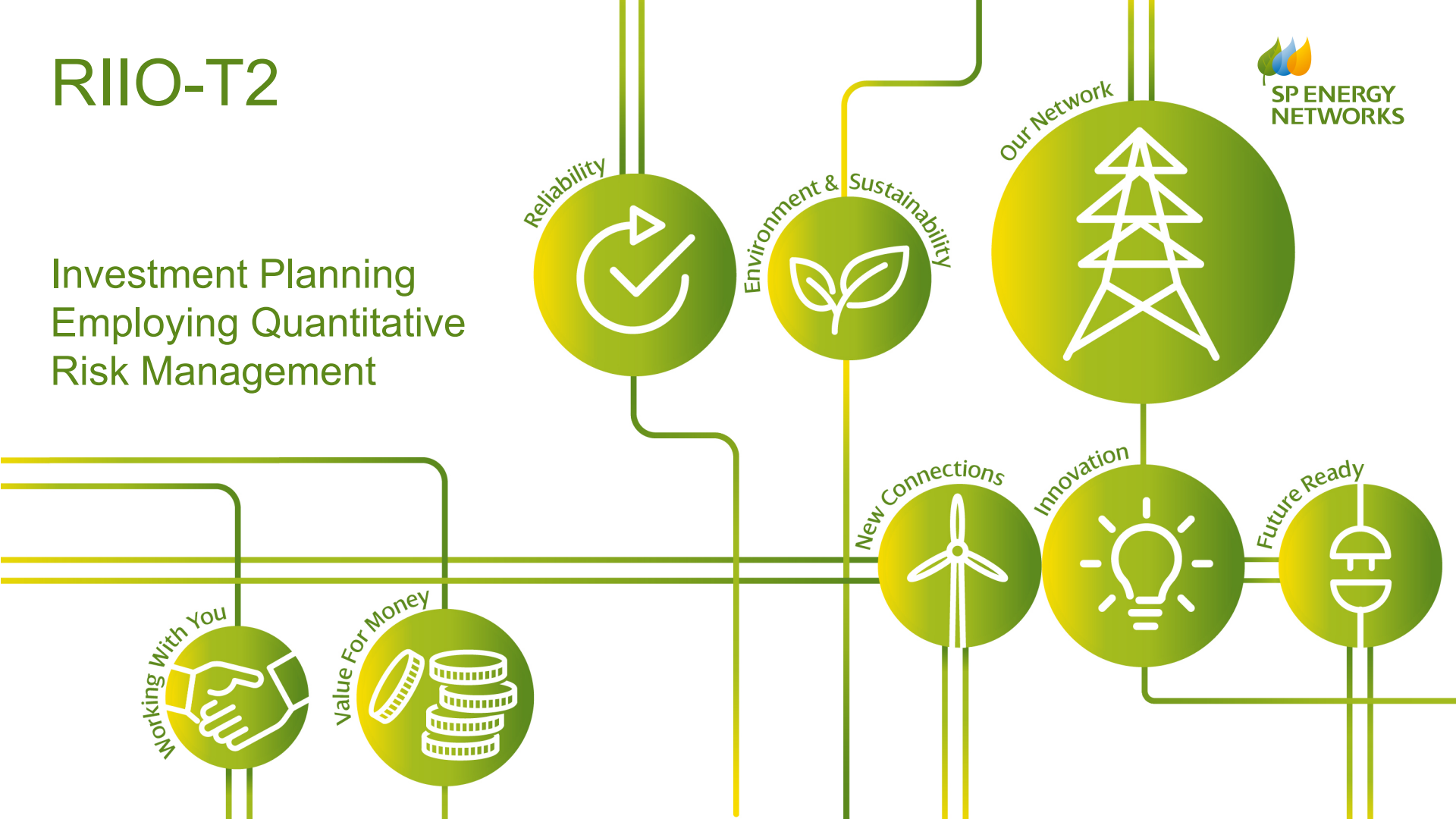
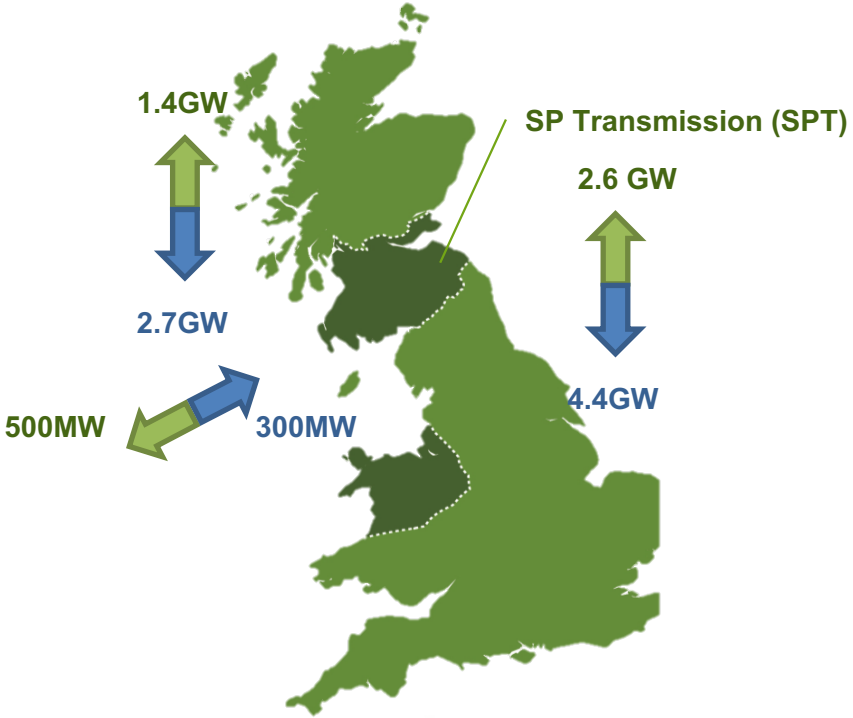
RIIO-T2

Investment Planning Employing Quantitative Risk Management



SP Energy Networks : Transmission



148

3752km

642km

Quantifying Risk: Motivation

Objective Measure of Asset Health

Objective Measure of Criticality

Justify Interventions

Forecast Future Condition

Prioritise Interventions

of asset risk for planning ?

Quantification of Risk: Components of Monetised Risk Framework for Lead Assets

SP ENERGY NETWORKS

Determine Condition

- Define relevant environment, duty and condition points for every lead asset type
- Apply environment & duty to modify expected life, per asset
- Apply condition points to determine equivalent age and calculate health score, per asset

Determine Probabilities of Failure

- Define material failure modes
- Apply company and industry failure rate data to determine *PoFs* for each failure mode from health score

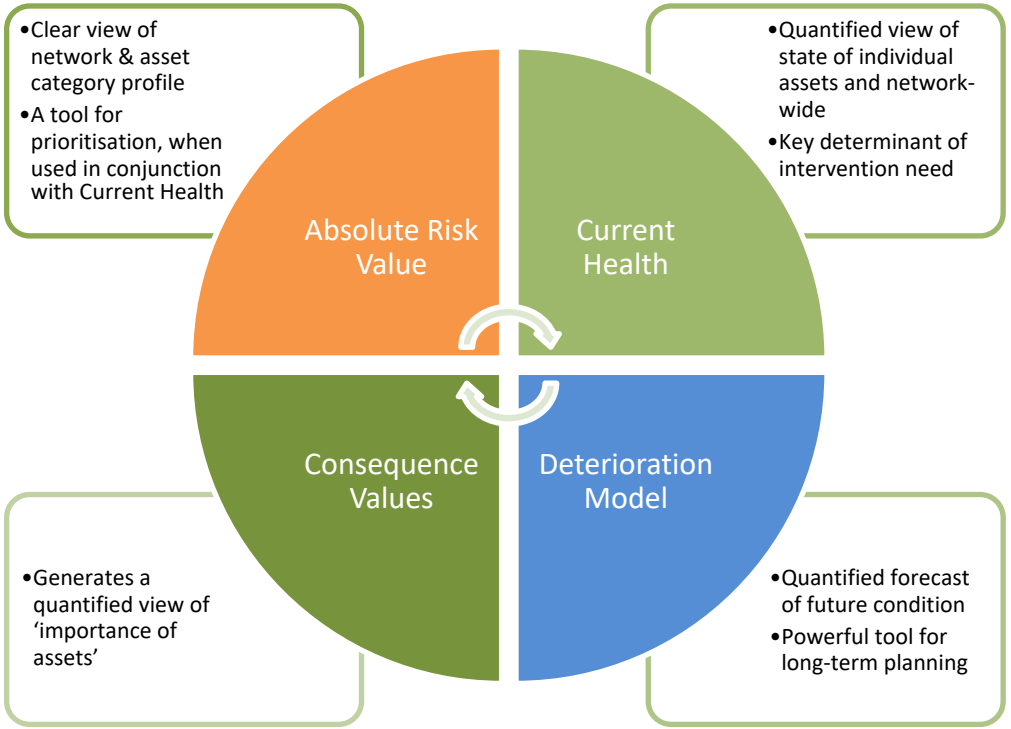
Determine Consequences & Map *PoFs* to Generate Risk

- Evaluate System, Safety, Environment & Financial Consequence costs (*CoFs*)
- Map failure mode *PoFs* to *CoFs* by probability of consequence
- Generate monetised risk values by failure mode

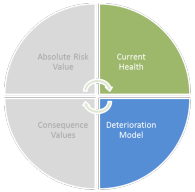
Consequences of Failure

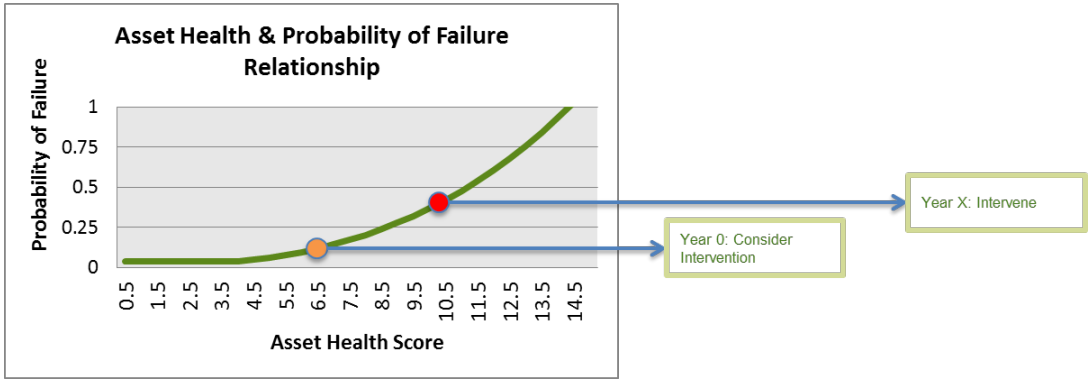
	Consequence Component	Quantification
System	Costs associated with asset unavailability: loss of demand, impact on generation, boundary constraints, reactive power	VoLL, ESO forecasts of generation, constraint and reactive power costs. Durations of events by failure mode. VoLL adjusted for e.g. EKP, COMAH sites.
Safety	Societal cost associated with injury due to asset failure	Probability of injury by failure mode, costs of injuries, exposure modifier.
Environment	Environmental costs due to oil SF_6, fire and waste issues caused by asset failure.	Costs modified by asset situation, proximity to sensitive areas
Financial	Repair or replacement costs by asset failure mode	Average cost of recovery from each failure mode modified by asset location

Using Monetised Risk & Its Components



Long-Term Planning: Identification of Need



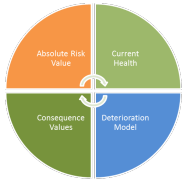


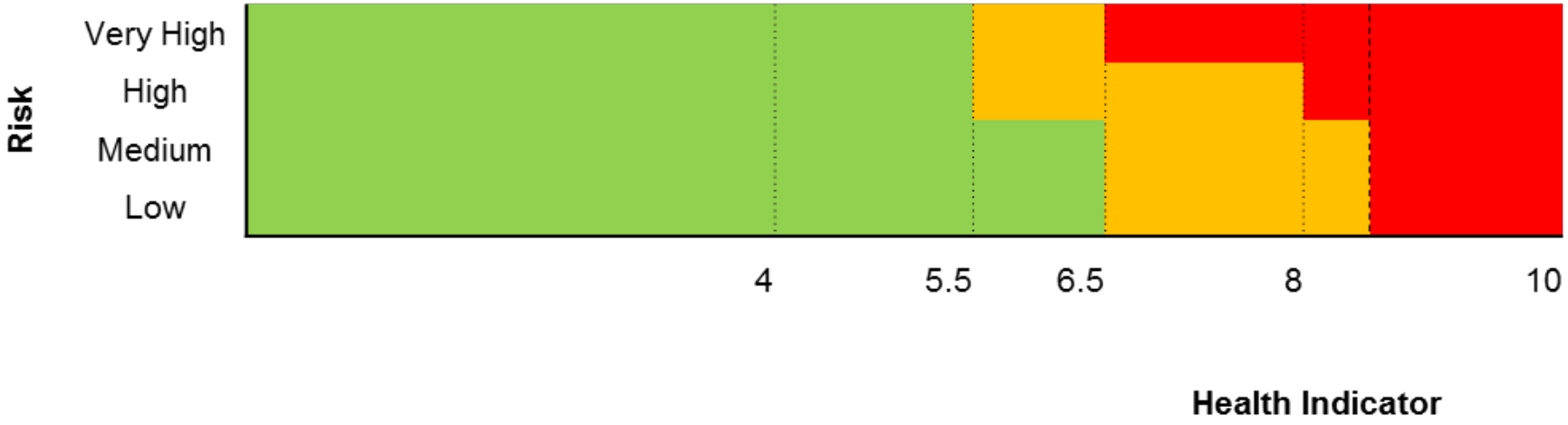
Forecast condition & End-of-Life

Blend with other data and information

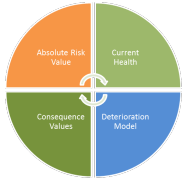
Identify interventions as part of long term plan

Prioritisation





Investment Options for Prioritised Intervention Needs



- Condition of particular components?
- Environment affecting consequence or condition?

What is driving health and risk?

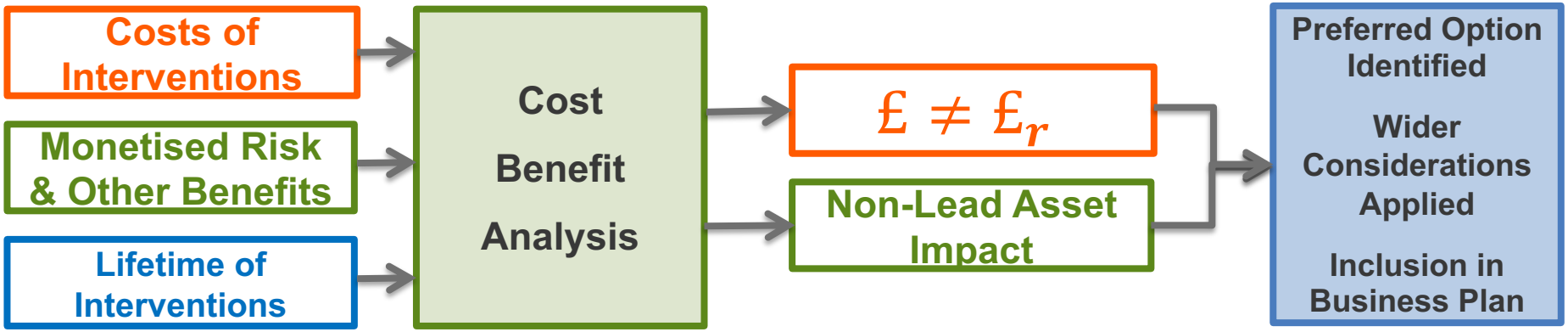
What are the options to manage?

- Short-listing of feasible options
- Analysis of impact of interventions on health, consequence & risk
- Analysis of failure mode effects: tolerable and recoverable if investment deferred?

- Co-ordination with other works to minimise system access needs
- Network topology: interdependence of assets
- Bow-wave effect of excessive deferrals.

Network-Wide View

Economic Analysis



Conclusion

SP ENERGY NETWORKS

Valuable Tool In Long-Term Planning

Provides a Degree of Objectivity

Caution Against Sense of False Accuracy

Requires Expert Input to Populate & Interpret

Part of a Toolkit for Planning & Assessment