The Actuarial Profession
making financial sense of the future

Insights from the industry on stress and scenario testing (SST)

Jessica Sum, Aviva

James Isden, KPMG UK

5 November 2012

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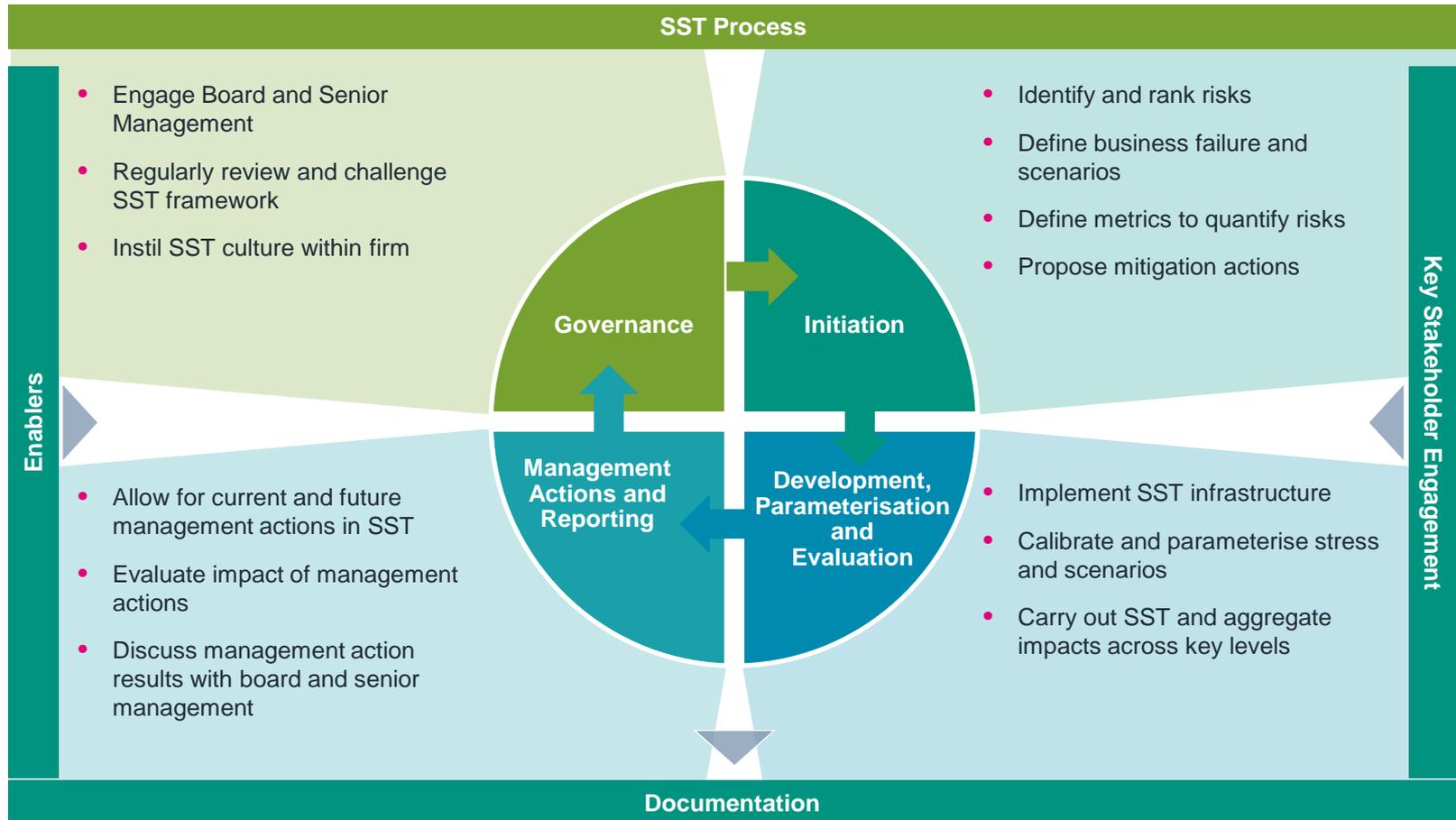- Uses of SST
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Introduction

- There are many challenges/issues for insurers and Groups around SST:

  – A pragmatic balance of accuracy vs. simplicity needs to be taken to ensure a timely output from the exercise.

  – Need to agree the granularity of the exercise and the extent to which a business-wide consistent approach is taken.

  – Group consolidation of impacts can be complicated due to intra-group arrangements and potentially different local businesses managing to different metrics.

  – Group governance can slow process down where sign-off is required at different levels within the Group.

  – International Groups may find different Regulators have different requirements around SST.
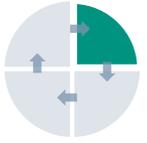
The three components of SST

Firms have typically identified three components (Stress Testing, Scenario Testing and Reverse Stress Testing) that lie at the core of the stress and scenario testing framework		
Component	**What is the component**	**Why do we need the components?**
Stress testing	• A single parameter stress, constant over time • Represent a range of adverse developments typically over one-year or instantaneously	• Allows for standard comparison of risk exposure and changes over time of risks across the business • It informs management on the impact of changes in economic and business conditions • Provides a basis for assessing management actions to mitigate individual risks
Scenario testing	• A forward looking assessment of adverse changes in a combination of macro economic and non-economic key indicators • The analysis should be informed by historic analysis and expert judgement	• To understand quantitatively and qualitatively the firm's exposure to macro (systematic) scenarios which represent a combination of events • To estimate the associated impacts of such scenarios which could adversely affect the business, accompanied by an assessment of the likelihood of occurrence
Reverse stress testing	• An iterative process to identify the type and severity of an event or combination of events which could cause the business model of the firm to fail, either at the local business or Group level	• To develop a comprehensive understanding of the circumstances under which the business model fail • To provide useful additional information for management and improve contingency planning • If required strengthen the points of failure

Stress and Scenario Testing process

SST Process

- Engage Board and Senior Management
- Regularly review and challenge SST framework
- Instil SST culture within firm

- Identify and rank risks
- Define business failure and scenarios
- Define metrics to quantify risks
- Propose mitigation actions

Enablers

Key Stakeholder Engagement

Governance

Initiation

Management Actions and Reporting

Development, Parameterisation and Evaluation

- Allow for current and future management actions in SST
- Evaluate impact of management actions
- Discuss management action results with board and senior management

- Implement SST infrastructure
- Calibrate and parameterise stress and scenarios
- Carry out SST and aggregate impacts across key levels

Documentation

Initiation

Planning interaction with regular business processes and meeting ad hoc requirements

- Need to agree how SST fits with business planning and ORSA and other business processes:
  - SST should inform plan and ORSA.
  - SST can be validate other processes.
  - Timing is important and SST should needs to be integrated with other processes
  - Frequency of SST whether full or lite will often match other processes.
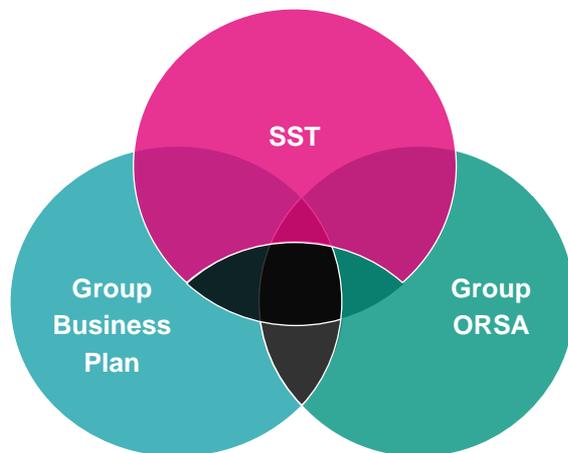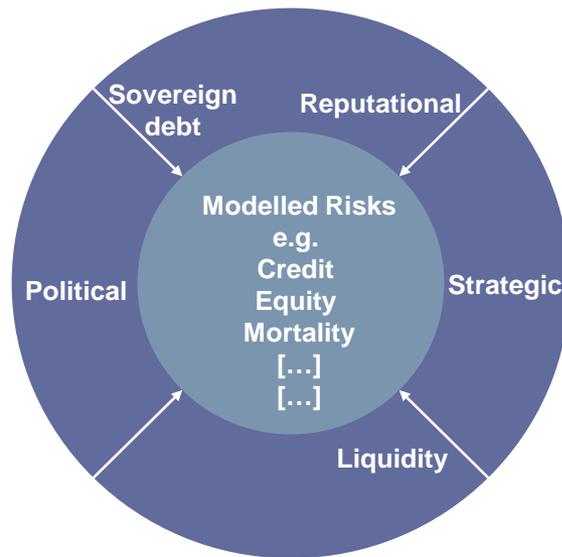
- Need right output to support ad hoc decisions informed by SST:
  - Restructuring
  - Re-insurance
  - M&A activity
  - ALM
  - De-risking
  - Pricing

Evolving risk landscape in Life Insurance

- Insures are required to subject the identified risks to a sufficiently wide range of stress test/scenario analyses to provide an adequate basis for the assessment of the overall solvency needs.

- Under the ORSA, **all risks** need to be considered, including long term risks that could be faced within the business planning period.

Risk Universe

Sovereign debt

Reputational

Modelled Risks e.g. Credit Equity Mortality […] […]

Political

Strategic

Liquidity

A comprehensive stress and scenario testing framework can play a key role in the development of a comprehensive 'risk universe' for the ORSA, both in terms of risk identification and quantification.

As the business model evolves, non-modelled risks will become modelled, and included in the SCR calculation where appropriate.

We note that industry requests for more guidance on how the proportionality principle will be applied in the ORSA have not been upheld, and as such companies need to adopt a clear governance framework considering both materiality and likelihood.

" Undertakings should be aware of the amount of capital that could be consumed if certain risks were to crystallise and should not be satisfied with a qualitative assessment just because this is less challenging. "

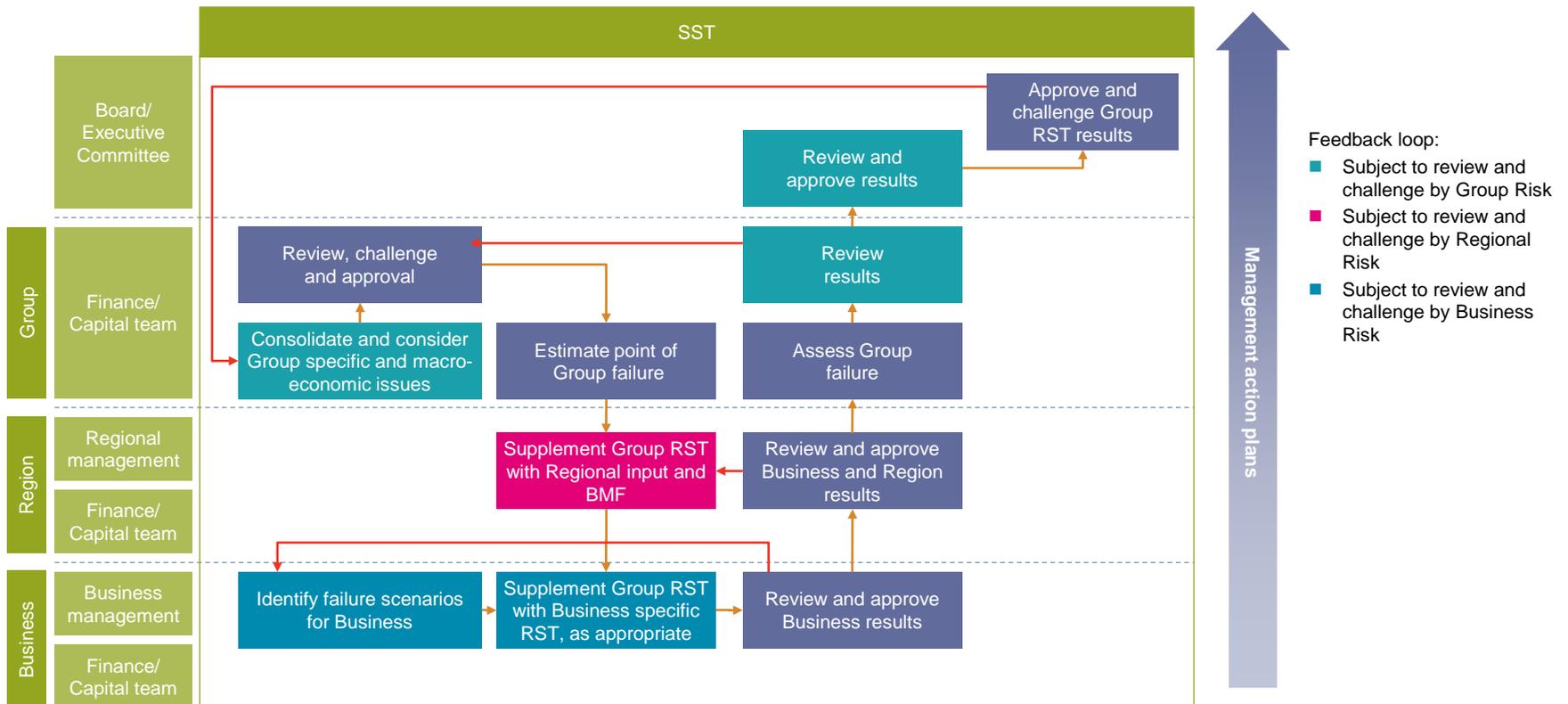EIOPA Public Consultation Report, July 2012

Time Horizon

- The design and results of a *firm's* reverse stress test must be documented and reviewed and approved at least annually by the *firm's* senior management or *governing body*.

- A *firm* must update its reverse stress test more frequently if it is appropriate to do so in the light of substantial changes in the market or in macroeconomic conditions.

- Scenario should not be procyclical and therefore should reflect the position of the cycle at the time it is set. However, on a practical basis scenarios should be updated to reflect new macroeconomic information such that firms are always stress testing against a plausible worst-case scenario.

SST interaction in an organisation

The proposed SST framework actively involves all levels of the organisation (Group, Regions, Businesses) and integrates Governance at all levels with the overall process managed with clear roles.

SST

Board/Executive Committee

Approve and challenge Group RST results

Review and approve results

Group — Finance/Capital team

Review, challenge and approval

Review results

Consolidate and consider Group specific and macro-economic issues

Estimate point of Group failure

Assess Group failure

Region — Regional management / Finance/Capital team

Supplement Group RST with Regional input and BMF

Review and approve Business and Region results

Business — Business management / Finance/Capital team

Identify failure scenarios for Business

Supplement Group RST with Business specific RST, as appropriate

Review and approve Business results

Management action plans

Feedback loop:
- Subject to review and challenge by Group Risk
- Subject to review and challenge by Regional Risk
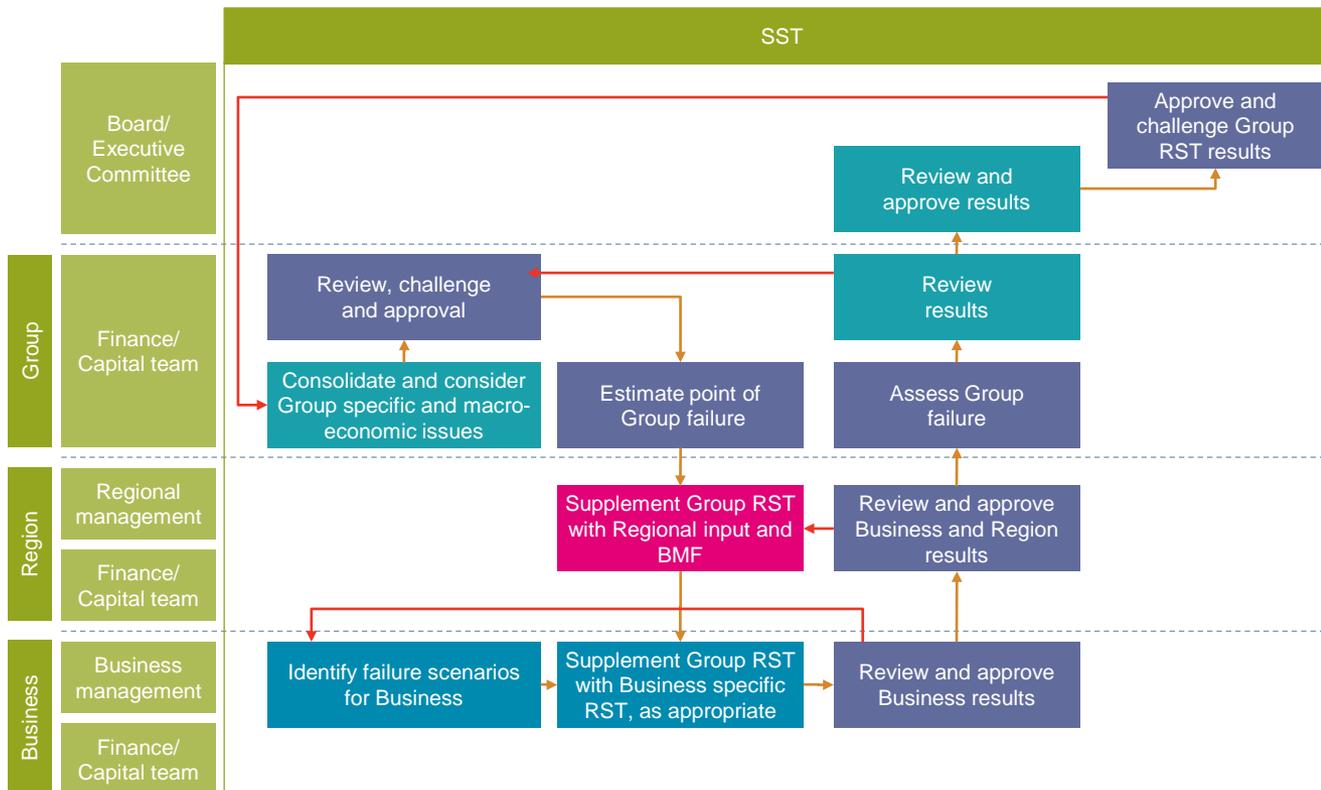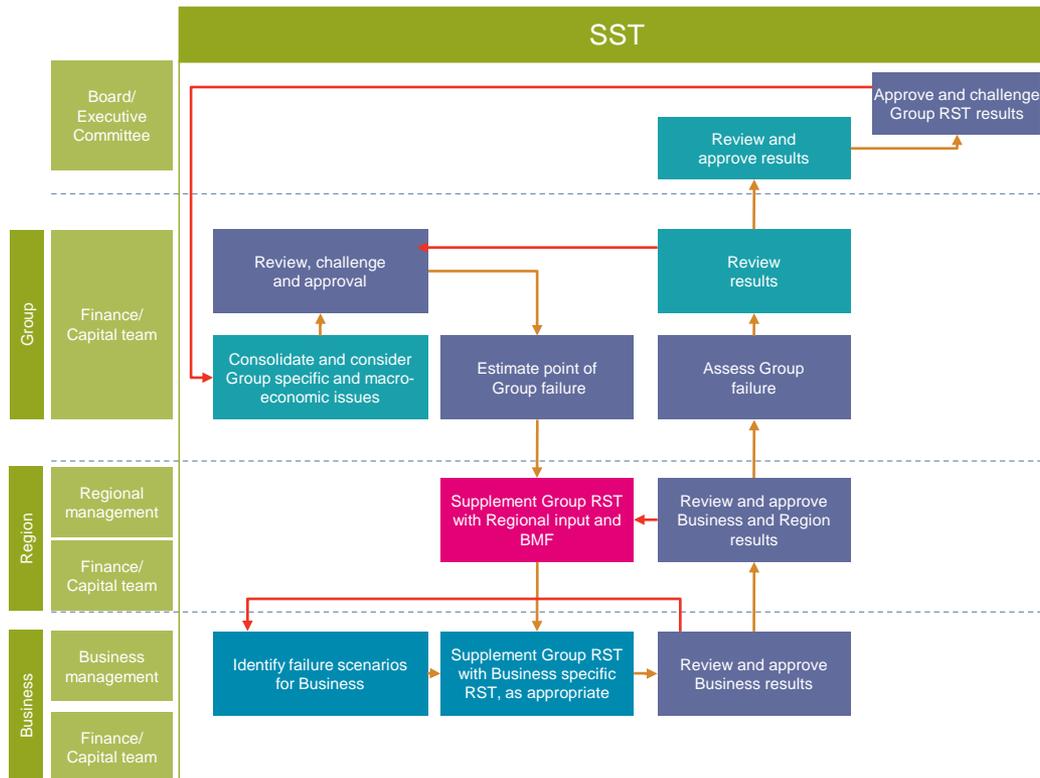- Subject to review and challenge by Business Risk

The proposed SST framework actively involves all levels of the organisation (Group, Regions, Businesses) and integrates Governance at all levels with the overall process managed with clear roles.

SST

Level		
Board/ Executive Committee		Approve and challenge Group RST results
		Review and approve results
Group — Finance/ Capital team	Review, challenge and approval	Review results
	Consolidate and consider Group specific and macro-economic issues	Estimate point of Group failure / Assess Group failure
Region — Regional management / Finance/ Capital team		Supplement Group RST with Regional input and BMF / Review and approve Business and Region results
Business — Business management / Finance/ Capital team	Identify failure scenarios for Business	Supplement Group RST with Business specific RST, as appropriate / Review and approve Business results

SST interaction in an organisation (cont.)

The proposed SST framework actively involves all levels of the organisation (Group, Regions, Businesses) and integrates Governance at all levels with the overall process managed with clear roles.
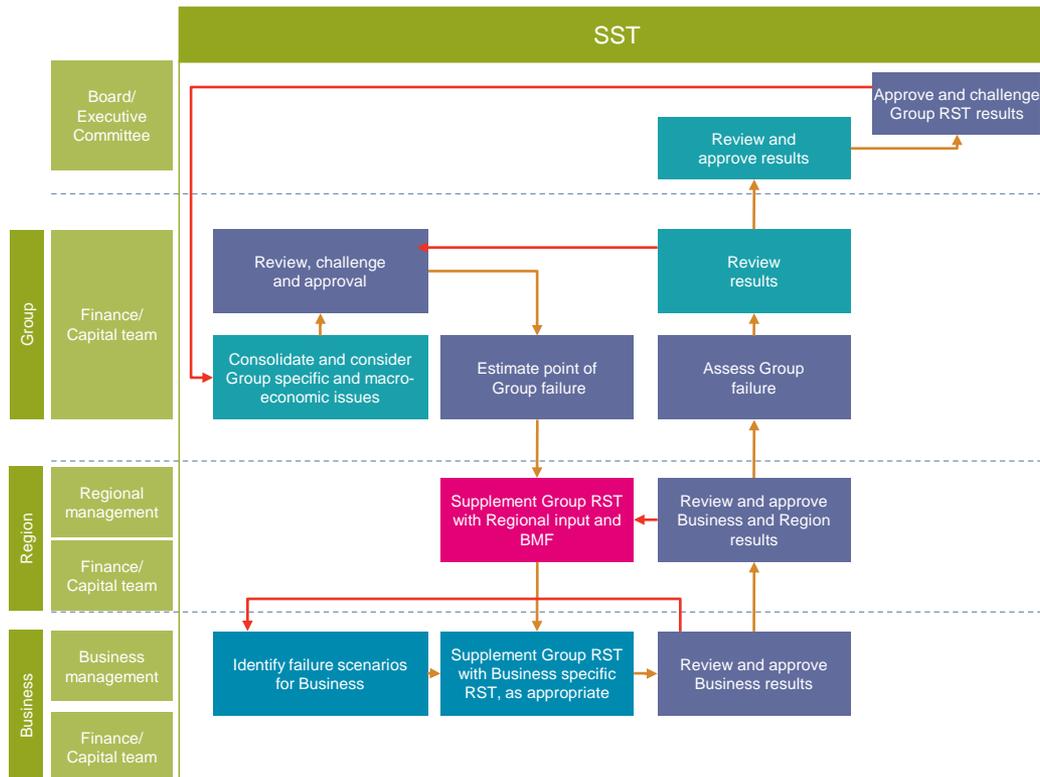
SST

Board/ Executive Committee	
Group — Finance/ Capital team	
Region — Regional management / Finance/ Capital team	
Business — Business management / Finance/ Capital team	

Flow boxes:
- Approve and challenge Group RST results
- Review and approve results
- Review, challenge and approval
- Review results
- Consolidate and consider Group specific and macro-economic issues
- Estimate point of Group failure
- Assess Group failure
- Supplement Group RST with Regional input and BMF
- Review and approve Business and Region results
- Identify failure scenarios for Business
- Supplement Group RST with Business specific RST, as appropriate
- Review and approve Business results

What do they want to achieve

- Group wide scenarios are key that will inform on Group impacts and management actions but there are a number of decisions required:
  – The extent the Group wide scenarios should be tailored for individual geographies/regions.
  – Group has Group-specific objectives
  – To what extent should Group dictate for example the number and scenarios/RSTs required.

- Businesses should be required to identify and perform their own scenarios/RSTs.
  – The outcome of these scenarios and RSTs as selected by BU should inform the Group and perhaps cause the Group to run some of those scenarios as Group wide scenarios in the future.
  – Should their be flexibility in the Group wide scenarios, e.g. would BUs be able to set the lapse or new business rates they think are appropriate for a particular Group scenario.

SST interaction in an organisation (cont.)

The proposed SST framework actively involves all levels of the organisation (Group, Regions, Businesses) and integrates Governance at all levels with the overall process managed with clear roles.
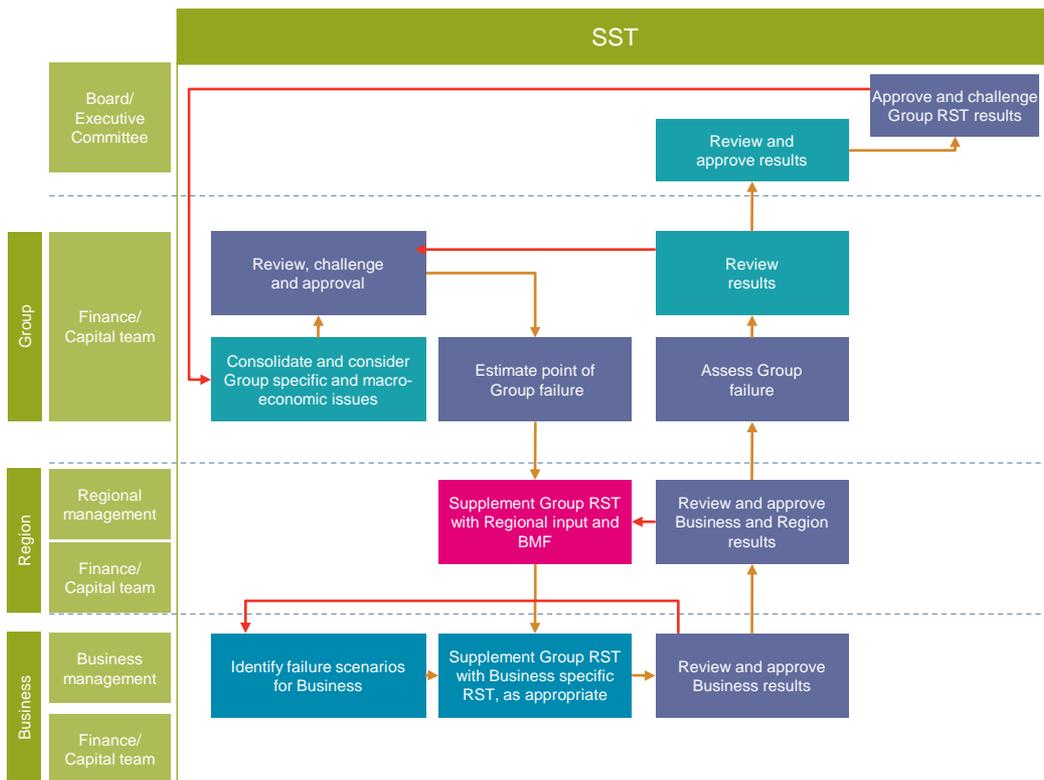
SST

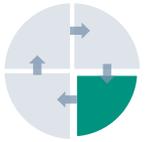| Layer		Process flow
Board/Executive Committee		Review and approve results → Approve and challenge Group RST results
Group – Finance/Capital team		Review, challenge and approval ← Review results
		Consolidate and consider Group specific and macro-economic issues → Estimate point of Group failure → Assess Group failure
Region – Regional management, Finance/Capital team		Supplement Group RST with Regional input and BMF → Review and approve Business and Region results
Business – Business management, Finance/Capital team		Identify failure scenarios for Business → Supplement Group RST with Business specific RST, as appropriate → Review and approve Business results

How would scenarios be different in each layer

– Consideration of risks applying at group level such as global economic crises and group concentration issues

– Regional risks such as Eurozone crisis and specific insurance risks surrounding shared balance sheets

– Risks such as operational risks, strategy and new business volumes

SST interaction in an organisation (cont.)

The proposed SST framework actively involves all levels of the organisation (Group, Regions, Businesses) and integrates Governance at all levels with the overall process managed with clear roles.

SST

Level	Team			
	Board/ Executive Committee			Approve and challenge Group RST results
Group	Finance/ Capital team	Review, challenge and approval		Review and approve results
		Consolidate and consider Group specific and macro-economic issues	Estimate point of Group failure	Review results / Assess Group failure
Region	Regional management / Finance/ Capital team		Supplement Group RST with Regional input and BMF	Review and approve Business and Region results
Business	Business management / Finance/ Capital team	Identify failure scenarios for Business	Supplement Group RST with Business specific RST, as appropriate	Review and approve Business results

Definition of failure

- Definitions of failure
  - Each layer of the business will have a different definition of business model failure:

  - Group: Group capital and liquidity

  - Region: Strategic

  - Business: Local solvency

Instructions
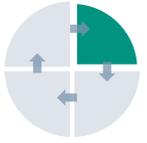
- The SST instructions are a key part of the process:
  - Group instructions needs to be sufficiently detailed that they can almost be standalone.
  - High level of engagement required with BUs though training/workshops to ensure understanding.
  - Launch workshop;
  - Regular catch-ups are useful through the SST process and also pre-submission of results.
- Learning points on typical information included in instruction pack:
  - Instructions to complete templates, even sign-conventions!;
  - Locked-down templates;
  - Mapping of financial reporting system to ensure reconciliation to right entries, e.g. Schedule No. – Field;
  - Q&A log to share best practice and multiple questions;
  - Roles and responsibilities at Group – Key contacts;
  - Explanation of parameterisations to help businesses assess qualitative risks, e.g. local lapse rate impacts;
  - Tailoring of instructions to different local teams.

Development, Parameterisation and Evaluation

Development of scenarios : key steps

Workshop with SME to identify key risks and themes that could drive significant impacts → Develop strawman scenarios → SME challenge of strawman scenarios → Fine tuning of scenarios → Revised scenarios

Governance

Approved final scenarios ← Senior Mgmt review and approval

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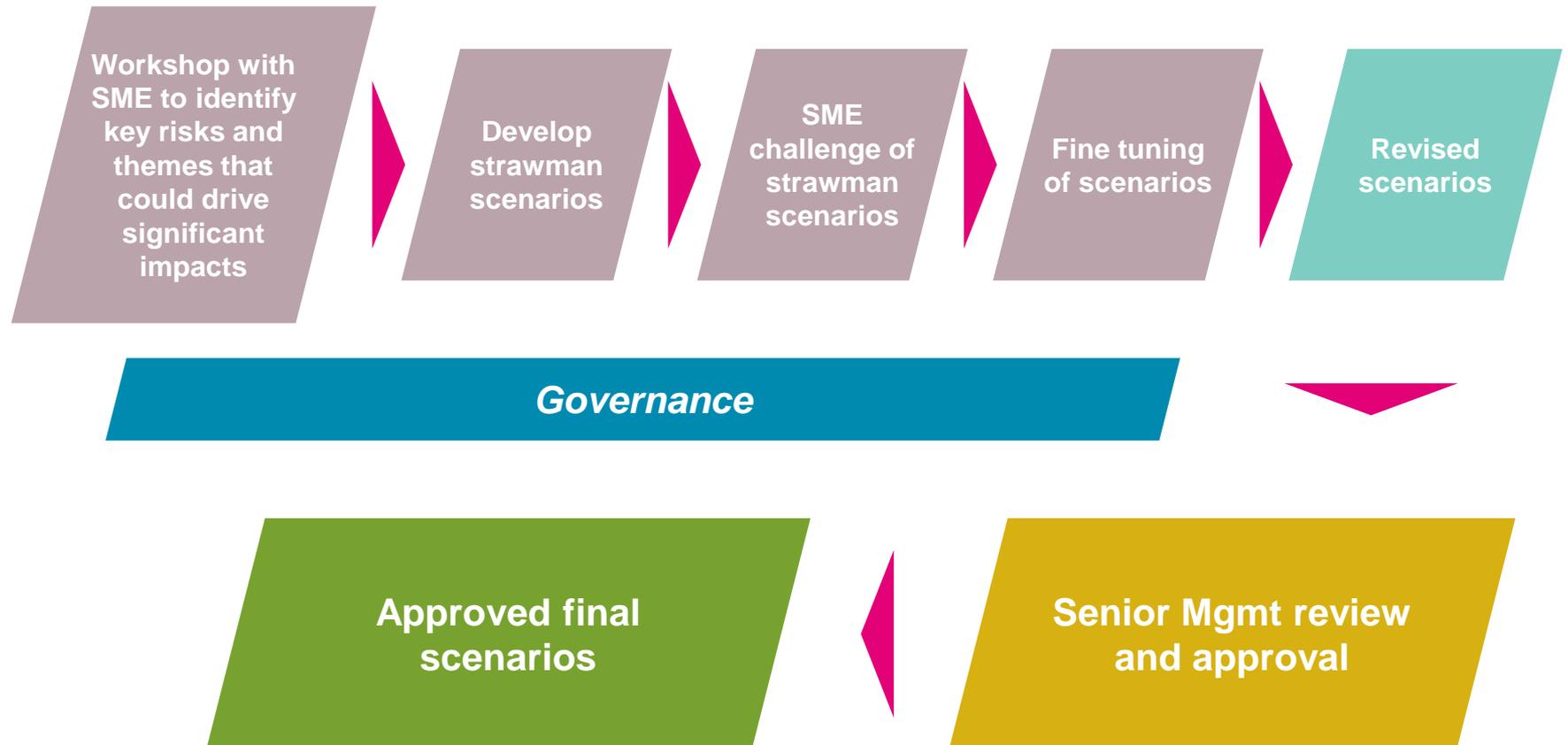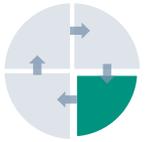
Parameterisation of scenarios : key steps

Approved final scenarios

Strawman parameterisation exercise

Strawman parameters

SME challenge of strawman parameters

Governance

Fine tuning of parameters

Approved final parameterised scenarios

Senior Mgmt review & approval

Revised parameters
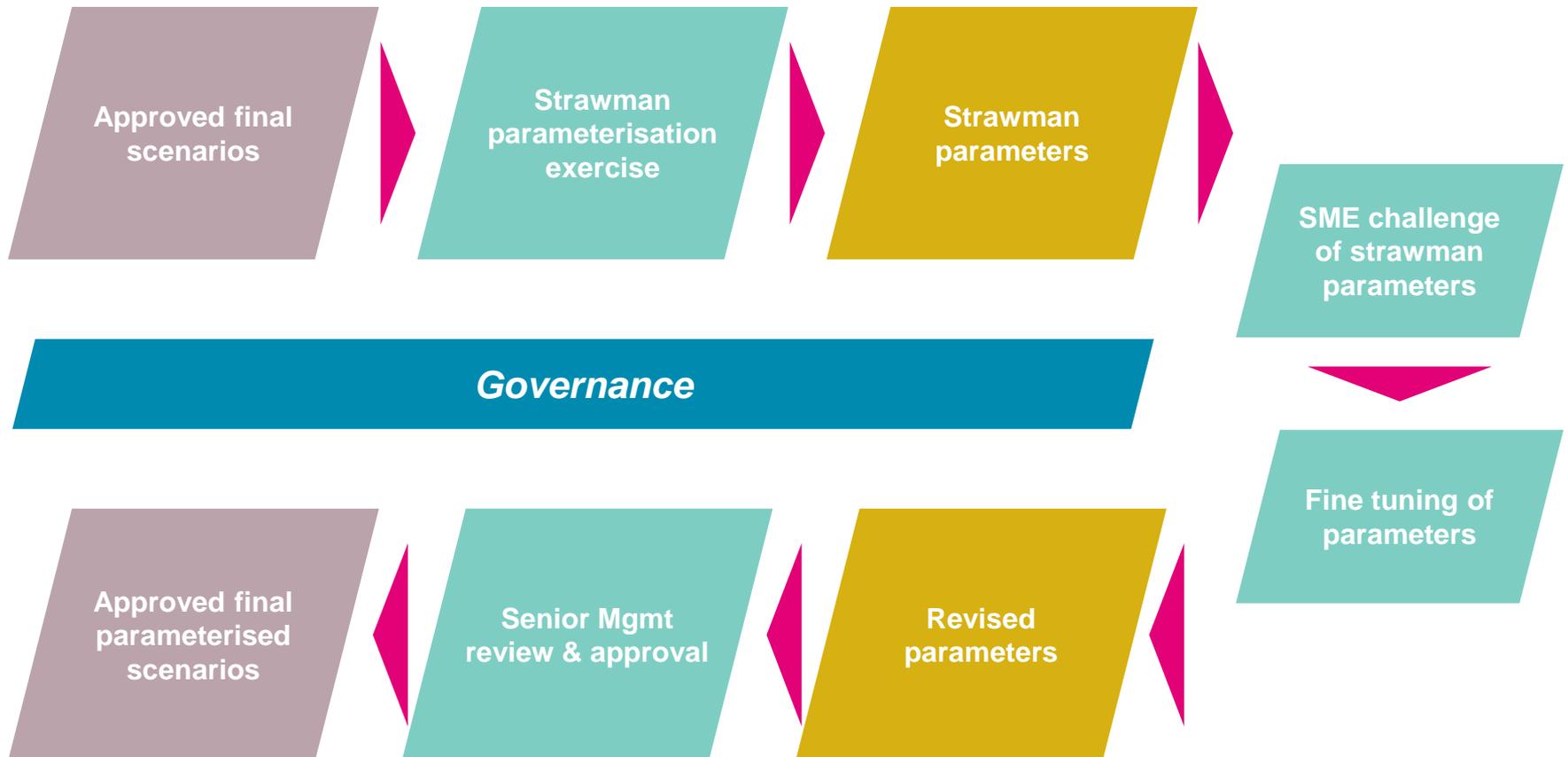
Scenario and RST development : key differences
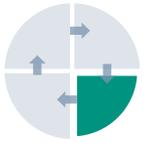
Scenario testing and reverse stress testing require different approaches to scenario development

Scenario testing – identify the impact of particular events

1. Determine scenario or cause → **2. Assess consequences and impacts on business** → **3. Evaluate outcome**

Reverse stress testing – identify the particular events that lead to a given impact

3. Consider causes which could have required impacts → **2. Assess consequences and impacts on business** → **1. Determine outcome i.e. point of business model failure**

Evaluation approaches : bottom up and top down
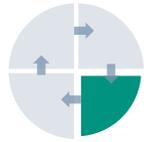
There are two main ways to approach a Group-wide evaluation: (1) bottom up approach; and (2) top down (i.e. led by Group)

- Bottom up
    - *Led by local businesses* instructions rolled-out to businesses to complete and submit results to Group for review and consolidation;
- Top down
   - *Led by Group* largely completed at Group using Group models with inputs/reviews from/by local businesses.

|	Bottom up approach	Top down approach
Benefits	• Results produced by local businesses who understand their business best • Local solvency/accounting/specificities (e.g. management actions) allowed for more accurately • Insights gained by local businesses from the exercise • Availability of granular data/results enabling better understanding of local businesses at Group	• Timely – quick turnaround time for urgent ad hoc requests & allows for quick multiple iterations of results for RSTs • Consistent understanding/interpretation of the scenarios/RSTs • Allows for sensitive Group strategic actions & maintains confidentiality in the process • Eases workload/resource constraints for local businesses
Weaknesses	• Usually time consuming and places a strain on resources at local business level • Different interpretations on Instructions and hence "inconsistent" results from local businesses making aggregation of Group results difficult • Different capabilities leading to different level of accuracy in results from local businesses • Additional "manual" adjustments often required at Group level	• Lack of detailed knowledge/modelling of specificities of local businesses • A number of approximations usually required leading to limitations on the results • Limited involvement from local businesses usually due to time constraints – robust enough to survive stakeholders challenge? • Limited insights at local business level

Other considerations
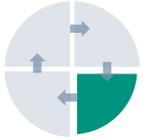
- All impacts should be assessed on a consistent basis to facilitate comparability/reconciliation of results across metrics – e.g. net of reinsurance / net of tax / net of MI for all metrics assessed such as ICA, IGD, EV, IFRS metrics.

- When the bottom up approach is used:
  - In the quantification and analysis of the SST scenarios/RST, local businesses should regard the metrics from Group as the **minimum** requirements. Local businesses should also consider impacts on other additional relevant metrics – e.g. local solvency / rating agency solvency - as deemed useful by local management.
  - To facilitate aggregation at Group level,
    - Currency (e.g. to use Group reporting currency such as £) and units (e.g. in £millions) should be consistent across businesses; and
    - Businesses should not modify any Group templates (e.g. delete/add rows) when completing these templates
  - There are a number of issues which make consolidation of the results difficult:
    - Identification of key Group interactions needs to be completed prior to beginning process so that they can be requested/reported on appropriately;
    - Credit for local management actions may be inconsistent with Group strategy; and
    - Materiality of impacts: what is immaterial at local level may be material at Group level e.g. Group aggregated exposure of many smallish local exposures.

- Where relevant/applicable, quantitative results should be accompanied by commentaries – e.g. explain major assumptions/approximations used, significant changes from previous results - to provide the "context" of the results.

- Submissions should also include key insights/learning and management actions identified, and sign-off by local senior management to ensure compliance with Group framework

Management Actions and Reporting
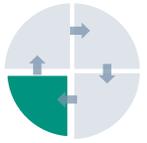
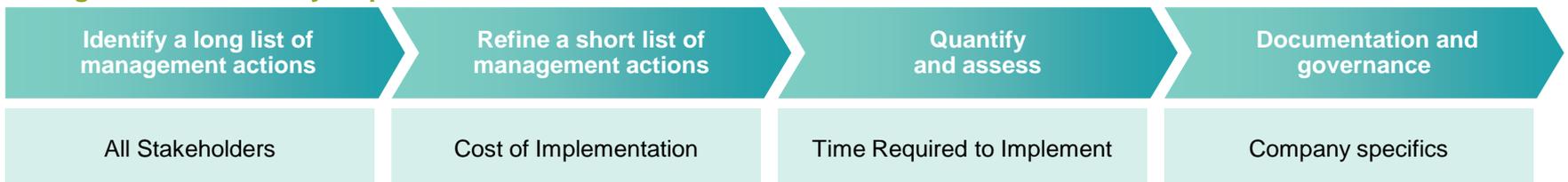# Management actions : pre-emptive and contingent
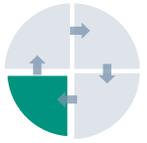
Articulating and documenting management actions is an integral part of the Stress and Scenario Testing. Firms should identify 'credible', 'realistic' and 'objective' management actions. There are two types of management actions which can be considered: (1) pre-emptive, and (2) contingent.
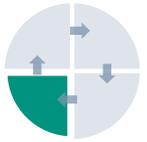
Pre-emptive actions (BAU actions)	Contingency actions (Recovery actions)
- Actions fed directly into business decisions and risk management processes, as a result of the stress and scenario testing process - Undertaken today to reduce the chances of an event occurring - May be implemented immediately by the business - Supports implementing contingency plans quickly and effectively - Need to be refreshed regularly - Fall into BAU process	- Actions which can be taken should an adverse scenario materialise to mitigate/limit the impact of a severe scenario - Contingent – not implemented today usually due to high costs involved - Developed appropriately to facilitate swift execution as required. - Prioritised and trigger points identified as to the scenarios under which they would be executed. - Regularly assessed and refreshed

Note pre-emptive and contingent actions are in addition to management actions that are 'ongoing' i.e. actions which are in the process of being executed.

Management action analysis process

Identify a long list of management actions	Refine a short list of management actions	Quantify and assess	Documentation and governance
All Stakeholders	Cost of Implementation	Time Required to Implement	Company specifics

Reporting with an impact to stakeholders : what works and what doesn't

- Firms should employ IT systems, resources and procedures that would assist them in producing timely and valuable SST information in a reader friendly format which covers a range of key metrics to senior management and other users. This principle should apply to both routine and ad hoc SST.

- Level of details to be provided should be tailored to the target audience – for example:

  – Report to the Board: high level summary on the range of scenarios analysed, key results including insights gained and management actions identified.

  – Report to "lower" committees (e.g. ALCO) : more detailed description of scenarios analysed including parameters used, detailed results, insights and management actions identified at both Group and local business levels, future refinements/enhancements to SST.

- Firms should have clearly documented policies, procedures and governance to enable effective implementation and maintenance of the SST program, which should be periodically reviewed by senior management.

- Senior management should periodically review the effectiveness of the firm's SST infrastructure and should ensure that necessary steps are taken for its ongoing improvement and relevance to the business needs e.g. replacing IGD metrics with S2 metrics.

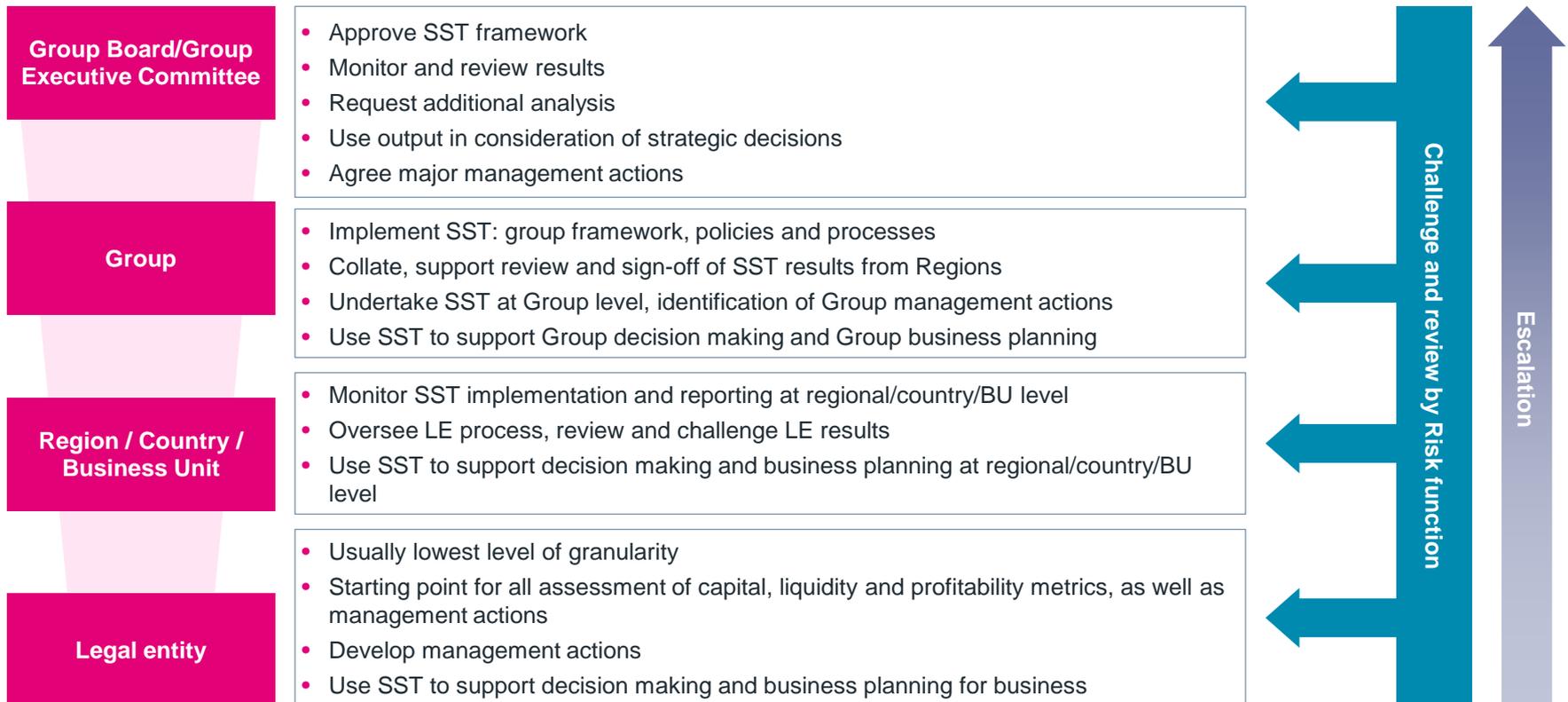# Governance

Overview :
Group SST Framework

To ensure each business throughout the Group fully embeds the SST process within their risk management framework, it is necessary to set minimum Group-wide requirements articulated for example through a Group Framework document on SST.

- The Group SST Framework document should sit within the Group Risk Management Framework Policy and is intended to set a minimum threshold on governance for the implementation, operation and governance of the SST activities.

- The Group SST Framework should be designed to meet the Group's objectives for SST and to ensure that the relevant regulatory requirements are met.

- To be useful to businesses, it must be flexible and proportionate.

- The Group SST Framework should also articulate and provide minimum standards in how businesses should embed / use the output e.g. in business planning, M&A.

- To support the objective of usage, it is typical that the output of the process is reported, as a minimum, in the following typical management reports:

  – Regular Group and local MI e.g. reports to ALCO, Risk Committee;

  – Business plans; and

  – Be demonstrated to be being used in relevant decision-making e.g. reports on transactions /M&A.

Typical Group SST Framework : ownership and governance

Under the SST framework, senior management usually takes ownership of SST at all levels of the organisation, with appropriate review and challenge from the Board/Executive Committee and Risk function.

Group Board/Group Executive Committee
- Approve SST framework
- Monitor and review results
- Request additional analysis
- Use output in consideration of strategic decisions
- Agree major management actions

Group
- Implement SST: group framework, policies and processes
- Collate, support review and sign-off of SST results from Regions
- Undertake SST at Group level, identification of Group management actions
- Use SST to support Group decision making and Group business planning

Region / Country / Business Unit
- Monitor SST implementation and reporting at regional/country/BU level
- Oversee LE process, review and challenge LE results
- Use SST to support decision making and business planning at regional/country/BU level

Legal entity
- Usually lowest level of granularity
- Starting point for all assessment of capital, liquidity and profitability metrics, as well as management actions
- Develop management actions
- Use SST to support decision making and business planning for business

Challenge and review by Risk function

Escalation

Group SST TOM : some considerations

- There are a number of decisions required around the optimal Group SST TOM:

  - Do you have a dedicated SST team?

  - Use existing reporting teams (ICA, IFRS etc.) to interact with businesses and consolidate results?

  - Interaction/ownership of SST between first and second line?

  - At what point should Group Risk get involved, how should the review be conducted?

  - Who performs validation of submissions from businesses?

- Example of a Group SST TOM:

Steps	Description	Team
1. **Production/ Calculation**	• Businesses produce results	Business SST team
2. **Group Review**	• Review results produced by businesses for reasonableness and consistency	Group SST team
3. **Group Aggregation**	• Group consolidation aggregate SST results for in-scope metrics	Group SST team
4. **Group Review**	• Review against appropriate metrics/other data and across in-scope metrics • Review against management actions included against each scenario and RST	Group SST team & Group SME
5. **Commentary**	• Produce commentary on key messages on results from review of key metrics	Group SST team
6. **Review of commentary**	• Review and challenge of commentaries	Group Risk / Group SMEs
7. **Finalise commentary & prepare report**	• Finalise commentaries • Production of reports for senior management review and discussions.	Group SST team

Uses of SST

Uses of output within organisation

Regulatory view

- Helping firms to understand key risks and scenarios that may put business strategies and continuance as a 'going concern' at risk.

- Providing management and regulators with qualitative information on the potential vulnerabilities… can identify appropriate actions that should be taken to manage such risks.

- Encourage firms to increase their focus on scenario development…. management bodies thinking through a range of extreme scenarios, potential mitigants and trigger points for action that would lead them to focus on big issues rather than detailed sets of numbers.

Business view

- Provide "building-blocks" data for quick assessment of emerging issues

- Support market disclosures, e.g. going concern statements

- Liquidity adequacy assessment

- Working capital statements for M&A

- Start point for contingency planning

- Risk appetite setting

- Financial Crisis Action Plan

Internal Model Validation

- Solvency II requires firms to use Stress and Scenario Testing (SST), including reverse stress tests (RSTs) to validate their internal model.

- The SST performed for internal model validation has a different objective to that performed for ORSA.

IMV objective	SST application
Validate aggregation & dependency assumptions	Stress & scenario testing to test reasonableness of overall results.
Validate key parameters in internal model	Stress testing on key parameters
Validate internal model capabilities for quantifying extreme stresses and scenarios	Stress and scenario testing, including reverse stress tests, to test reasonableness of overall results.
Validate coverage of risks in the internal model	Scenarios, and in particular RSTs used to further understand risk exposures and identify any material risks not captured or not adequately captured by the internal model. This can also feed directly into the ORSA process.

Firms will need to demonstrate a strong link between their internal model validation and the SST framework that firms have developed in response to the FSA's PS09/20 requirements

Firms should aim to integrate the internal model into the regular SST cycle with a view of performing the SST as a means of validating the internal model alongside what is required for ORSA.

"Some firms have made use of limited stress and scenario testing, or have selected these tests from the internal model itself. In these cases the range of circumstances considered is insufficient or the tests fail to provide an independent check of the results."

FSA IMAP Letter, May 2012

Final thoughts & questions

- It can be difficult to:
    - fulfil all the competing requirements of an SST process;
    - keep process proportionate;
    - maintain relevance of output.

- An effective process will achieve the above objectives, within an effective, flexible framework.