (17.3% of total P&C insurer capital) and $15 billion in Quebec (40% of total P&C insurer capital) following a $40 billion event. Funds of this size are not a realistic possibility for PACICC.

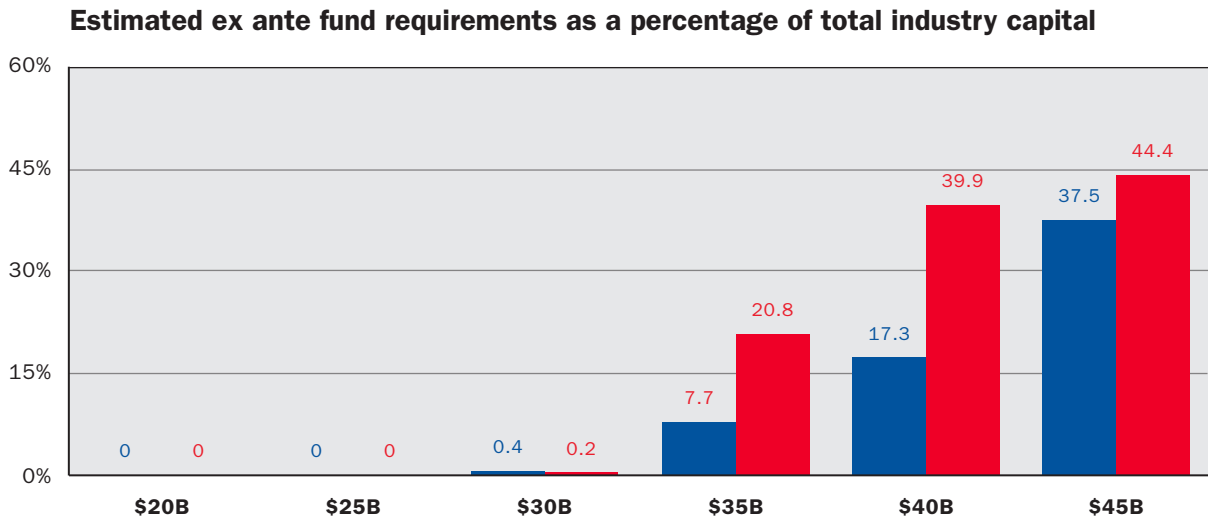
Figure 11 – Size of Ex Ante Fund required? Estimated Quantum to cover for 12 months



PACICC's existing pre-fund is approximately $60 million. Amount required to pay one year of claims (both catastrophic and non-catastrophic) for failed insurers + refund all unearned premiums

Source: PACICC

Figure 12 – Size of Ex Ante Fund required? As a percentage of total industry capital



The P&C industry's total equity base is approximately $60B.

Source: PACICC

The analysis in Scenario #2 suggests that increasing the size of the PACICC Compensation Fund could assist Canada's P&C insurance industry in dealing with failures in the Orange Zone. However, the size of an ex ante fund required to protect consumers from a catastrophic event greater than $35 billion is simply not realistic.

Alternative Scenario #3: What if the scope of regulatory forbearance changed? What if regulators do not close insurers until MCT is negative? And, what if Regulators do not close "group" insurers that survive the event?

Canada's insurance regulators decide if, and when, any insurer fails. This is not a decision that is made by PACICC. As a reminder, the PACICC base Model makes the following assumptions on how regulators will act:

1. Any insurer that reports a MCT of better than 100% following a catastrophic event is deemed only to be "distressed." Following a mega-catastrophe, we have assumed that regulators will allow companies with MCT scores above 100% to continue operations if the company can access additional reinsurance or capital from a related regulated entity, or if the required capital injection for a branch insurer is less than 10% of the parent company's global capital base.
2. Capital and reinsurance inflows that would enable a distressed insurer to increase its MCT score back above 100% are allowed from related companies that are regulated in Canada. In our Model, these transfers "save" the distressed insurer, unless and until the capital inflow required exceeds the total capital and reinsurance available at the related entities. If the required capital exceeds this amount, then the distressed insurer and all related entities are deemed to be insolvent.

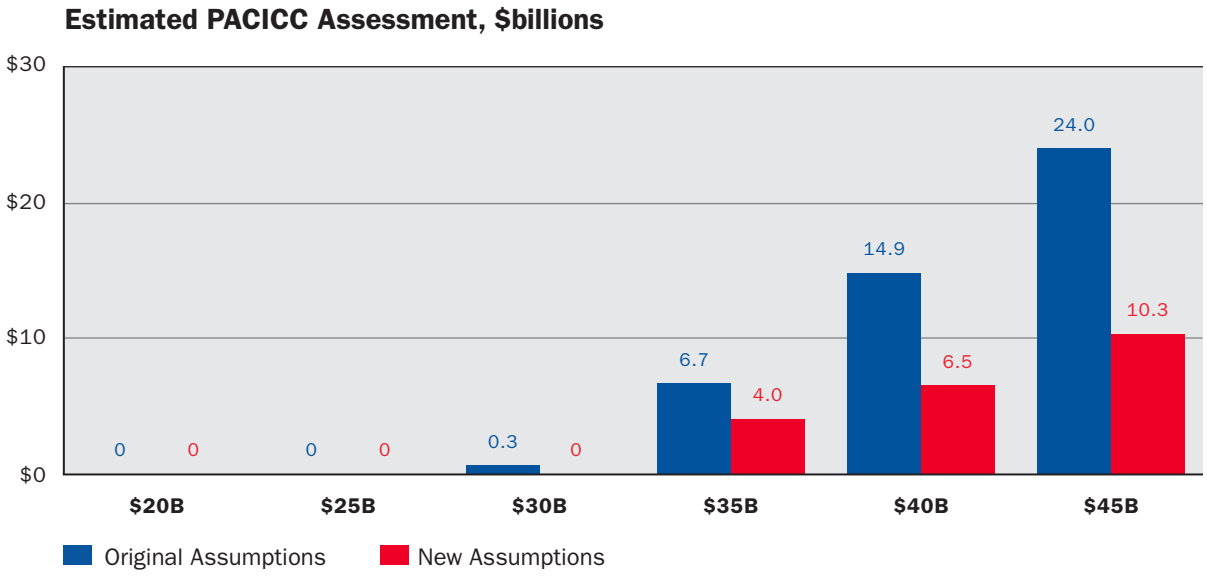
We modelled a scenario where we changed these assumptions as follows:

1. Regulators will not close any insurer with a post-event capital test greater than zero percent. An insurer with an MCT score below 100% reports that its liabilities exceed its assets. However, it may be possible for the insurer to survive if it continues to write new business. In this case, the new premiums are used to pay old claims. The company could survive as long as the new business is profitable, and the insurer does not suffer any additional negative surprises. Naturally, PACICC does not recommend that Canadian regulators allow an insurer to operate at these inadequate capital levels. However, this scenario is possible under the most extreme circumstances.
2. Regulators will not close any insurer due to a capital deficit at other insurers within the insurance group.

British Columbia

Under the changed assumptions, fewer insurers fail and the resulting PACICC Assessment is smaller. For a $30 billion event in British Columbia, no insurers report a negative post-event MCT and no Assessment is required. For a $35 billion event, only five insurers would report a negative MCT score. However, the average MCT at these insurers is -1,137.9%. The resulting PACICC Assessment falls from the estimated $6.7 billion in our original Model – to $4.0 billion.

Figure 13 – PACICC Model – British Columbia
Impact of increased regulatory forbearance



Using PACICC's Resolution Protocol does not materially impact the Green-Orange-Red levels estimated above.

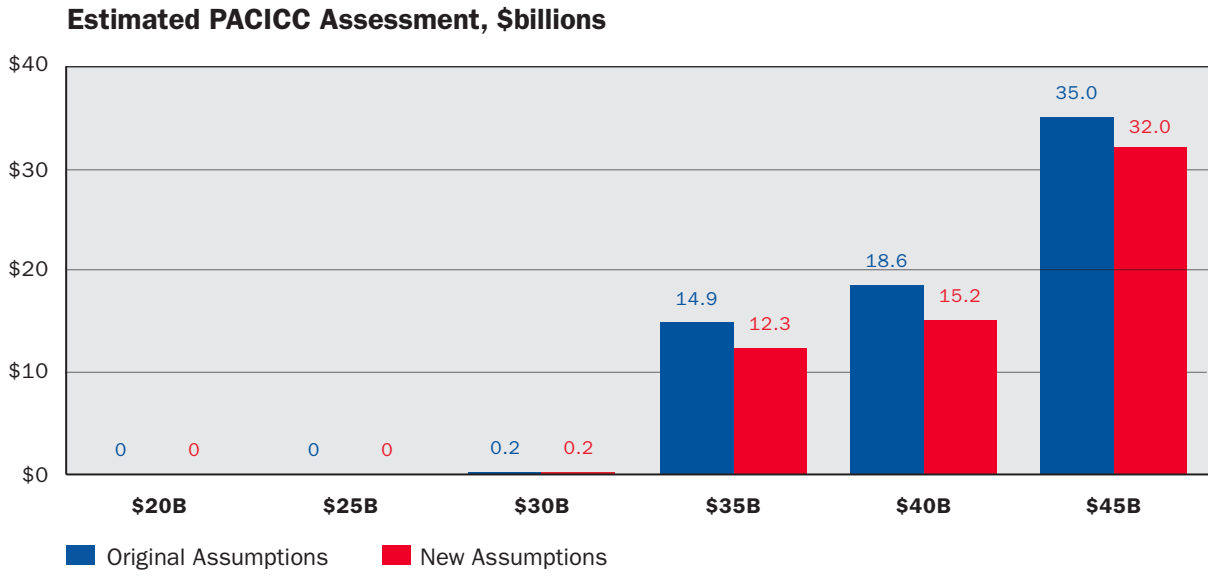
Source: PACICC

Unfortunately, this reduction in Assessment is not enough to prevent contagion. At this level of Assessment, 10 insurers that survive the initial event still fail due to the PACICC Assessment.

Quebec

Under the changed assumptions, fewer insurers fail and the resulting PACICC Assessment is smaller. For a $30 billion event in Quebec, no insurers report a negative post-event MCT and no Assessment is required. For a $35 billion event, only seven insurers would report a negative MCT score. However, the average MCT at these insurers is -600%. The resulting PACICC Assessment falls from the estimated $14.9 billion in our original Model – to $12.3 billion.

Figure 14 – PACICC Model – Quebec
Impact of increased regulatory forbearance



Using PACICC's Resolution Protocol does not materially impact the Green-Orange-Red levels estimated above.

Source: PACICC

Unfortunately, this reduction in Assessment is not enough to prevent contagion. At this level of Assessment, Canada's insurance system still fails.

This analysis leads PACICC to conclude that increased regulatory forbearance does not materially change the Green-Orange-Red Zones estimated above.

There is another possible form of regulatory forbearance. In both the 2008 financial crisis and the 2020 pandemic, Canadian regulators changed the solvency test of Canada's banks and life insurers. In both cases, the test was changed to allow financial institutions to withstand what were believed to be temporary declines in the market values of significant

assets. The thought was that markets would rebound before banks and life insurers planned to sell these assets, and that recognizing "temporary paper losses" would reduce confidence in Canada's financial system. The years immediately after 2008 have proven this to be a wise decision.

The core difference between the problems that banks and life insurers faced in 2008 and the challenges described in our Model is that the losses for insurers described in this paper are not a temporary paper loss. Canada's P&C insurers will have experienced a very real, and comparatively massive, actual loss in capital – in cash.

It is possible that Canadian regulators could change the MCT test such that the entire PACICC Assessment is not carried as a liability. As described previously, there is a limit to the size of the Assessment that PACICC can levy in any single calendar year. The remainder is due, but is an accounting contingent liability rather than a mandatory cash outlay. **PACICC would welcome discussions with OSFI to enhance the MCT test to reduce the type of systemic risk described in this paper. However, PACICC cannot envisage a change that would remove the systemic risk arising from peak perils.**

Table 3 – Limited scope for additional regulatory forbearance

	# of insurers with negative MCT	Average MCT of these insurers		# of insurers with negative MCT	Average MCT of these insurers
	British Columbia			Quebec	
$30B	0	N/A		0	N/A
$35B	5	-1,137.9%		4	-595.7%
$40B	8	-1,500.5%		8	-682.2%
$45B	11	-2,101.3%		11	-766.9%

A negative MCT score means that the insurer's liabilities are greater than its assets. For instance, after the $45B event, the failed insurers in BC owe $21 in liabilities for every $1 in assets.

Source: PACICC

Alternative Scenario #4: Could PACICC's new Resolution Protocol materially impact the Green/Orange/Red Zones?

When PACICC was first established, it was granted many of the powers of a "resolution authority." However, it has rarely, if ever, had the opportunity to use them. Expanding PACICC's resolution toolkit to incorporate a range of actions beyond simply providing compensation after liquidation could serve to reduce systemic risk in Canada's P&C insurance industry. In PACICC's Model estimating the industry's capacity to withstand a catastrophic earthquake, the key driver of systemic risk is the failure of a larger Member insurer and the resulting Assessment. Liquidating any of the largest insurers in Canada would require a multi-billion-dollar Assessment which would then result in a cascade of other company failures across the industry.

In 2020, the PACICC Board approved a Resolution Protocol that outlines the steps that PACICC must undertake before authorizing the use of industry funds to assist a distressed Member insurer. The PACICC Board-approved Protocol is intended for the purpose of evaluating the potential resolution action to be undertaken by PACICC, in the context of a single insurer failure. It was not intended or designed to respond to the special circumstance of serial insurer failure in the wake of a natural disaster such as a major earthquake – and, in fact, specifically declares that the Protocol is not operative under those circumstances. This section of the paper seeks to determine if utilization of the PACICC Resolution Protocol after a large catastrophic event could produce better outcomes for consumers.

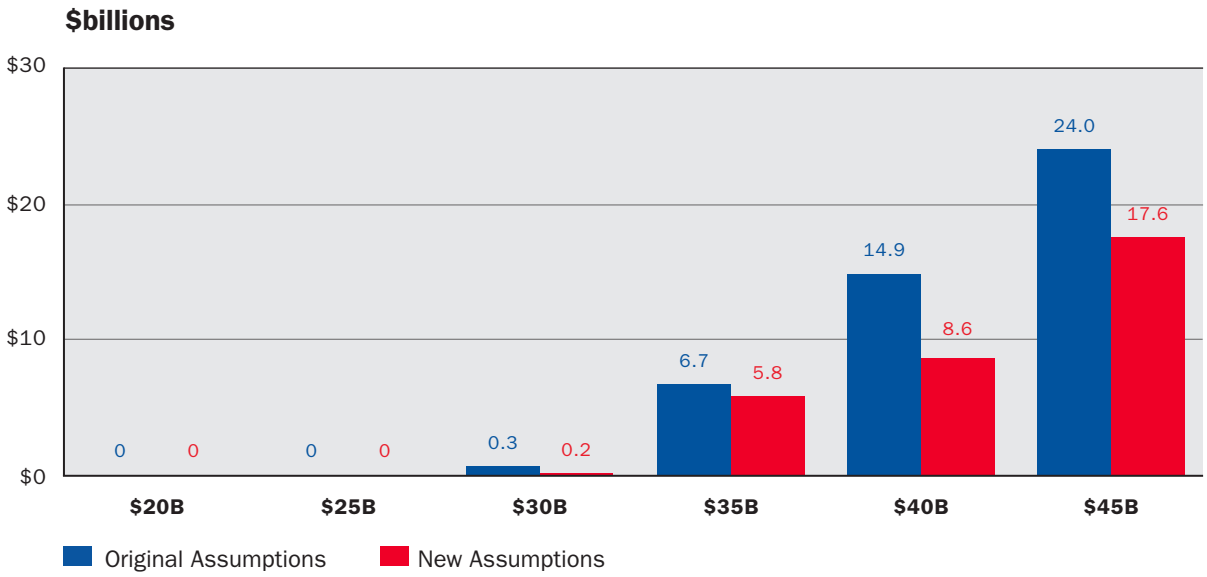
Our original Model assumes that all insurers closed by regulators will be liquidated. In this section of the paper, we change this assumption as follows:

1. Insurers will be only liquidated if their post-event MCT is negative.
2. Insurers with a post-event MCT greater than zero will receive a capital injection (cash) large enough to increase their MCT to 150% via PACICC intervention – funded by an Assessment

British Columbia

Under the changed assumptions, fewer insurers fail and the resulting PACICC Assessment is smaller. For a $30 billion event in British Columbia, no insurers report a negative post-event MCT and a capital injection of $200 million is required to return one distressed insurer to a MCT score of 150%. For a $35 billion event, five insurers report a negative MCT score. Unfortunately, the average MCT at these insurers is -1,137.9%. While the required PACICC Assessment falls from the estimated $6.7 billion to $5.8 billion, this reduction in Assessment is not enough to prevent contagion. **At this level of Assessment, 12 insurers that survive the initial event still fail due to the PACICC Assessment.**

Figure 15 – PACICC Model
Alternatives to Liquidation? Required Assessment – British Columbia



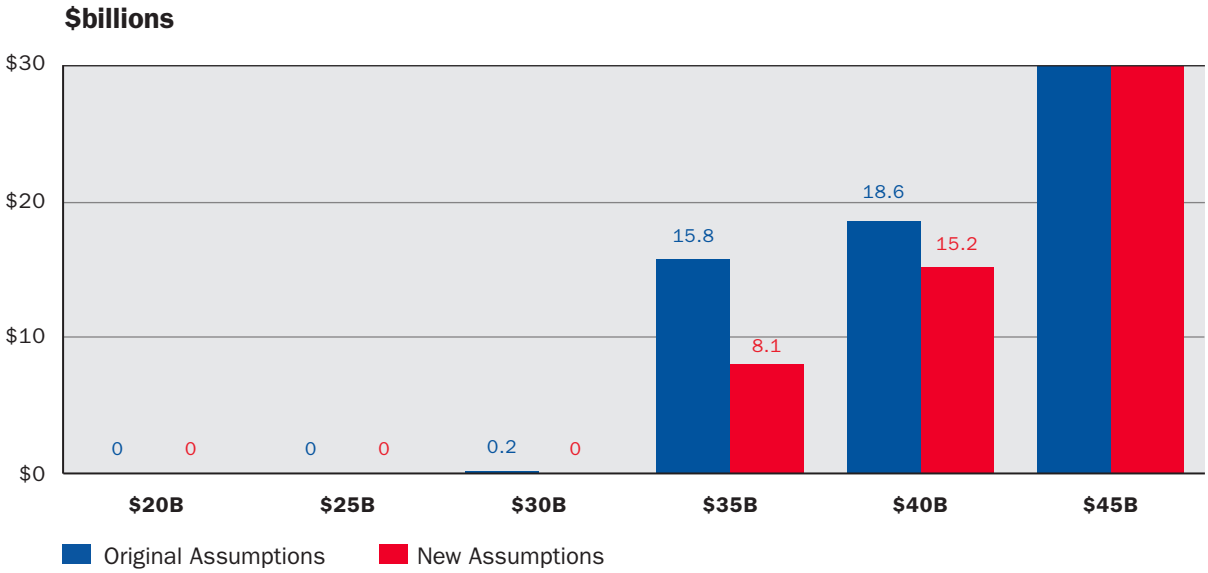
Using PACICC's Resolution Protocol does not materially impact the Green-Orange-Red levels estimated above.

Source: PACICC

Quebec

The changed assumptions have a similar impact in Quebec. For an event that results in claims of $35 billion, the original assumptions resulted in seven insurers failing, with the resulting Assessment being $15.8 billion. Under the changed assumptions, four insurers report a negative MCT score and three companies report a positive MCT score. This significantly reduces the required PACICC Assessment – to $8.1 billion. **Unfortunately, this reduction in Assessment is not enough to prevent contagion.**

Figure 16 – PACICC Model
Alternatives to Liquidation? Required Assessment – Quebec



Using PACICC's Resolution Protocol does not materially impact the Green-Orange-Red levels estimated above.

Source: PACICC

This analysis leads PACICC to conclude that using PACICC's Resolution Protocol would not materially change the Green-Orange-Red Zones estimated above.

Alternative Scenario #5: What if PACICC were to borrow money (from Government or elsewhere) instead of making an Assessment on Member insurers following a mega-catastrophe?

PACICC's 2021 maximum annual Assessment of $1.017 billion provides considerable financial capacity to respond to policyholder compensation obligations of a failed insurer, but may not provide sufficient liquidity to support timely payment of all policyholder claims. The U.S. experience indicates that 90% of policyholder claims are made and resolved within three years after a catastrophe event. The adjacent Table (Estimated borrowing requirements) shows the estimated range of capital injection that would be required to:

a. Return all distressed insurers' post-cat MCT to 150%, or

b. Pay all catastrophe claims and allow all distressed insurers to return to pre-event MCT level

There is a wide array of options to provide this capital including direct cash injection, loan or reinsurance. This paper does not evaluate these options.

Table 4 – PACICC Model – Borrowing instead of Assessing? Estimated borrowing requirements

	Capital required to return to 150% MCT	Capital required to pay cat claims		Capital required to return to 150% MCT	Capital required to pay cat claims
	British Columbia			Quebec	
$30B	$0.05B	$0.2B		$0.02B	$0.4B
$35B	$1.1B	$4.2B		$3.4B	$6.1B
$40B	$2.3B	$8.3B		$6.4B	$17.6B
$45B	$5.0B	$15.4B		$9.3B	$21.3B

Government could provide capital (in the form of a loan) to increase each distressed insurer's MCT to 150% (the regulatory minimum). Alternatively, the loan could be enough for the insurer to pay catastrophe claims and continue with its normal operations.

Source: PACICC

British Columbia

After the $35 billion event, $1.1 billion would allow the distressed insurers to return to a MCT score of 150%, or a cash injection of $4.2 billion would pay all of the catastrophe claims. After a $45 billion event, these insurers require $5.0 billion to return to a 150% MCT, and there would be a requirement for $15 billion to settle catastrophe claims.

Quebec

After the $35 billion event, $3.4 billion would allow the distressed insurers to return to a MCT score of 150%, or a cash injection of $6.1 billion would pay all of the catastrophe claims. After a $45 billion event, these insurers require $9.3 billion to return to a 150% MCT, and there would be a requirement for $21.3 billion to settle catastrophe claims.

The existing PACICC Assessment mechanism would generate more than $14.9 billion needed in Quebec, or $24.0 billion required in BC, for a $45 billion catastrophic event – but only over 20 years. PACICC could theoretically borrow funds or develop a contingent credit facility to pay the claims in a more timely fashion, and repay this large amount through future Assessments. A contingent credit facility could be established with a major bank, capital markets or with government agencies. This would enable PACICC to access funds, which would come in the form of a loan, to pay consumer claims. This loan would be re-paid via future industry Assessments – perhaps as a fixed percentage of future policyholder premiums.

There are pros and cons associated with PACICC borrowing from the private sector.

Pros:

- Increases PACICC's capacity to respond to a major disaster
- Increases the capacity of the industry to respond to a disaster somewhat larger than $30 billion

Cons:

- There would be significant cost in establishing this facility and having it on "stand-by"
- There would be significant interest charges and fees associated with actually using such a facility

Using PACICC's future Assessment capacity as collateral could still create a potential contingent liability for Member insurers under accounting standards This scenario remains a viable one to address an event in the Orange Zone. However, PACICC would need to develop an Assessment mechanism which would minimize potential "contingent liability" on insurer balance sheets. While not impossible to achieve, to date, all efforts in this regard have encountered significant, and very real stumbling blocks.

Conclusion

Our Model exposes a major risk to our country. None of the five alternatives explored above effectively mitigate this risk for an event in the Red Zone.

Box 2 – International best practice

In February 2017, the Organisation for Economic Co-operation and Development (OECD) recommended that member states "establish a strategy, under the leadership of Ministers of Finance or other relevant national authority, for managing the financial impacts of disasters." Many modern economies have developed programs to manage the risks of catastrophic natural disaster events. The purpose of these programs is not to protect insurance companies; rather, they serve to protect the competitiveness and resiliency of their economies.

In 2020, the Global Risk Institute in Financial Services conducted an international survey of earthquake insurance providers and guarantee schemes.[10] Examples of these programs include:

France: Created in 1982, **the Caisse Centrale de Réassurance** (**CCR**) is a public-private partnership providing government-guaranteed reinsurance.

New Zealand: The **Earthquake Commission** (**EQC**) provides automatic first-loss cover for valid claims for all policyholders of residential fire insurance. Premiums are collected through a compulsory levy added to all homeowner policies, and private insurers transfer the levy to the EQC for investment by the Natural Disaster Fund. Owners of non-insured property can expect no help from government.

Spain: The **Consorcio de Compensación de Seguros** (**CCS**) was founded to indemnify Spanish insurance companies against claims arising from unpredictable events, including natural disasters. It became a permanent state-run, private-public partnership in 1954, providing nationwide, state-guaranteed cover for extraordinary risks.

Turkey: The **Turkish Catastrophe Insurance Pool** (**TCIP**) was established in 2000 as a legal public entity to provide earthquake policies. These policies are sold by private insurers. They transfer the full risk to the TCIP and receive a commission.

United States: The **California Earthquake Authority** (**CEA**) was established in 1996 as a tax-exempt, not-for-profit, largely privately-funded pool to cover seismic damage in that State. Insurers had the option of paying an "exit tax" and offering cover, or transferring funds and participating in the pool; 70 percent agreed to transfer funds which, together with premiums and return on investments, provides the total CEA income.

This list is not exhaustive. Many countries have developed programs to increase the resiliency of their economies to the risks posed by natural catastrophes. While the structures of each of these programs are unique to the countries that they protect, there is a common theme with these programs – a recognition by Governments that there are catastrophic events that are too large for private insurers and that there is a role for Government. The core finding of the GRI study was that none of these countries, with the exception of Canada, rely on an industry-funded policyholder protection mechanism like PACICC to cover catastrophic risk.

[10] https://globalriskinstitute.org/publications/international-survey-of-earthquake-insurance-guarantee-schemes/

Every country has used a different approach to address this issue. And it is entirely possible that the solution for Canada is different again – and even that the solution for BC is different than the one for Quebec. **What is not acceptable is that our Federal Government and our industry fail to put in place a mechanism to eliminate the exposure to our country and its citizens above the $35 billion Red Zone threshold – beyond the tipping point.**

In 2017, Finance Canada, as part of its review of Canada's financial system, acknowledged the potential systemic risk from earthquake risk.[11] Since 2017, Finance Canada has built a team to study this issue. PACICC acknowledges this progress and anxiously awaits decisive action by Canada's Federal Government.

[11] http://www.fin.gc.ca/activity/consult/pssge-psefc-eng.pdf, p20-21

What events could result in this level of catastrophic damage?

Fortunately, Canadians, and the insurance industry, have never experienced a very large disaster resulting in catastrophic loss and damage. PACICC's consultation with the scientific and insurance communities confirms that there are in fact relatively few perils that could bring the level of catastrophic damage anticipated in our Model. While these are very unlikely to occur, they are distinctly possible and would have severe adverse impacts on Canada – with the potential to overwhelm the capacity of Canada's insurance industry to respond.

A catastrophic earthquake in Vancouver or Montreal

The risk of a very strong earthquake occurring is "high" in Vancouver and "moderate" in Montreal.[12] On the other hand, vulnerability to earthquake damage is "moderate" in Vancouver and "high" in Montreal, particularly in terms of the number of older, high-value buildings and infrastructure – built before modern seismic engineering knowledge was applied to building codes.

Crustal earthquakes under urban areas result in extensive damage to buildings and infrastructure. This includes destruction due to strong shaking and the potential for extensive fire damage. Older structures are the most vulnerable. A large subduction event results in less shake and fire damage because it is located some distance from major urban areas, but damage will extend over a larger area and there is the additional risk of damage to coastal communities from a tsunami. The tsunami exposure of insurance companies is not well understood.

A 2020 report from the Global Risk Institute notes:

Risk Management Solutions (RMS) estimates that a worst-case earthquake (1-1000 years) in Western Canada could result in over $95 billion in insurance claims, while a worst-case event (1-1200 years) in the East could inflict even greater costs.[13]

In the 2020 update of Canada's National Building Code, Natural Resources Canada provided new estimates from its National Earthquake Model. These estimates include new science regarding; how seismic waves move, soil conditions and changes to Canada's built

[12] https://seismescanada.rncan.gc.ca/hazard-alea/simphaz-en.php

[13] https://globalriskinstitute.org/publications/international-survey-of-earthquake-insurance-guarantee-schemes/, p.2

environment. All of these changes indicate that the modelled cost of a major earthquake in a Canadian city is substantial and could easily surpass the $35 billion tipping point described in this paper.

An asteroid striking Toronto or another urban centre

Meteoroids are small particles or fragments of comets or asteroids, typically less than a metre wide. An estimated 15,000 tonnes of meteoroids impact the Earth's atmosphere each year. While much of this material incinerates in the form of meteors, pieces of larger meteoroids (greater than 10 cm in diameter) may survive to impact the earth's surface – they are called meteorites. Property insurance covers the risk of damage from falling objects, including responding to damage claims from meteorites.

Asteroids are large rocky bodies with a diameter exceeding 30 metres. Comets are of similar size, and are composed of ice, mixed with rock. In 1908, a small asteroid or comet exploded over Siberia blowing down 80 million trees over an area of 2,000 square kilometres. There is a five to 10 percent chance over the next 50 years that the planet will experience another asteroid or comet strike like the 1908 event. Almost 70 percent of the planet is covered by oceans, so the asteroid or comet is most likely to strike water and result in a tsunami damaging coastal communities. If the asteroid or comet were to strike land and directly hit a city, the devastation would be beyond anything previously experienced. A RMS model of a small asteroid strike or explosion (like the 1908 event) in New York City resulted in an estimate of more than $1 trillion in damage. [14]

The value of insured property in Toronto and other large built-up areas in Canada is several hundred billion dollars. While an asteroid striking a city is very unlikely to occur, it would certainly result in damage claims that would far exceed Canadian insurers' ability to pay.

Extreme space weather

Solar storms can disrupt communications satellites, weather monitoring, and electrical transmission lines and damage pipelines, spacecraft, and require the redirection of air travel to avoid the increased risk of radiation in polar regions. For example, in 1989, a geomagnetic storm tripped the circuit breakers on Hydro-Quebec's power grid, resulting in a blackout that lasted for 12 hours, affected five million people and resulted in more than $2 billion in damage. Some satellites lost control for several hours and short-wave radio signals were disrupted.

[14] http://support.rms.com/publications/1908_tunguska_event.pdf

Society has grown increasingly dependent on sensitive electrical equipment. Research to understand and help manage the risks associated with the next solar superstorm, like the 1859 Carrington event, has been under way for about a decade, but the implications for society and potential impact on the insurance industry are still emerging.[15] The impact of an extreme space weather event on the Canadian insurance industry is unknown, but there is some risk that it could result in several tens of billions of dollars of claims, potentially exceeding the industry's financial capacity.

Cyber Risk

The reliance of modern society on computer systems is ever-increasing. And, more and more, these systems are relying on a limited number of "cloud" providers for data storage and as operating platforms. The risk to these platforms from natural (space weather) or man-made (terror, hacking) catastrophes is not well understood, but must be substantial. By the time we update this Model again, it is very likely that we will all have a better understanding of the exposure from Cyber Risk and the potential for a Cyber event to cause systemic issues for the Canadian P&C industry, and thus for Canada.

[15] https://www.history.com/news/a-perfect-solar-superstorm-the-1859-carrington-event

Key Observations and Recommendations

This paper makes clear the fact that, despite strong regulation and the best efforts of highly capitalized and well-resourced private insurers to anticipate a very large catastrophic event (such as a major earthquake), there are clear and definable limits to the capacity of Canada's private insurance system. A clear and compelling case is made for the establishment of a federal backstop mechanism to protect Canadians from the impact of a severe "tail-risk" event.

Following are key observations and recommendations from the paper:

1. **Canada's P&C insurance system is prepared for a mega-catastrophic event that results in claims up to $30 billion, with minimal impact on solvency.**
2. **This level of preparedness is seven-times larger than the largest natural disaster experienced in Canadian insurance history.**
3. **This level is $10 billion higher (or 33% greater) than the industry's level of preparedness in 2013.**
4. **A primary reason for the increase in preparedness of Canada's insurance system is the result of a dramatic increase in reinsurance purchased by Canada's P&C insurers (71% since 2013).**
5. **Canadian scientists and insurance industry experts believe that there are rare, but plausible events that would cause insured losses above this threshold. These include:**
   - **Earthquake in British Columbia and Quebec**
   - **Solar storms**
   - **Space debris**
   - **Cyber risk.**
6. **An event that caused insured losses between $30 billion and $35 billion would cause multiple insurers to fail. The insurance system would be strained, but should be able to withstand such an event.**
7. **A catastrophic event with insured losses greater than $35 billion would overwhelm Canada's insurance industry – this is the tipping point.**
8. **Inaction by PACICC following a mega-catastrophe of this size would result in reduced availability of insurance and cause hardship for millions of policyholders across every province and territory in Canada.**

9. **Increasing PACICC's prefund to an amount adequate to forego the need for any Assessments on Member insurers after a $30 billion event would require the PACICC Compensation Fund to grow by only $140 million, or 0.4% of the industry's total capital base. However, to increase the Fund to handle a $35 billion catastrophic event would require it to grow $4.6 billion. This represents approximately 8% of the total capital base supporting Canada's insurance industry, and is not a credible solution.**
10. **Using PACICC's new Resolution Protocol to avoid liquidation of Member insurers that reported MCT capital tests between 0% and 150% following a catastrophic event would not materially impact PACICC Model estimates.**
11. **Increasing regulatory forbearance to allow insurers to continue operations if their post-event MCT remained greater than zero would not materially impact PACICC Model estimates.**
12. **A catastrophic event that resulted in insurance claims greater than $35 billion is entirely credible and the subsequent failure of the entire Canadian P&C industry would create a national crisis for Canada.**
13. **Canada can and must be better prepared for such an event by following international best practice and by developing a backstop partnership between insurers and Government.**

PACICC is committed to working with the Federal Government and other industry stakeholders to establish a backstop mechanism that will assist the P&C insurance industry in withstanding the very worst effects of a severe tail-risk event, thereby strengthening the safety net for all Canadian P&C insurance policyholders and for our country.

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