

TEXAS WINDSTORM INSURANCE ASSOCIATION

TWIA – 0006 Actuarial Services – Catastrophe Modeling

January 19, 2022

A business of Marsh McLennan

Guy Carpenter Overview

Guy Carpenter is a leading global solutions provider to the (re)insurance industry, delivering a powerful combination of analytics, reinsurance broking expertise, and strategic advisory services to help our clients manage risk and capital. We use a host of **proprietary tools** to analyze risk, model portfolios, and preview potential outcomes regarding reinsurance and capital management strategies. In addition, we provide guidance on a broader range of issues such as catastrophe exposure management, capital allocation, reserve risk estimation, Enterprise Risk Management, and economic capital modeling.

Guy Carpenter has **deep experience** working with risk-bearing entities of all types and sizes, including several residual coastal markets. Guy Carpenter does not disclose details regarding the programs placed for clients. That said, with respect to property catastrophe reinsurance, our overall scale – **more than 900 programs annually with a total limit placed in excess of \$75 billion** – is an advantage for our clients. Guy Carpenter has been providing reinsurance brokerage services for nearly **100 years**.

Key Statistics



Placed ~\$46 billion
in ceded premium
in 2020



Our 3,100 employees
sit in over 60
locations worldwide



Deliver a powerful
combination of broking
expertise, strategic
advisory services, and
industry-leading analytics



Part of Marsh McLennan,
a \$17.2 billion
professional services
firm, since 1923

Guy Carpenter Analytics Team

North American Analytics

A group of almost 200 actuaries and catastrophe analysts throughout the US and Canada focused on providing advisory services and delivering insights to Guy Carpenter's clients. A rating advisory team specializes in assisting clients in navigating rating agency interactions and meeting rating goals.

Model Solutions and Advisory

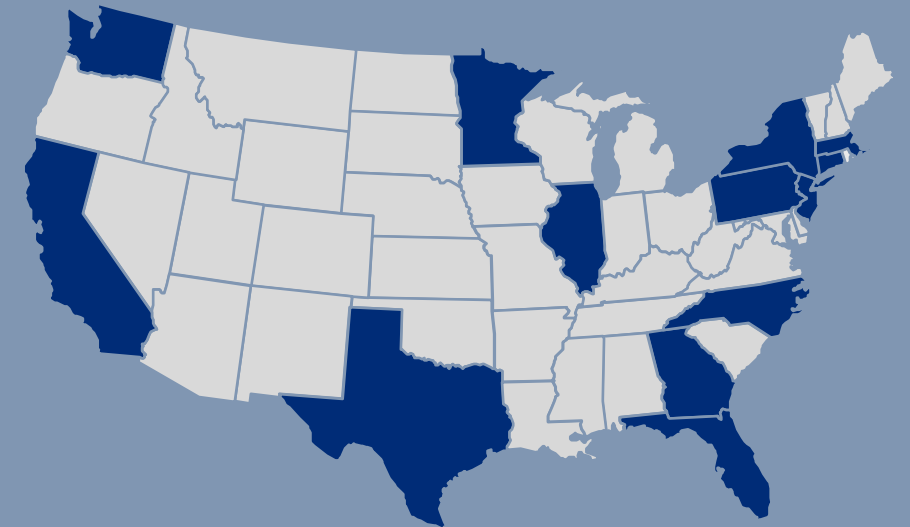
A global team of ~ 50 model developers and scientists who evaluate licensed models through the MSA framework; provide deep peril, climate change, and event response insights; and develop proprietary models and views of risk when warranted. A dozen scientists are dedicated specifically to North American perils.

North American Strategic Advisory

The North American Strategic Advisory teams engage clients in economic capital modeling, portfolio optimization, predictive analytics, growth strategies, and enterprise risk management using a suite of proprietary, cutting-edge GC tools.

North American Catastrophe Advisory

- Over 100 catastrophe analysts in North America in 14 locations, including Dallas
- With an average team tenure of over ten years, the catastrophe advisory team offers unparalleled bench depth
- Extensive experience in GC's four US hurricane licensed catastrophe models: AIR, CoreLogic, RMS, and KatRisk
- On an annual basis, over 400 US clients in the insurance industry are receiving catastrophe modeling output from Guy Carpenter
- Specialized portfolio management, event response and reinsurance strategy teams have a reputation for offering best in class solutions



Catastrophe Advisory Framework

Defining TWIA's 100-year Probable Maximum Loss

View of Risk

Crafting a bespoke view of risk goes well beyond a simple model selection. Guy Carpenter has a holistic framework beginning with the data collection process that assesses the four major components that influence catastrophe loss estimates. This framework will help determine the 100-year probable maximum loss for TWIA.

Data Strategy

Review, coding and inclusion of policy terms, primary risk characteristics and secondary modifiers

Model Vendor

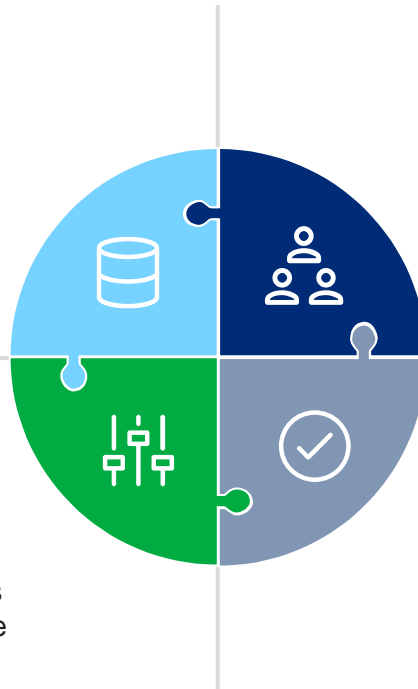
Evaluate vendor options, single or multiple model view, which may differ by peril and line of business

Model Options / Versions

Selection of options for each peril to be modeled such as demand surge, event catalog (10k, 50k, 100k), and view of the frequency

Post Model Adjustments

Adjust output for model deficiencies, non-modeled losses, model blending, loss adjustment expense, climate change, etc.



Standard Output



- Detailed review to understand current data, exposure and changes over time
- Documentation of model codes and settings
- Catastrophe modeling results for hurricane and severe convective storm, including PMLs for various model scenarios and a final TWIA view of risk
- Support for TWIA Board of Directors presentation

Visualization Platform



- Exposure accumulations, event response, exposure and loss visualization, etc.

Portfolio Optimization



- Identification of impactful data enhancements, key loss drivers and average annual losses by the desired resolution

Risk Transfer Optimization



- Layer losses and reinsurance cost allocation

Risk Transfer Execution



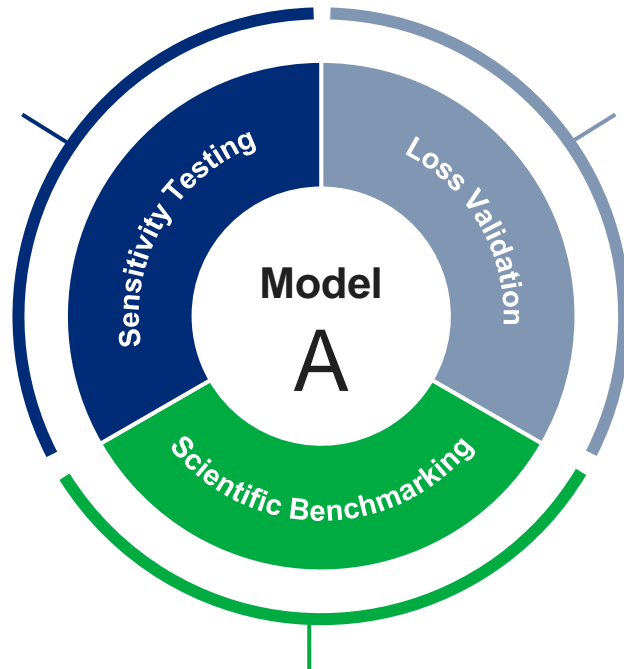
- Model files and documentation as needed for reinsurance placement(s)

Model Suitability Analysis (MSA)

Keeping TWIA Ahead of the Curve

Calculated losses in a catastrophe model depend on numerous factors, including building characteristics, model catalog parameters and modeled hazards.

- Reveals hidden model assumptions
- Improves data collection
- Enhances underwriting strategies



- Compares modeled loss to real loss experience
- Customizes assessment of model performance to portfolio

- Studies catalog, hazard, and vulnerability
- Uncovers opportunities for adjustment

Guy Carpenter's **MSA framework** allows for accurate quantification of model performance via three main types of inquiries:

Sensitivity Testing

The representation of exposure within the model can significantly influence the loss experienced at a location. Sensitivity testing quantifies the influence of various exposure attributes on loss calculations

Loss Validation

Comparing model performance to historical observations identifies structure types, regions, and events resulting in over-or underestimating losses

Scientific Benchmarking

At the heart of catastrophe models lies a peril hazard model. Scientific benchmarking answers questions regarding the accuracy of the underlying hazard modeling within a catastrophe model

Understanding Impacts of 100-Year PML Selection

Determining TWIA's Risk Tolerance



There is no one “correct” view of risk, rather a range of estimates encompassing the most likely potential of risk. Guy Carpenter’s Catastrophe Advisory Framework helps develop the narrowest range with an acceptable confidence level.

Range of Reasonable Estimates for 100-year PML

Low Estimate



Risks:

- Potentially unprotected from what other views may consider within the 100-year PML
- Increased potential for post-event funding
 - Debt-issuance
 - TWIA / Private policyholder assessments
 - Request for taxpayer assistance
- Reduced ability to trade-forward should a catastrophe event approaching 100-year PML occur

Central Estimate



Risks:

- Must secure additional reinsurance funding
- Potential to over-reinsure due to uncertainty in modeled outcomes
- Must recoup increased reinsurance expenses from TWIA policyholders or member companies

High Estimate

TWIA must determine risk preference ranging from a relative certainty of marginally increased expenses or a possibility (however remote) of significant post-event expense and reduced claims-paying ability.

Proposed Schedule

The schedule and content delivered is reliant on TWIA obtaining the appropriate model vendor licenses.

Coordination

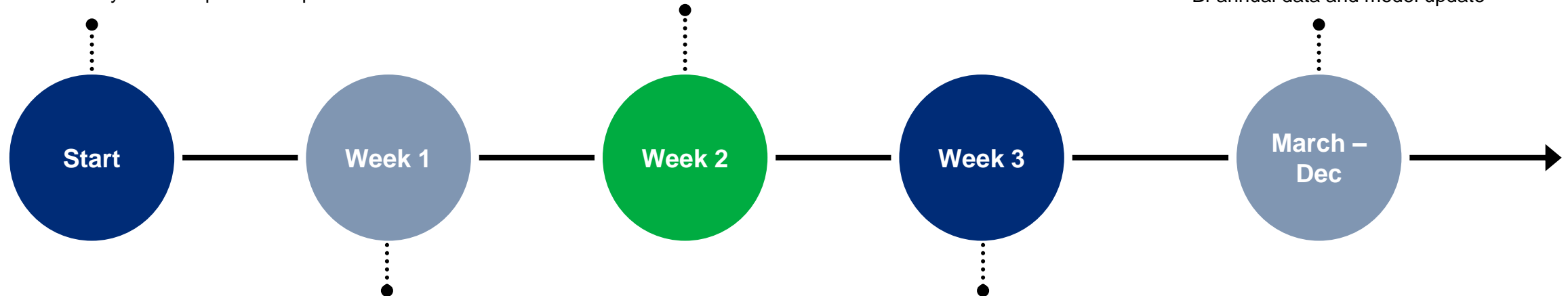
- TWIA data is requested with 24 hours if the RFP is awarded to Guy Carpenter
- Strategic planning meeting with your Guy Carpenter team
- TWIA confirms that necessary vendor licenses have been or will be secured before delivery of the requested output

Catastrophe Modeling

- Prior year model view is delivered as a baseline
- Baseline results are reviewed and approved by TWIA
- Additional views of risk are discussed, modeled in AIR & RMS and portfolio-level results are delivered
- TWIA selects final custom view of risk

Pre and Post Renewal

- Location level loss detail
- Files to support reinsurance renewal
- Additional views of loss: sensitivity testing, other vendor models, etc.
- Event response
- Bi-annual data and model update



Data Strategy

- Data is received, reviewed and assumptions are provided
- Adjustments made as needed
- TWIA approves data totals and assumptions

Output and Board Presentation

- Catastrophe model output, based on the final view of risk and as outlined in section 3.1 Catastrophe Modeling Services, is delivered
- Content and preparation for the TWIA Board of Directors meeting scheduled for February 22, 2022



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Texas Windstorm Insurance Association

Catastrophe and Actuarial Services
Proposal

January 19, 2022



Why Aon is the Ideal Analytics Partner for TWIA

About Aon's Proposal

- Aon's scale, market experience and insight uniquely positions us to bring greater analytics value and insight to TWIA – Aon is the largest global intermediary
- Analytics partnership proposal is based on our assessment of what Aon can best provide to TWIA, and pricing has been developed around our experience with similar projects

Aon's Unique Qualifications

- Aon contracts with multiple modeling firms, lending greater expertise and experience in support of reinsurance transactions and capital stress testing
- Model access will allow Aon to support TWIA beyond the reinsurance placement, giving greater insight into model behaviour
- Aon will be TWIA's independent analytics advocate

TWIA View of Risk

- Establishing a TWIA View of Risk will be an important differentiator for the future
- Customized view will feature a bespoke model built on Aon's Impact Forecasting platform
- An independent View of Risk will allow TWIA to improve benchmarking against both historical and future events, better capture building code impacts and general structure performance, and reduce uncertainty
- Creating a customized View of Risk will reduce the potential for reinsurance purchase level requirement changes caused by 3rd party vendor model updates
- TWIA will increase confidence in making critical decisions based on modeled results. It is important to recognize that a bespoke model may not lead to lower PML estimates. We hope that it does.

Recognition of key milestones will be vital to success when partnering with Aon:

Stage 1:
Appointment of
Analytics
Partner

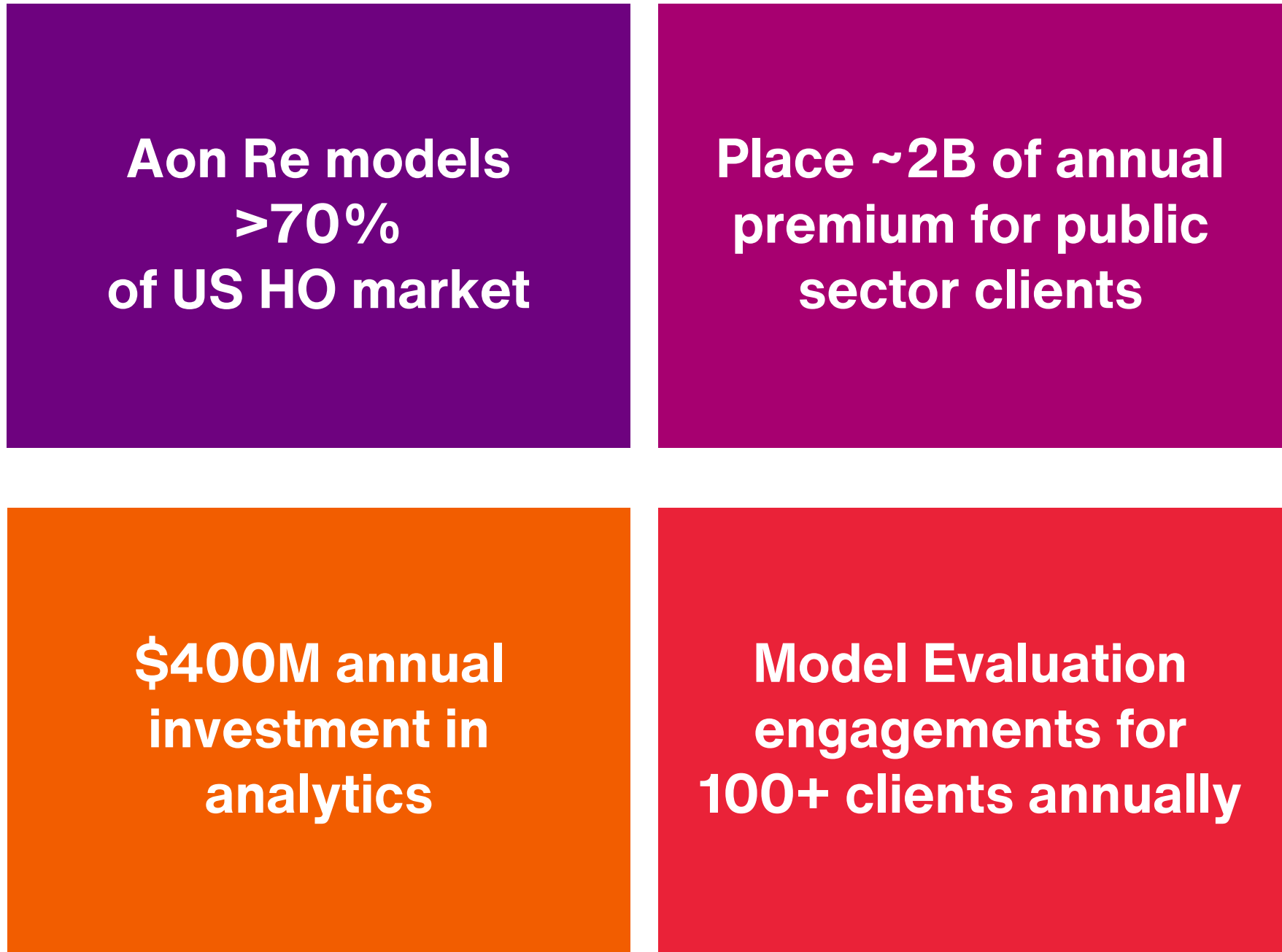
Stage 2:
Confirmation of
Analytics
outputs

Stage 3:
Establishment of
structure
funding

Stage 4:
Commence with
establishing
TWIA View of
Risk

Your Aon Team Brings Analytics Scale and Expertise to TWIA

Aon’s scale and breadth provide TWIA unique catastrophe analytics insights



Partnering with the Public Sector to Promote Resiliency

For over 40 years, Aon has supported public entities globally, creating a global network consistently working together with governments to meet the most timely and challenging issues.

The PSP team is comprised of colleagues with broad experience serving in government, insurance, reinsurance, consulting, and the capital markets.

Aon’s PSP by the Numbers



3,500+

Public Sector Clients Globally



500+

Colleagues Serving Public Sector Globally



\$100B+

Public Sector Risk Transferred in the Last 5 Years

Partnership to Support TWIA's Mission through Analytics

We work together through...

Collaborative Partnership

- Develop an evidence-driven, customized view of catastrophe risk
- Work to increase communications and transparency with various stakeholders

Advanced Analytics

- Industry-leading analytics team to support TWIA
- Collaborate to capitalize on a well-tested suite of models, industry experts, tools and services

Independent Opinion

- Utilize an independent opinion
- Aon is TWIA's advocate

In order to achieve...

Placement Analytics Reinsurance Supporting Analytics

- Execute on catastrophe modeling with required models to support the reinsurance transaction, determine purchase level of reinsurance and total funding
- Visualize exposures
- Support in presentation of modelling results to stakeholders
- Manage portfolio risk and support rate filings
- Provide real-time cat event reporting

TWIA View of Risk Customized and independent solution

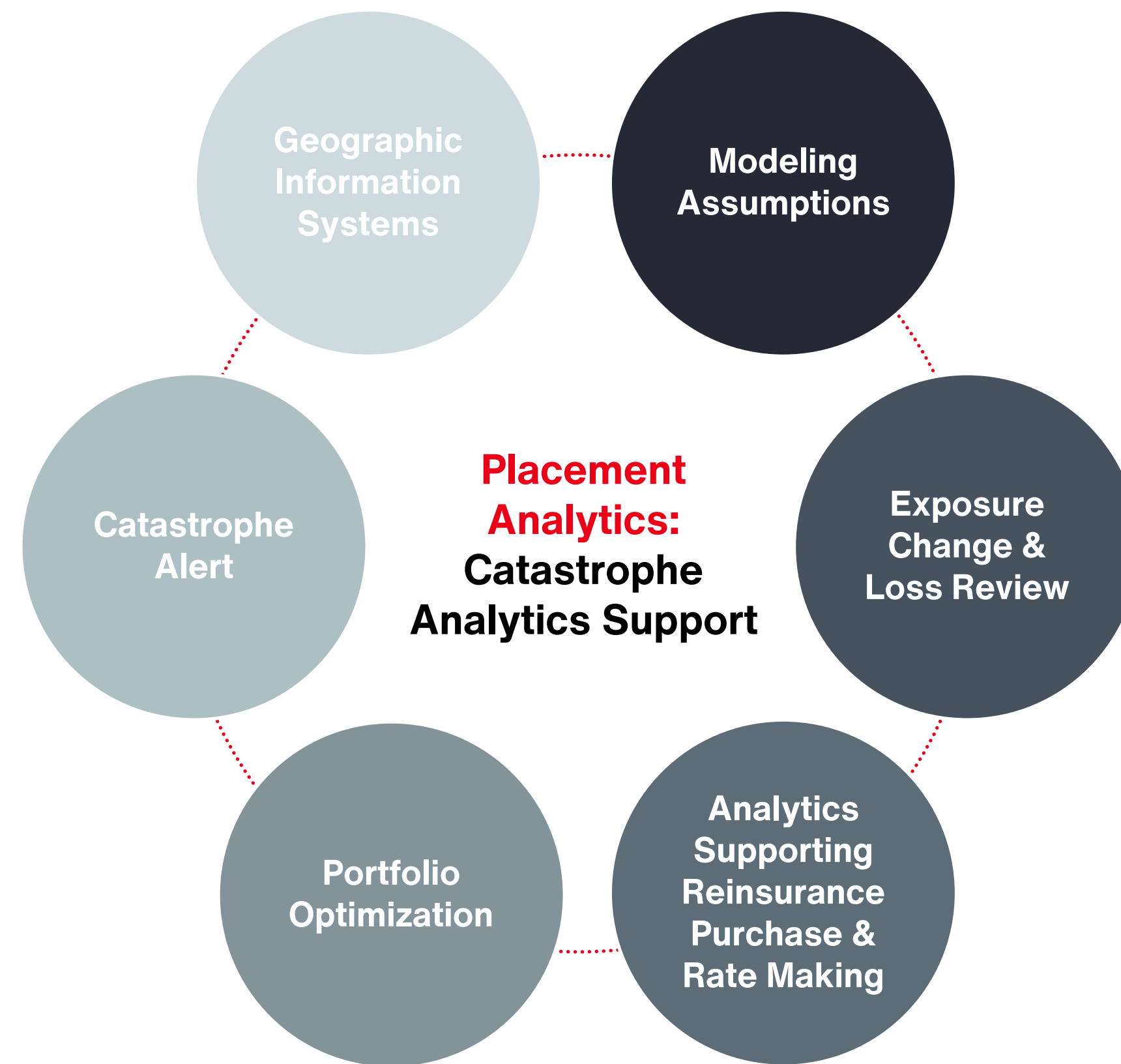
In addition to items under Placement Analytics:

- Create a custom view of risk through an independent, transparent, and customizable modeling solutions
- Arm TWIA with knowledge that drives efficiency and financial stability for all stakeholders
- Make more informed funding and risk management decisions

Placement Analytics – Option 1

Suite of Analytics to Support Reinsurance Placement and Rate Making

Cat modeling year-round engagement with TWIA



Catastrophe modeling

- Generate exposure outputs aimed at providing TWIA accurate and transparent understanding of their portfolio using multiple models
- Provide accurate and detailed modeling results to TWIA for the development of reinsurance structure
- Leverage Aon's expertise with the inner-workings of models to ensure TWIA is representing their exposure as accurately as possible
- Support TWIA's discussions with reinsurers and stakeholders by providing necessary modeling detail

Reinsurance cost allocation

- Provide detailed allocation of reinsurance costs, tailored to TWIA's management view of risk in support of rate filings

Data visualization

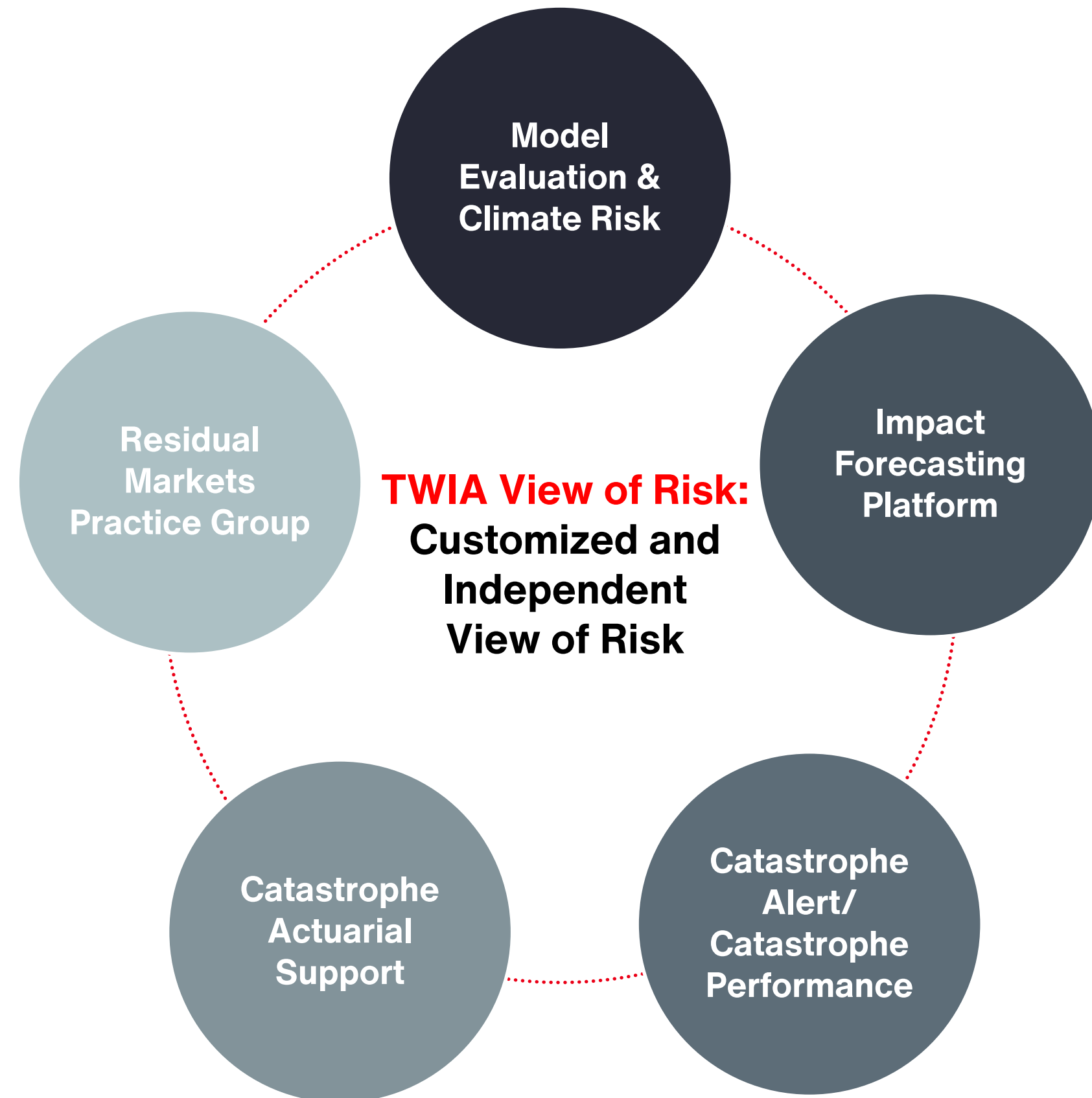
- Grant TWIA access to Aon's geographic information system, ImpactOnDemand, to assist with exposure mapping and accumulation management
- Platform provides TWIA with the ability visualize portfolio against a comprehensive suite of hazard data in real time

Analytics Dashboards

- Interact with exposure management modeled loss dashboards, providing flexibility with reporting abilities
- Catastrophe response and real-time monitoring of events
- Hurricane Viewing Guides can be made available on the platform and will provide management level insight of exposure to varying event scenarios

TWIA View of Risk – Option 2

Additional Analytics Support



Model Evaluation and Climate Risk

- Bring a deep understanding of the underlying science and assumptions within each catastrophe model and provide insight into performance specific to TWIA's portfolio
- Leverage Aon's expertise in the areas of model education, model deep dives, and understanding of loss impact from model adjustments
- Work with Aon to better understand the science behind climate change and the impact in both the short and long term that it can have on the performance of your portfolio

Impact Forecasting Platform

- Access the open modeling framework and take advantage of a full suite of peril models and the knowledge gained through key industry partnerships
- Impact Forecasting is approved by the FL Commission and due for release to the broader US in 2022

Catastrophe Alert/Model Performance

- Take advantage of Aon's deep knowledge of historical events to better understand model performance relative to actual events
- Gain better insight into actual loss experience by collaborating with Aon to review historical loss data as part of a claims analysis to better address model miss

Cat Actuarial Support

- Leverage Aon's expertise in rate filing and risk pricing through the use of Cat Scoring analytics
- Evaluate profitability of your portfolio and gain insight into key loss drivers to help inform better strategic decision-making

Aon's Residual Markets Practice Group

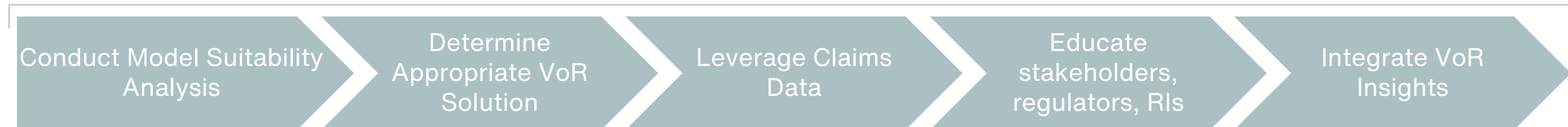
- Follow trends, better understand exposure and loss trends, and access peer data by partnering with Aon's residual markets team

TWIA View of Risk – Option 2

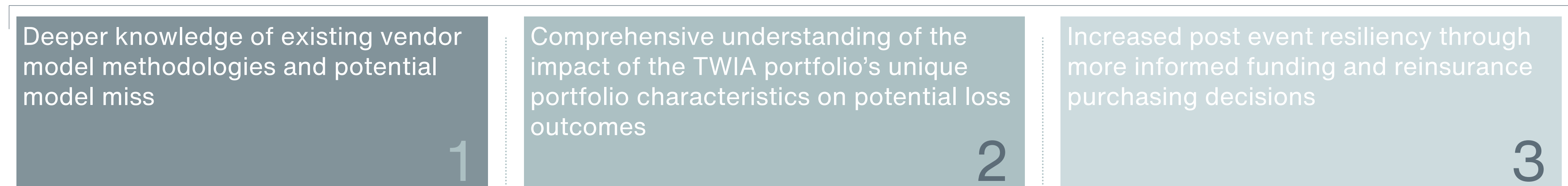
Informed Decisions with Custom View of Risk

A custom View of Risk (VoR) affords TWIA a platform to better understand why TWIA’s exposures are unique and to make more informed funding and risk management decisions that ultimately protect policyholders and member companies, and increases the resiliency of the Association

Our value driven approach to View of Risk



Impact of Recommended Solution



Our proposal addresses TWIA’s core mission of protecting policyholders and member companies through a more informed View of Risk

Establishing a New Partnership with Aon

Concluding comments

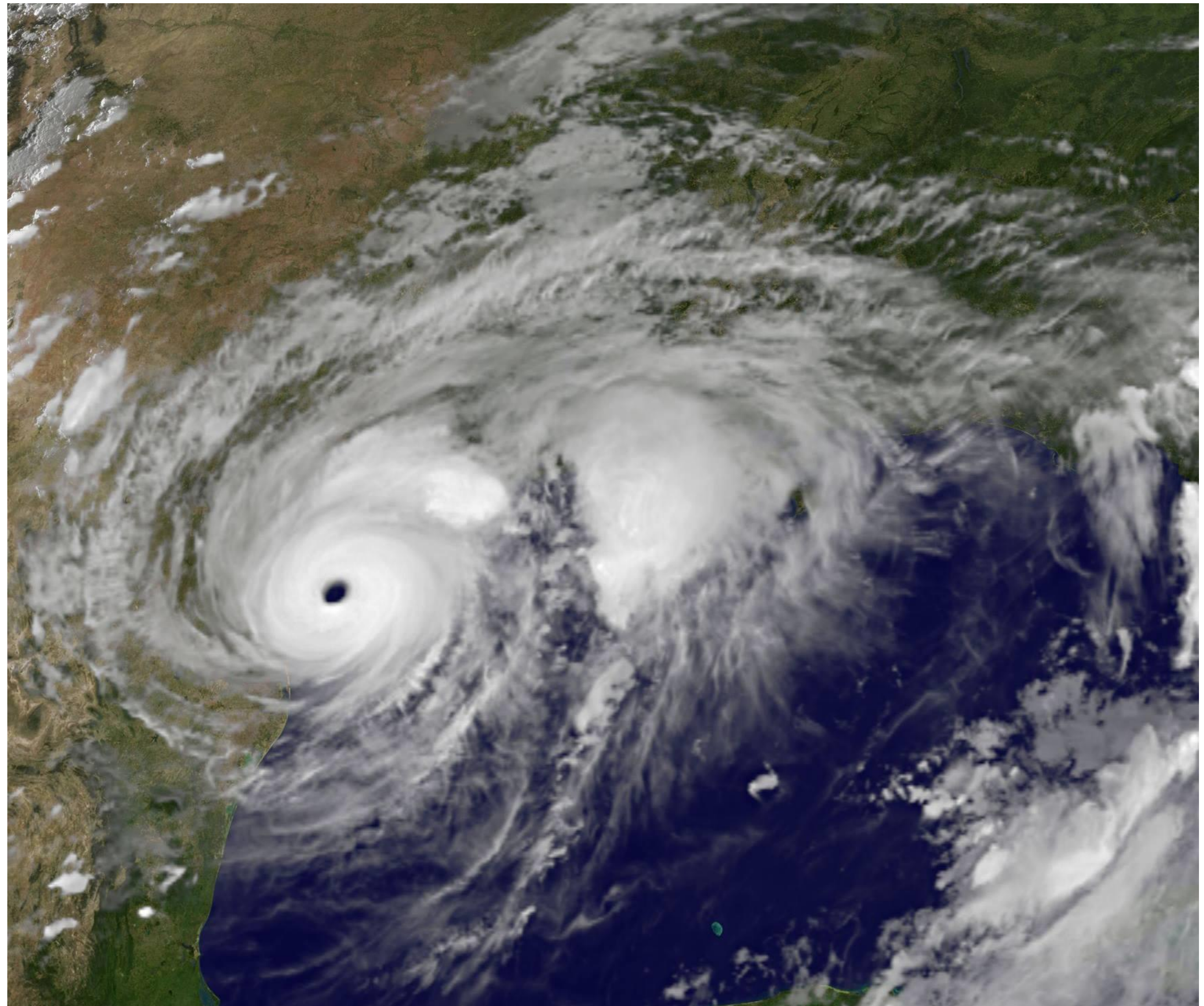
Next steps

Questions

Thank you



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