

Risk Management in Interconnector Projects

Presentation Renewable Energy Institute

Global Energy Interconnections; Status and Perspectives, Realizing the Asia Super Grid

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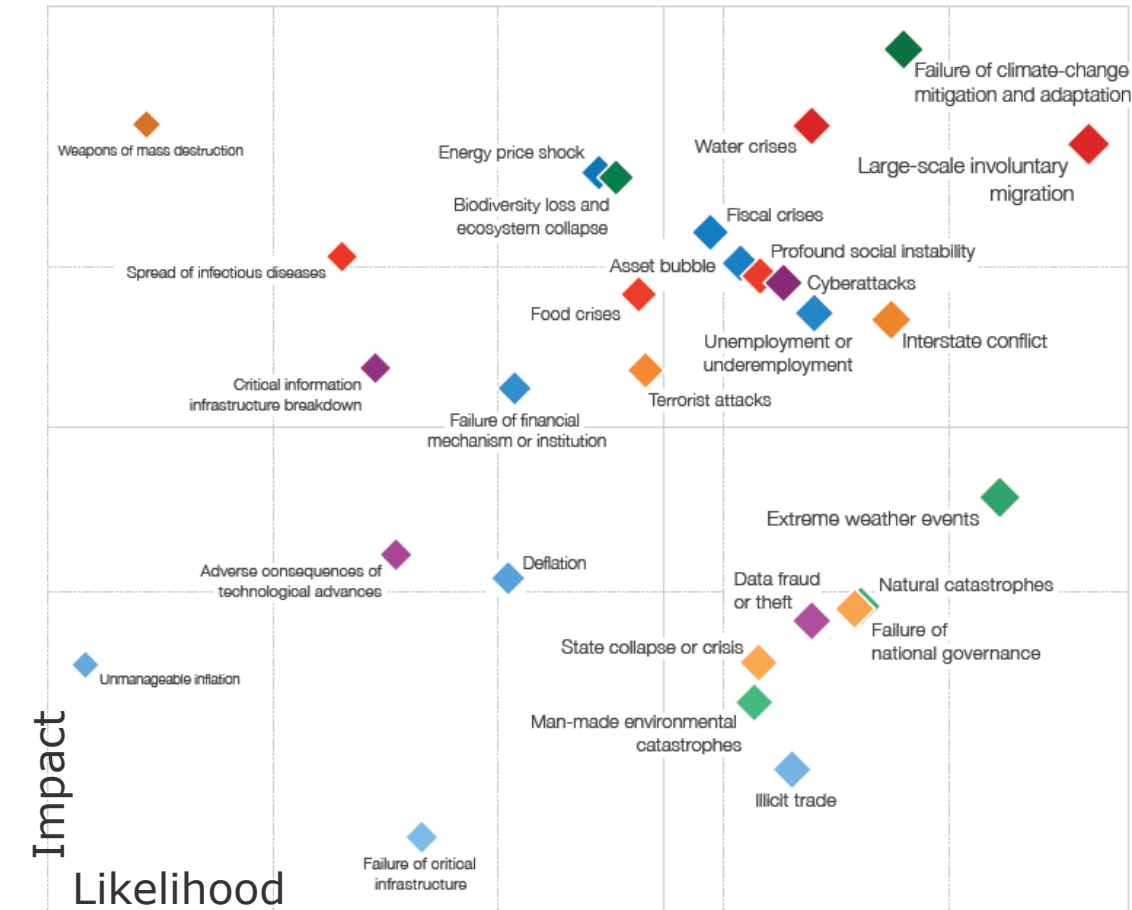
Why the commercial risk should be highest on the agenda right now

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The world is a complex and chaotic place

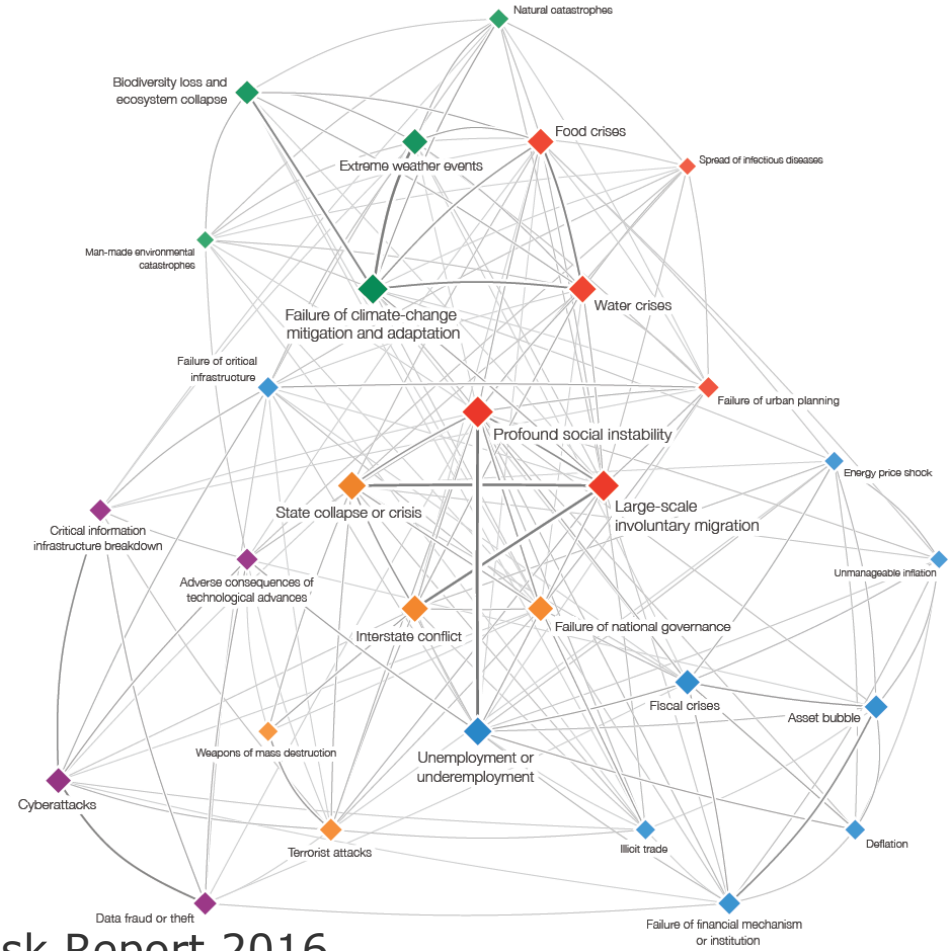
- Increasing the importance of good risk management

The global risk landscape



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Risk interconnection map

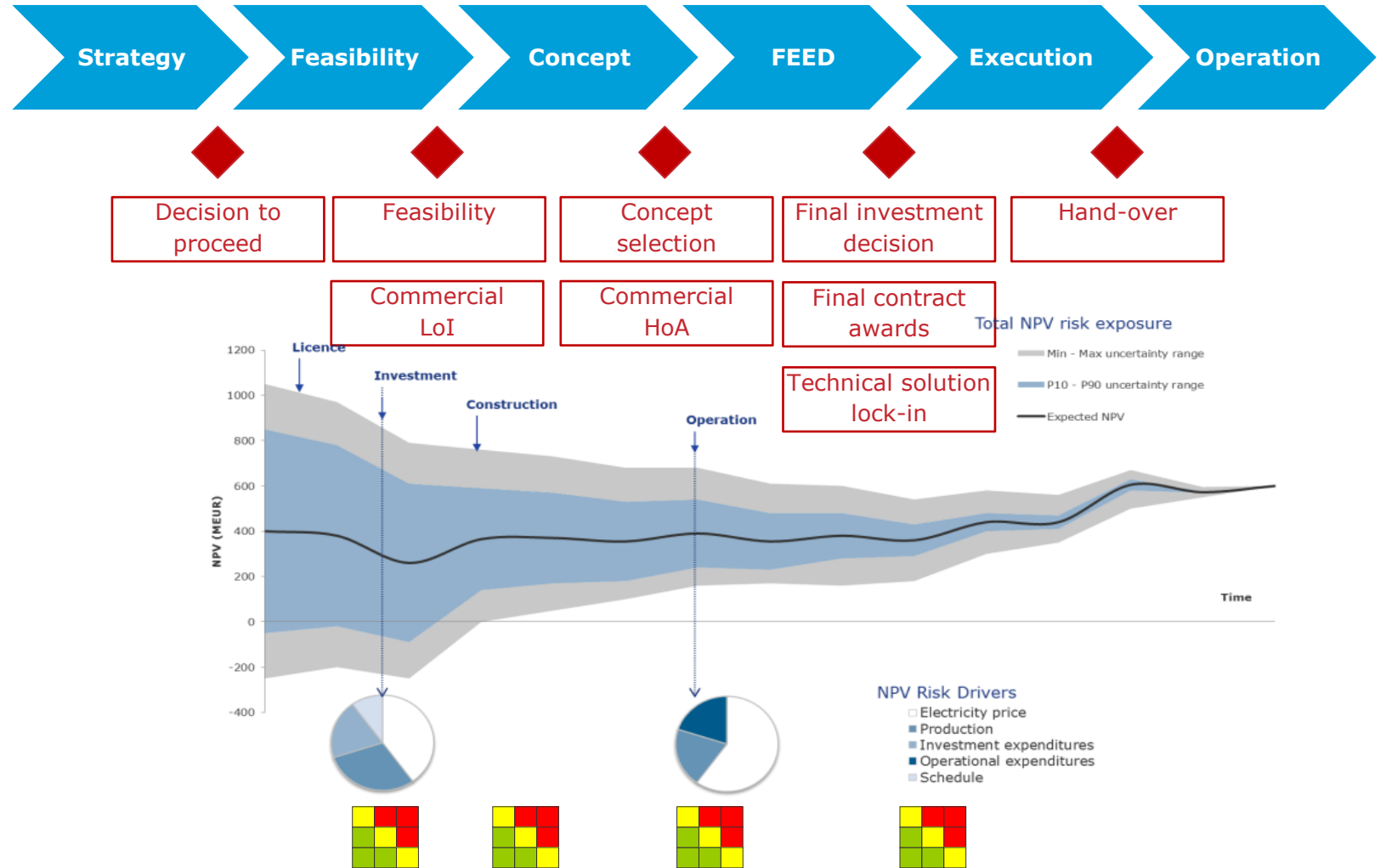


World Economic Forum Global Risk Report 2016

Interconnector project risk roadmap

- What risks must be resolved to keep progressing?

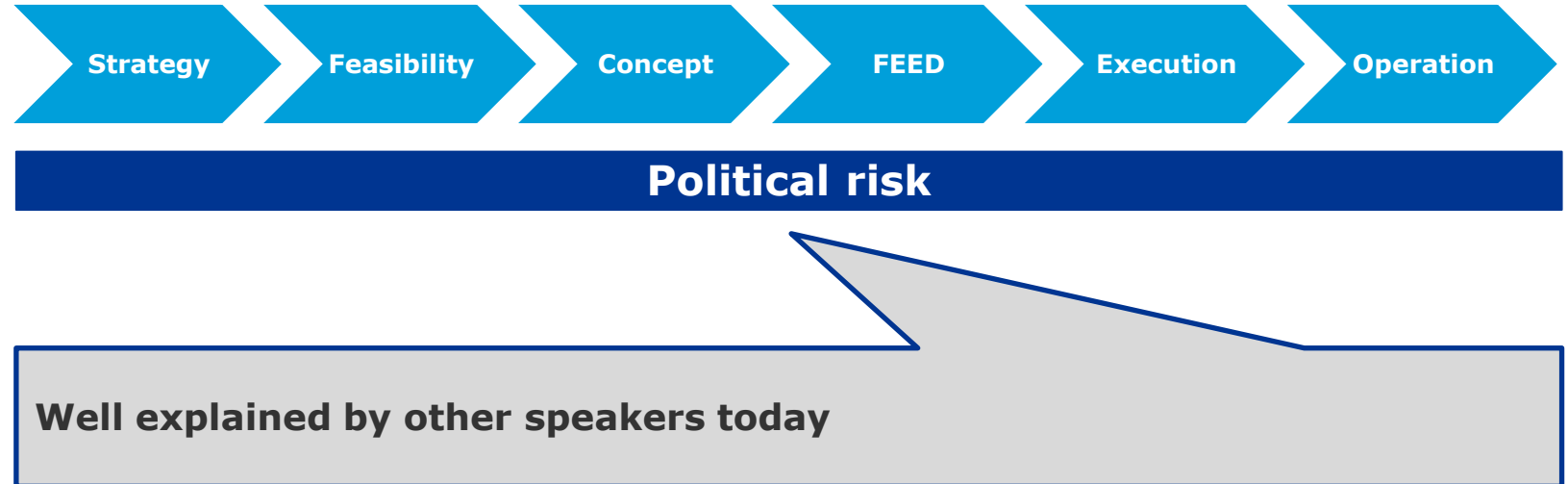
- A structured approach is needed to resolve the right risks at the right time
- Important decisions are made when the uncertainty is at the highest, and front end loading in the risk management process is necessary, establishing an overview of risks and uncertainties
- Assess and prioritize resolving risks with an impact on decision making
 - Differentiators
 - Schedule critical issues
 - Interdependencies
 - Stakeholders' processes
- Avoid spending time and resources on risks that may not need to be resolved at all



Political risk evolves and need to be managed throughout

– The project has way longer lifespan than any election frequencies....

- Political risk is always an issue for international projects, and can delay projects indefinitely
- Will need to manage cross border and multiple jurisdictions' approval processes, and operational regulations
- Despite mitigating measures like commitment through agreements under international law, there is always residual risk that need to be managed



Technical risks do not need to be resolved early on

- Planned solutions are within reach of existing technology

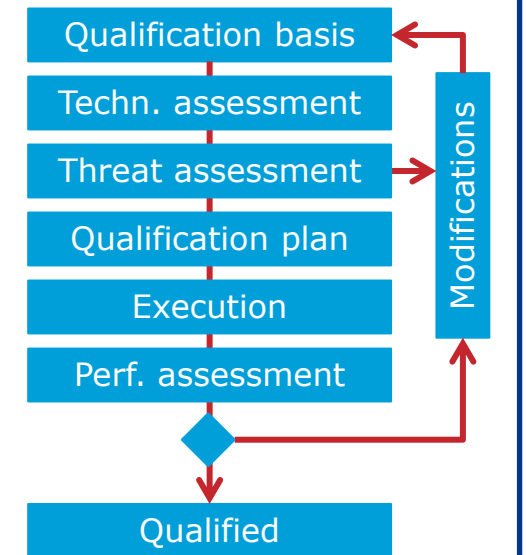
- Technical uncertainty prioritization is a consequence of a criticality evaluation, e.g. including time to expected solution
- Planned project is within reach of existing technology. A full super grid will need significant technology development, e.g. in HVDC switchgear
- Generally, technological risk is well managed and significant uncertainty can be resolved in later phases
- Technical solution is a consequence of frame conditions, thus technology risk is crystallized through commercial and operational clarifications



Technology risk

How

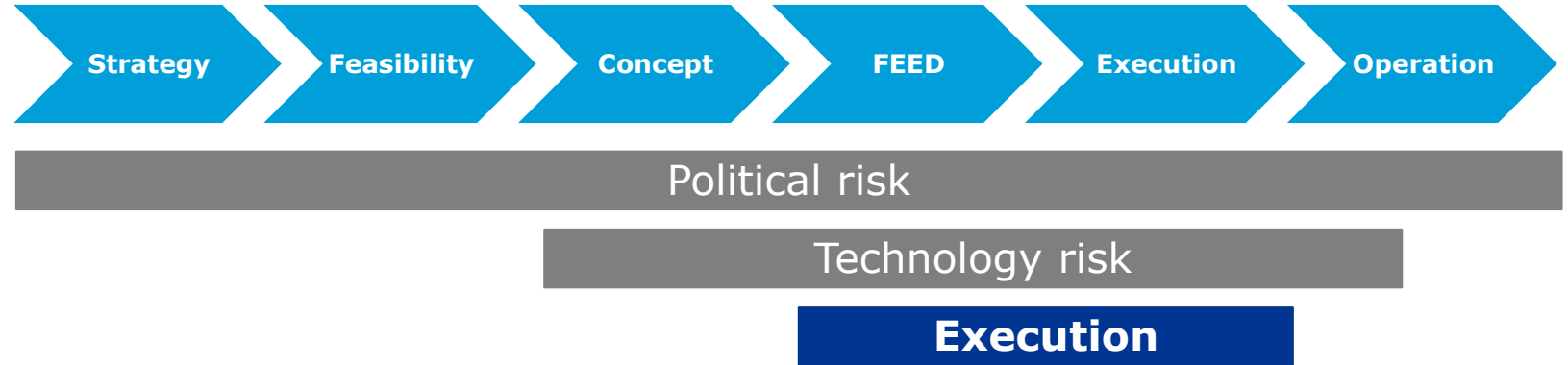
- Feasibility studies, including technical feasibility
- Concept selection including technology risk alongside other risks to investigate the impact in different scenarios, ensuring robust concept decision, while still facing uncertainty. E.g. through quantitative risks model for decision support
- Technology qualification (TQ) assures new technology works as intended . Is used to resolve risk in an orderly manner, linking TQ with project phases. Assures that new technology works as intended Help reduce time to market and development costs of new technology
- Testing & inspection



Project execution risk span across national borders

- But still is not a prominent risk

- Execution risk for interconnectors is relatively modest compared to other industries with complex projects
- With a properly planned and clearly specified project, the risk should be manageable
- Approval processes for execution may imply higher risk than execution itself
- Ability to manage uncertainties during installation and commissioning is well understood in the industry



How

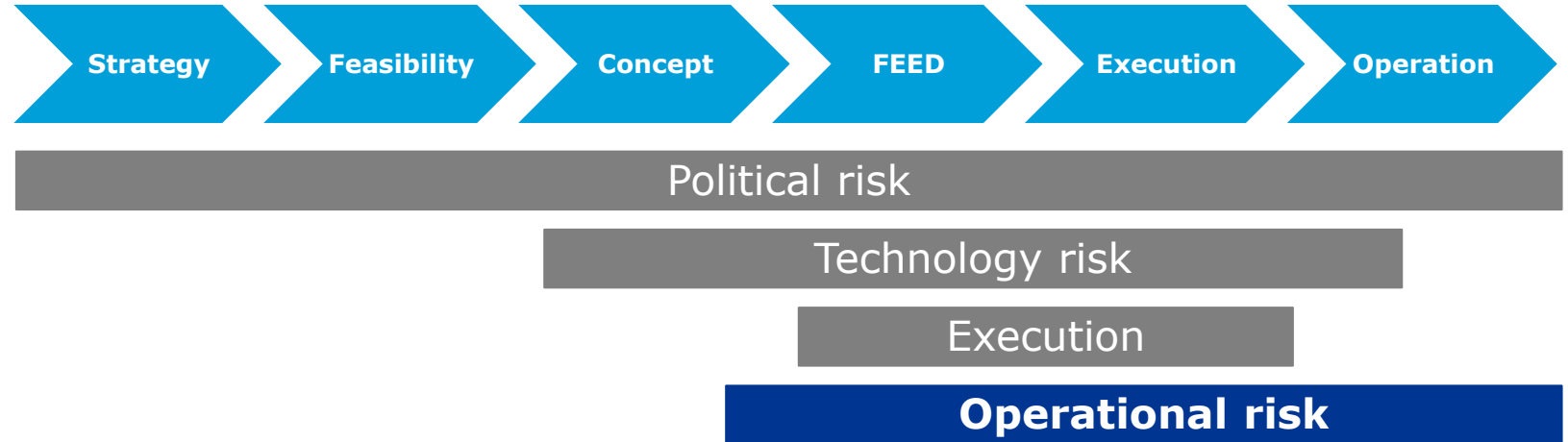
- Project Risk Management (PRM) including cost and schedule analyses, prior of and during execution, to establish realistic budgets with contingencies and project reserves
- Follow-up project risks and actions qualitatively in a structured manner
- Quality management / assurance / control incl. testing testing



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Operational risk is a function of technical and commercial constraints

- Physical limitations of grids defines the operating envelope
- The technical solutions are consequences of commercial choices, and needs to be managed across borders with operating procedures and organizations to match
- Common operations challenging, e.g., due to grid balancing. The power will not be isolated from the grid, neither in the start, along the way, or at the destination
- Ready for operations focus needs to follow technical and commercial solutions, preparing the organization for operations possibly having consequences for the larger grid

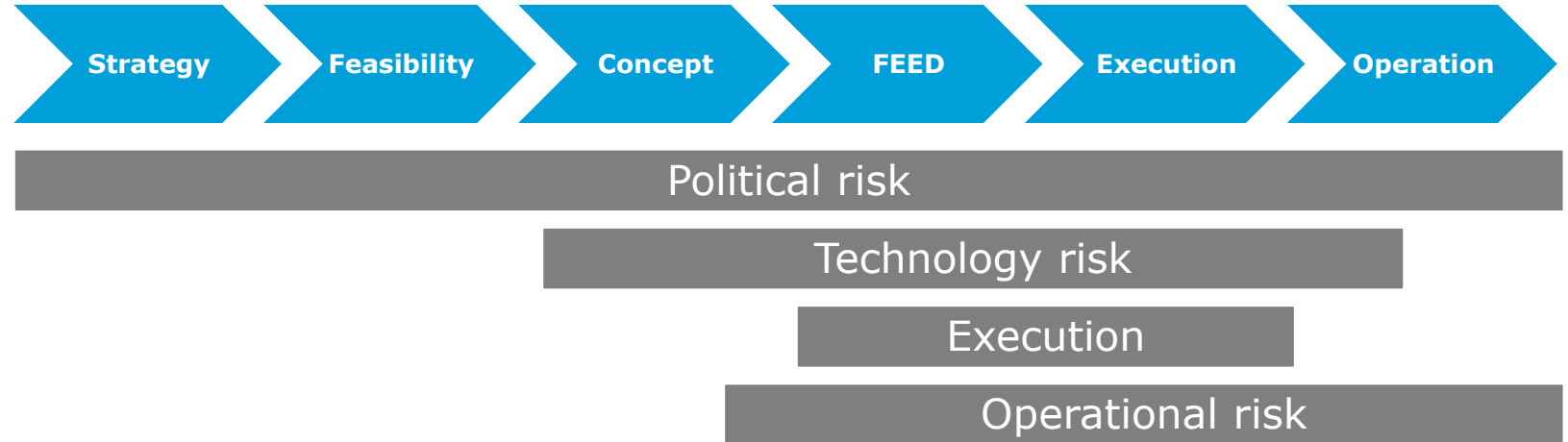


How

- Feasibility studies
- Modelling of the physical grid.
 - PSCAD model including controls to meet the specified performance requirements
 - PSSE model utilizing the two-time step methodology
 - System integration study to ensure the acceptable performance of the integrated AC/DC systems including identification of AC system upgrades required to support the HVDC

Commercial risk defines the nature of other risks, acceptance criteria and requirements, and thus needs to be resolved early on

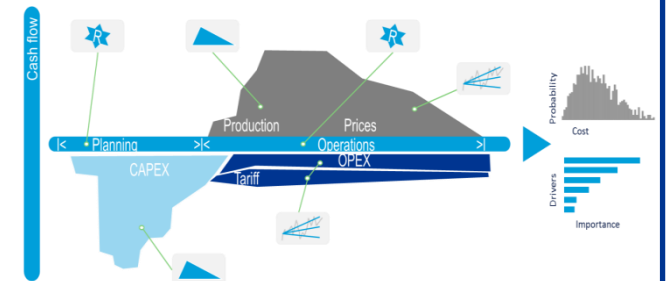
- Commercial risk along 2 dimensions:
 1. the value of the interconnectors, &
 2. the cascading effect of business model on other areas
- Has direct consequences for chosen concept. Technical solutions and operations must be aligned with the business model behind
- Will always remain to a certain extent, but needs to be managed, mitigated, and distributed to the correct owners
- Impacted by deregulation with effect on pricing and power flows, introducing significant uncertainty both on price and operational levels



Commercial risk

How

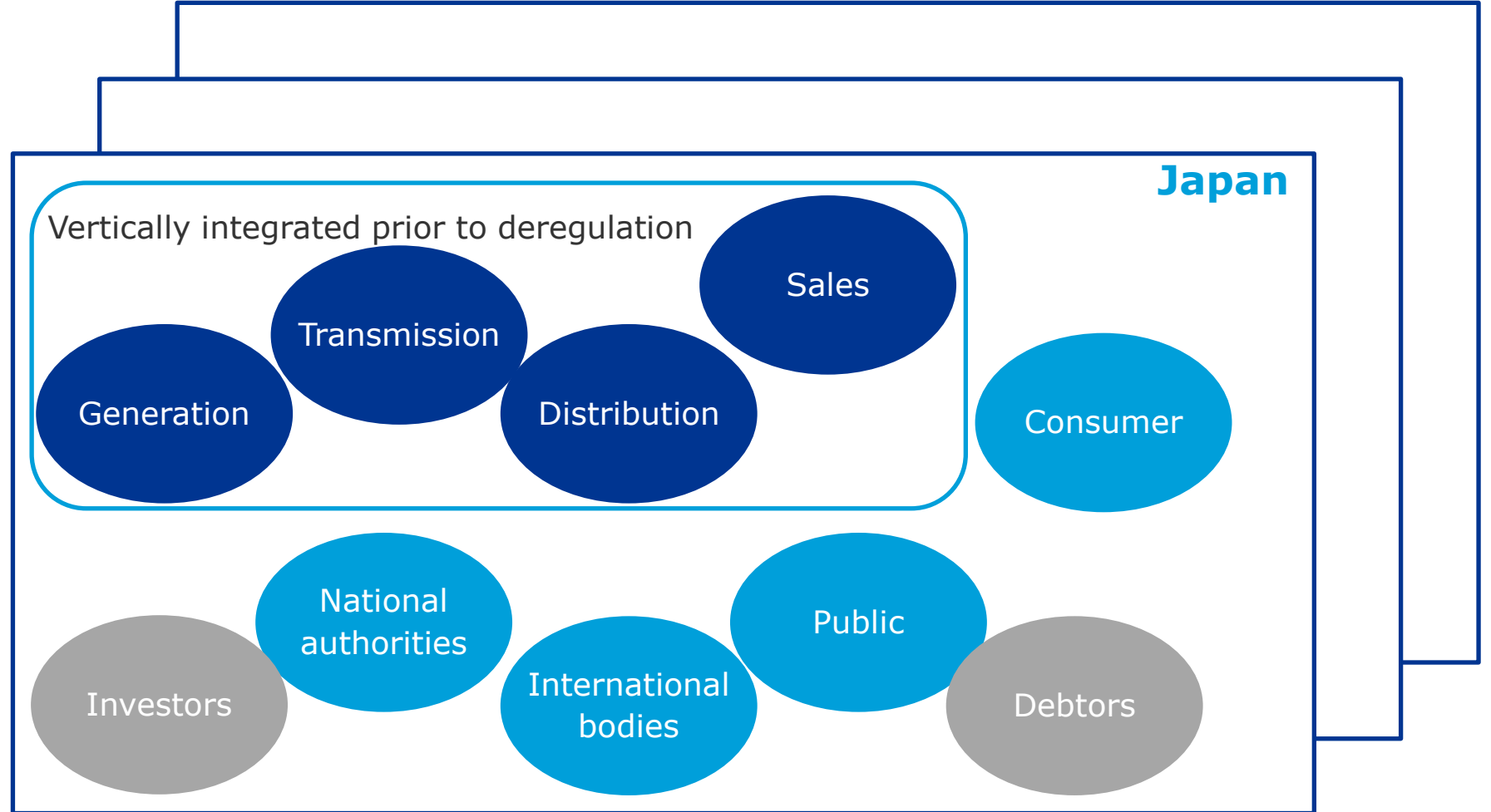
- Feasibility studies on project economy & market dynamics
- Market simulations based on the economic and technical characteristics/ requirements of the respective systems to show the effect of business models.
- Value Chain Assessment (VCA) used for selection of solutions / concepts covering the entire life-cycle, including risk and uncertainty



Knowing your stakeholders

- Who owns what, including the risk is essential for risk management

- Old roles may disappear as vertically integrated utilities enter deregulation, or have to deal with new interfaces
- New roles appear through deregulation and cross-border relationships
- New interfaces appear as a consequence of interconnections without clear cut routines for managing these
- The changes are happening fast



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3 key takeaways

Front end loading of risk management

- Define requirements for decision making
- Make risk visible from start to end; assess and prioritize
- Resolve risks in time for the next stage

Prioritize critical risks for each phase and decision gate

- Gain control of the important stuff first
- Focus on commercial which will define the technical and operational aspects as well
- Focus on critical paths in the schedule

Manage stakeholders' interests and risk distribution

- Understanding parallel processes
- Share risks and uncertainty to ensure no uncovered interfaces
- Understand effects on operations

Thank you

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