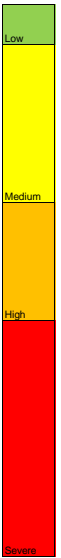


## Project Risk and Benefit Matrix - Summary

Risk ID	Risk Title	Risk	Responsible Operator		
			Unmitigated Overall Risk Rating	Mitigated Overall Risk Rating	Progressive Network Enabler Mitigated Overall Risk Rating
1	Asset Failure	<p>Lack of visibility of key information due inadequate system overview, lack of space and positions of the desks means reduced situational awareness.</p> <p>The increased complexity of the network creates a need for greater awareness. Presentation of information is key to managing this successfully. This includes managing the islands and offshore grids. The need to commission new equipment and test existing equipment is also increased</p> <p>Restoring the system following a major incident or blackout is hindered by the lack of a system overview and key indicators during the emergency. There is risk of delays to restoration and a risk of inability to act as the system operator during a blackout.</p>	Severe	Medium	Medium
2	Operational Safety	<p>Distractions and interruptions to control centre operators Increased stress often occur as people traverse along the accessways next to them.</p> <p>Concentration whilst working can be disrupted, impacting on safety coordination. With the growing responsibilities needs are increasing in volume as more interfaces with offshore, new users and interconnectors builds.</p> <p>Incorrect or sub-optimal decisions made during anticipated and unanticipated events due to distraction, noise and/or interruptions</p>	High	Medium	Medium
3	Network Digitalisation	<p>The size and configuration of the building has meant splitting the members away into 3 different areas. This has reduced the mutual benefit of close communication and collaboration with subsequent inefficiencies and errors likely.</p> <p>The dislocation between team members can result in miscoordination and suboptimal planning of outages and creates barriers to general awareness of activities within the team. This can also reduce communication and ideas sharing between the year ahead team and the current year team and the manager's awareness is reduced for half of the group</p> <p>The growth in network and consequent team size to manage it, will mean increased desk numbers. The current building will not accommodate these without severe disruption to TCC and other parts of the business.</p> <p>Lack of capacity and space for operational, user or commissioning testing, relies on using existing monitoring screens for testing while also monitoring the system.</p>	Severe	Medium	Medium
4	Asset Life Extension	<p>Site security is poor, allowing the potential for intrusion and consequent danger to the network or staff as a result of nefarious switching. For the importance of the TCC, it does not compare favourably to the security protocols in other control rooms around the world</p>	Severe	Medium	Medium
7	Environment/ Sustainability	<p>Welfare is a concern as should the teams be required to remain on site for any length of time such as in a blackstart an area that can be used as rest areas is unavailable.</p> <p>Food, water and sanitation services would become unavailable in the hours after an extended loss of grid.</p> <p>No option for segregation of teams under bio security is possible at the present site. Increased vulnerability is present with 3 other business operating from the same floor</p>	Severe	Medium	Low
OVERALL			Severe	Medium	Medium



		Unmitigated Likelihood					
		Almost Never	Hardly Ever	Unlikely	Possible	Likely	Almost Certain
Unmitigated Impact	Catastrophic	High	High	Severe	Severe	Severe	Severe
	Severe	Medium	High	High	Severe	Severe	Severe
	Major	Medium	Medium	High	High	Severe	Severe
	Significant	Low	Medium	Medium	High	High	Severe
	Minor	Low	Low	Medium	Medium	High	High
	Incidental	Low	Low	Low	Medium	Medium	Medium

		Mitigated Likelihood (Responsible Operator)					
		Almost Never	Hardly Ever	Unlikely	Possible	Likely	Almost Certain
Mitigated Impact (Responsible Operator)	Catastrophic	High	High	Severe	Severe	Severe	Severe
	Severe	Medium	High	High	Severe	Severe	Severe
	Major	Medium	Medium	High	High	Severe	Severe
	Significant	Low	Medium	Medium	High	High	Severe
	Minor	Low	Low	Medium	Medium	High	High
	Incidental	Low	Low	Low	Medium	Medium	Medium

		Mitigated Likelihood (Progressive Network Enabler)					
		Almost Never	Hardly Ever	Unlikely	Possible	Likely	Almost Certain
Mitigated Impact (Progressive Network Enabler)	Catastrophic	High	High	Severe	Severe	Severe	Severe
	Severe	Medium	High	High	Severe	Severe	Severe
	Major	Medium	Medium	High	High	Severe	Severe
	Significant	Low	Medium	Medium	High	High	Severe
	Minor	Low	Low	Medium	Medium	High	High
	Incidental	Low	Low	Low	Medium	Medium	Medium

		Mitigated Likelihood (Minimum Standard)					
		Almost Never	Hardly Ever	Unlikely	Possible	Likely	Almost Certain
Mitigated Impact (Minimum Standard)	Catastrophic	High	High	Severe	Severe	Severe	Severe
	Severe	Medium	High	High	Severe	Severe	Severe
	Major	Medium	Medium	High	High	Severe	Severe
	Significant	Low	Medium	Medium	High	High	Severe
	Minor	Low	Low	Medium	Medium	High	High
	Incidental	Low	Low	Low	Medium	Medium	Medium

## Project Risk & Benefit Matrix - Responsible Operator

Risk ID	Risk Title	Risk	Unmitigated Risk Likelihood	Unmitigated Risk Impact	Unmitigated Overall Risk Rating	Mitigation Action		Mitigated Risk Likelihood	Mitigated Risk Impact	Mitigated Overall Risk Rating	Benefits
1	Failure to Observe System conditions (Situational Awareness)	<p>Lack of visibility of key information due Inadequate system overview, lack of space and positions of the desks means reduced situational awareness.</p> <p>The increased complexity of the network creates a need for greater awareness. Presentation of information is key to managing this successfully. This includes managing the islands and offshore grids. The need to commission new equipment and test existing equipment is also increased</p> <p>Restoring the system following a major incident or blackout is hindered by the lack of a system overview and key indicators during the emergency. There is risk of delays to restoration and a risk of inability to act as the system operator during a blackstart.</p>	Almost Certain	Severe	Severe	<p>Use improved System overview displays, including large System mapboard on a video wall.</p> <p>Improved work areas and presentation of key information to maximise situational awareness.</p> <p>Separate space for commissioning new equipment and testing existing equipment within the control room.</p>		Unlikely	Serious	Medium	<p>Increased awareness in observing events and high level overview visible would provide more understanding of conditions.</p> <p>Improved restoration times during blackouts or major disturbances, reduces cost to wider society of delays in restoration.</p>
2	Operational Safety	<p>Distractions and interruptions to control centre operators Increased stress often occur as people traverse along the accessways next to them.</p> <p>Concentration whilst working can be disrupted, impacting on safety coordination. With the growing responsibilities needs are increasing in volume as more interfaces with offshore, new users and interconnectors builds.</p> <p>Incorrect or sub-optimal decisions made during anticipated and unanticipated events due to distraction, noise and/or interruptions</p>	Likely	Serious	High	<p>Create a separate control room and commissioning area with reduced distractions and through traffic from other teams.</p> <p>Create a "no-interruption" zone, where operators can work with reduced distractions top operator the grid safely.</p>		Unlikely	Minor	Medium	<p>Improved safety critical work zones, avoid distractions and improve accuracy of work.</p> <p>Error reduction, less reworking and reduced stress on team members.</p>

3	Space	<p>The size and configuration of the building has meant splitting the members away into 3 different areas. This has reduced the mutual benefit of close communication and collaboration with subsequent inefficiencies and errors likely.</p> <p>The dislocation between team members can result in miscoordination and suboptimal planning of outages and creates barriers to general awareness of activities within the team. This can also reduce communication and ideas sharing between the year ahead team and the current year team and the manager's awareness is reduced for half of the group</p> <p>The growth in network and consequent team size to manage it, will mean increased desk numbers. The current building will not accommodate these without severe disruption to TCC and other parts of the business.</p> <p>Lack of capacity and space for operational, user or commissioning testing, relies on using existing monitoring screens for testing while also monitoring the system.</p>	Almost Certain	Major	Severe	<p>Create an environment that will meet the growth needs, bring the team together and allow work areas to be in "quiet" zones for times when concentration or privacy is required.</p> <p>Provide collaboration space close to the workplace without disruption to others.</p>		Unlikely	Serious	Medium	<p>Meet the need to increase capabilities in managing the much larger and complex system.</p> <p>Increased collaboration and efficiency of business processes through improved communications.</p> <p>Continue to meet the high performance of the team from plan to delivery, by working better as a team.</p> <p>Formal, disciplined and dedicated areas for early stage commissioning, data preparation and project testing give improved capacity and more rigor in commissioning, data preparation and live projects.</p>
4	Physical Security	<p>Site security is poor, allowing the potential for intrusion and consequent danger to the network or staff as a result of nefarious switching. For the importance of the TCC, it does not compare favourably to the security protocols in other control rooms around the world</p>	Almost Certain	Severe	Severe	<p>Provide suitable CNI security measures based on deter, deny, detect and delay principles.</p> <p>Outer perimeter and buildings would require "hardening". Internal security must rely on limited access for only those who need to be there.</p>		Unlikely	Serious	Medium	<p>Increased asset utilisation, delivering value for the customer.</p> <p>Safety of the operators is improved, reducing risk of intrusions</p> <p>Safety of field workers is improved, reducing risk of nefarious switching from</p>
5	Control Centre Resilience/Integrity (Business Continuity)	<p>Impeded of operational capacity through loss of the current TCC would result in occupation of the DR site at Burghmuir. This would only allow a bare minimum number of staff to operate the system and emergency support. No full contingency site is prepared to regain business as usual. Furthermore should the Perth area be affected there is no alternative site for contingency or DR out of the area.</p> <p>In the event of an extended loss of grid, the site risk being unusable due to shared facilities and its reliance on mains services such as water and sewage.</p>	Almost Certain	Catastrophic	Severe	<p>Create a 3 centre approach to increase resilience where the main TCC and contingency sites remain close enough for mitigation of building loss, considered the most likely scenario. Then use a DR site out of area in the event of a Perth areawide issue.</p> <p>Provide a facility that can withstand loss of all external services and give sufficient flexibility for multiple event scenarios, such as blackstart, local lockdown or work place limitations.</p>		Possible	Minor	Medium	<p>Higher resilience to building loss and increased business continuity, by having main, contingency and DR sites.</p> <p>Increased surety and efficiency of recovery from a nationwide power outage for extended loss of grid. Reduced time and societal cost in the event of a major system disturbance</p>

6	Control Centre Resilience/Integrity (Business Continuity)	Long term loss of the Main TCC, causing enduring loss of full facilities in maintaining operational readiness and business continuity for delivery of the system plan, data preparation and technical support.	Likely	Serious	High	<p>Create a 3 centre approach to increase resilience where the main TCC and contingency sites remain close enough for mitigation of building loss, considered the most likely scenario. Then use a DR site out of area in the event of a Perth areawide issue.</p> <p>Provide a facility that can withstand loss of all external services and give sufficient flexibility for multiple event scenarios, such as blackstart, local lockdown or work place limitations.</p>	Likely	Serious	High	<p>Higher resilience to building loss and increased business continuity, by having main, contingency and DR sites.</p> <p>Increased surety and efficiency of recovery from a nationwide power outage for extended loss of grid. Reduced time and societal cost in the event of a major system disturbance.</p>
7	Control Centre Resilience/Integrity (Welfare)	<p>Welfare is a concern as should the teams be required to remain on site for any length of time such as in a blackstart an area that can be used as rest areas is unavailable.</p> <p>Food, water and sanitation services would become unavailable in the hours after an extended loss of grid.</p> <p>No option for segregation of teams under bio security is possible at the present site. Increased vulnerability is present with 3 other business operating from the same floor.</p>	Almost Certain	Catastrophic	Severe	<p>Significant flexible space to be created that can be multipurpose use should be provided. Welfare arrangements must be capable of meeting the onsite needs of the teams plus any other co-opted staff required.</p> <p>Control of access and ability to split teams and reduce risk of any cross contagion, such as flu or other agents.</p> <p>The new building will be designed to include high specifications for building services, with air circulation systems, building sanitation and other shared facilities all designed to mitigate the risk of pathogen spread</p>	Possible	Minor	Medium	<p>Multipurpose areas will allow for physical distancing in the control room and in all shared facilities in the building to mitigate contagious disease spread.</p> <p>Limiting disease outbreak among operation staff reduces the risk of absenteeism. Having inexperienced or under qualified personnel operating the grid is a risk to system reliability.</p> <p>Improved health outcomes for staff operating the grid and their families, if pathogen spread is limited.</p>
8	Future Needs	<p>Inability or high cost to adapt current TCC to future business needs, when the network operation is changing so rapidly. This would in turn lose the ability to operate safely, securely and efficiently.</p> <p>Failure to meet statutory obligations, resulting fines or loss of Transmission license.</p> <p>New obligations and services that align with the TCC operations will not be met due to lack of flexibility at the current TCC. This includes new data modelling, management processes and secure transfer to other stakeholder</p> <p>New equipment such as active network management devices, will need to be controlled, monitored, trained for.</p> <p>The actual gird is likely to be "weaker" meaning degree of difficulty managing the system increases and HILP events increased</p>	Likely	Severe	Severe	<p>When creating the new TCC account for a proportionate increase in work spaces and facilities that will allow adoption of new functions or increased demands on the TCC when they arise.</p> <p>By installing a new large overview display in the new control center, the operators have a wide area overview of the system and its key indicators. This will radically improve situational awareness for the system that is rapidly changing.</p> <p>Improved facilities will improve operational team coordination which should improve data management for the complex future system, especially in alternative outage planning.</p>	Unlikely	Minor	Medium	<p>Future proofing and flexibility to accommodate changes without need to extend.</p> <p>Having operational staff co-located in the facility will improve coordination for outage planning especially alternative outage planning which has major cost implications for capital works projects on the system.</p>
9	Failure of Telephony	In the current control center there is a risk of the telephony system failing, due to increased demands on the system	Possible	Major	High	When designing the new control center and transferring operations, the telephony system will be upgraded to improve resilience for future system operation	Hardly Ever	Major	Medium	Full controllability of the grid is assured at all times, communications is maintained to field staff to coordinate safety activities and switching

10	Deficiencies in Training	<p>The lack of a training simulator in the current facility and the limits to on the job training during a pandemic has exposed risks to operational capability among staff. This is especially acute since the risk of an outbreak of disease among existing staff is increased.</p> <p>The future system will be very much more complex, requiring extensive and continuous training, certification and assessment</p> <p>The likelihood of a blackout or a major system disturbance in future is increasing, these major events can only be trained for in a simulator.</p> <p>The interdependence of the future system needs coordinated blackstart training exercises with DNOs, NGESO, wind farm operators, not training in this way risks poor outcomes to major events etc</p>	Likely	Severe	Severe	A new training simulator in the new control center which will allow a streamlined approach to training operators continuously and for major incidents such as blackstart, power system oscillations or extreme weather events	Hardly Ever	Minor	Low	<p>Fully trained and qualified operators improve grid reliability, ensuring effective, efficient and accurate response to major disturbances when they occur.</p> <p>Faster response to blackstart and restoration reduces economic impacts of loss of electricity on wider society.</p>
11	Cyber Security	<p>There is a risk to the security of supply on the system with a cyber intrusion from a bad actor potentially gaining access to the EMS/SCADA system. This risk entails nefarious switching activity to disconnect load and switch on the system when field workers are working near live equipment.</p> <p>There is also a risk of theft or manipulation of sensitive documents or system critical data.</p> <p>The risks are real and some system operators have reported breaches in Europe in 2020.</p>	Almost Certain	Severe	Severe	<p>Highest standards of cyber security protection implemented based on CISC guidelines and CPNI hardening requirements.</p> <p>Separation and redundancy of new cyber communication equipment in new facility.</p>	Possible	Major	High	<p>Ensured reliability of supply to customers with reduced risk of nefarious actors performing switching or interfering in system operation.</p> <p>Improved safety to field staff when working on live plant</p> <p>Secure system data, data exchange and documents</p>

## Project Risk & Benefit Matrix - Responsible Operator

Risk ID	Risk Title	Risk	Unmitigated Risk Likelihood	Unmitigated Risk Impact	Unmitigated Overall Risk Rating	Mitigation Action		Mitigated Risk Likelihood	Mitigated Risk Impact	Mitigated Overall Risk Rating	Benefits
1	Failure to Observe System conditions (Situational Awareness)	<p>Inadequate system overview due to the lack of space and positions of the desks means reduced situational awareness and lack of visibility of key information.</p> <p>The increased complexity of the network creates a need for greater awareness. Presentation of information is key to managing this successfully. This includes managing the islands and offshore grids. The need to commission new equipment and test existing equipment is also increased</p> <p>Restoring the system following a major incident or blackout is hindered by the lack of a system overview and key indicators during the emergency. There is risk of delays to restoration and a risk of inability to act as the system operator during a blackstart.</p>	Almost Certain	Severe	Severe	<p>With two new control centers, there will be improved System overview displays, including large System mapboard on a video wall.</p> <p>Improved work areas and presentation of key information to maximise situational awareness.</p> <p>Separate space for commissioning new equipment and testing existing equipment within both new control rooms.</p>		Unlikely	Serious	Medium	<p>Increased awareness in observing events and high level overview visible would provide more understanding of conditions.</p> <p>Improved restoration times during blackouts or major disturbances, reduces cost to wider society of delays in restoration.</p>
2	Operational Safety	<p>Distractions and interruptions to control centre operators Increased stress often occur as people traverse along the accessways next to them.</p> <p>Concentration whilst working can be disrupted, impacting on safety coordination. With the growing responsibilities needs are increasing in volume as more interfaces with offshore, new users and interconnectors builds.</p> <p>Incorrect or sub-optimal decisions made during anticipated and unanticipated events due to distraction, noise and/or interruptions</p>	Likely	Serious	High	<p>In the two new control centers, create a separate control room and commissioning area with reduced distractions and through traffic from other teams.</p> <p>Create a "no-interruption" zone, where operators can work with reduced distractions top operator the grid safely.</p>		Unlikely	Minor	Medium	<p>Improved safety critical work zones, avoid distractions and improve accuracy of work.</p> <p>Error reduction, less reworking and reduced stress on team members.</p>

3	Space	<p>The size and configuration of the building has meant splitting the members away into 3 different areas. This has reduced the mutual benefit of close communication and collaboration with subsequent inefficiencies and errors likely.</p> <p>The dislocation between team members can result in miscoordination and suboptimal planning of outages and creates barriers to general awareness of activities within the team. This can also reduce communication and ideas sharing between the year ahead team and the current year team and the manager's awareness is reduced for half of the group</p> <p>The growth in network and consequent team size to manage it, will mean increased desk numbers. The current building will not accommodate these without severe disruption to TCC and other parts of the business.</p> <p>Lack of capacity and space for operational, user or commissioning testing, relies on using existing monitoring screens for testing while also monitoring the system.</p>	Almost Certain	Major	Severe	<p>In both control centers, create an environment that will meet the growth needs, bring the team together and allow work areas to be in "quiet" zones for times when concentration or privacy is required.</p> <p>Provide collaboration space close to the workplace without disruption to others.</p>		Unlikely	Serious	Medium	<p>Meet the need to increase capabilities in managing the much larger and complex system.</p> <p>Increased collaboration and efficiency of business processes through improved communications.</p> <p>Continue to meet the high performance of the team from plan to delivery, by working better as a team.</p> <p>Formal, disciplined and dedicated areas for early stage commissioning, data preparation and project testing give improved capacity and more rigor in commissioning, data preparation and live projects.</p>
4	Physical Security	<p>Site security is poor, allowing the potential for intrusion and consequent danger to the network or staff as a result of nefarious switching. For the importance of the TCC, it does not compare favourably to the security protocols in other control rooms around the world</p>	Almost Certain	Severe	Severe	<p>In both control centers, provide suitable CNI security measures based on deter, deny, detect and delay principles. Outer perimeter and buildings would require "hardening". Internal security must rely on limited access for only those who need to be there.</p>		Unlikely	Serious	Medium	<p>Safety of the operators is improved, reducing risk of intrusions</p> <p>Safety of field workers is improved, reducing risk of nefarious switching from intrusions</p>
5	Control Centre Resilience/Integrity (Business Continuity)	<p>Loss of the current TCC would result in occupation of the DR site at Burghmuir. This would only allow a bare minimum number of staff to operate the system and emergency support. No full contingency site is prepared to regain business as usual. Furthermore should the Perth area be affected there is no alternative site for contingency or DR out of the area.</p> <p>In the event of an extended loss of grid, the site risk being unusable due to shared facilities and its reliance on mains services such as water and sewage.</p>	Almost Certain	Catastrophic	Severe	<p>Create a 3 centre approach to increase resilience where the main TCC and contingency backup facilities are new facilities and both sites remain close enough for mitigation of building loss, the most likely scenario. Then use a DR site as teh existig Inveralmond site.</p> <p>Provide two facilities that can withstand loss of all external services and give sufficient flexibility for multiple event scenarios, such as blackstart, local lockdown or work place limitations.</p>		Hardly Ever	Minor	Low	<p>Higher resilience to building loss and increased business continuity, by having main, contingency and DR sites.</p> <p>Increased surety and efficiency of recovery from a nationwide power outage for extended loss of grid. Reduced time and societal cost in the event of a major system disturbance</p>



6	Control Centre Resilience/Integrity (Business Continuity)	Long term loss of the Main TCC, causing enduring loss of full facilities in maintaining operational readiness and business continuity for delivery of the system plan, data preparation and technical support.	Likely	Serious	High	<p>Create a 3 centre approach to increase resilience where the main TCC and contingency backup facilities are new facilities and both sites remain close enough for mitigation of building loss, the most likely scenario. Then use a DR site as teh existig Inveralmond site.</p> <p>Provide two facilities that can withstand loss of all external services and give sufficient flexibility for multiple event scenarios, such as blackstart, local lockdown or work place limitations.</p>	Hardly Ever	Minor	Low	<p>Higher resilience to building loss and increased business continuity, by having main, contingency and DR sites.</p> <p>Increased surety and efficiency of recovery from a nationwide power outage for extended loss of grid. Reduced time and societal cost in the event of a major system disturbance.</p>
7	Control Centre Resilience/Integrity (Welfare)	<p>Welfare is a concern as should the teams be required to remain on site for any length of time such as in a blackstart space for accommodating rest areas. Food, water and sanitation services would be unavailable in the hours after an extended loss of grid.</p> <p>In particular the option for segregation of teams under bio security is impossible at the present site, with 3 other business operating from the same floor.</p>	Almost Certain	Catastrophic	Severe	<p>In both new control centers, significant flexible space to be created that can be multipurpose use should be provided. Welfare arrangements must be capable of meeting the onsite needs of the teams plus any other co-opted staff required.</p> <p>Control of access and ability to split teams and reduce risk of any cross contagion, such as flu or other agents.</p> <p>The new buildings will be designed to include high specifications for building services, with air circulation systems, building sanitation and other shared facilities all designed to mitigate the risk of pathogen spread</p>	Hardly Ever	Minor	Low	<p>Multipurpose areas will allow for physical distancing in the control room and in all shared facilities in the building to mitigate contagious disease spread.</p> <p>Limiting disease outbreak among operation staff reduces the risk of absenteeism. Having inexperienced or under qualified personnel operating the grid is a risk to system reliability.</p> <p>Improved health outcomes for staff operating the grid and their families, if pathogen spread is limited.</p>
8	Future Needs	<p>Inability or high cost to adapt current TCC to future business needs, when the network operation is changing so rapidly, in turn losing the ability to operate safely, securely and efficiently.</p> <p>Failure to meet statutory obligations, resulting fines or loss of Transmission license.</p> <p>New obligations and services that align with the TCC operations will not be met due to lack of flexibility at the current TCC. This includes new data modelling, management processes and secure transfer to other stakeholder</p> <p>New equipment such as active network management devices, will need to be controlled, monitored, trained for.</p> <p>The actual gird is likely to be "weaker" meaning degree of difficulty managing the system increases and HILP events increased</p>	Likely	Severe	Severe	<p>When creating the two new TCC buildings; account for a proportionate increase in work spaces and facilities that will allow adoption of new functions or increased demands on the TCC when they arise.</p> <p>By installing a new large overview display in the new control center, the operators have a wide area overview of the system and its key indicators. This will radically improve situational awareness for the system that is rapidly changing.</p> <p>Improved facilities will improve operational team coordination which should improve data management for the complex future system, especially in alternative outage planning.</p>	Unlikely	Minor	Medium	<p>Future proofing and flexibility to accommodate changes without need to extend.</p> <p>Having operational staff co-located in the facility will improve coordination for outage planning especially alternative outage planning which has major cost implications for capital works projects on the system.</p>
9	Failure of Telephony	In the current control center there is a risk of the telephony system failing, due to increased demands on the system	Possible	Major	High	When designing the two new control centers and transferring operations, the telephony system will be upgraded to improve resilience, redundancy and seperation of systems for future system operation	Hardly Ever	Major	Medium	Full controllability of the grid is assured at all times, communications is maintained to field staff to coordinate safety activities and switching

10	Deficiencies in Training	<p>The lack of a training simulator in the current facility and the limits to on the job training during a pandemic has exposed risks to operational capability among staff. This is especially acute since the risk of an outbreak of disease among existing staff is increased.</p> <p>The future system will be very much more complex, requiring extensive and continuous training, certification and assessment</p> <p>The likelihood of a blackout or a major system disturbance in future is increasing, these major events can only be trained for in a simulator.</p> <p>The interdependence of the future system needs coordinated blackstart training exercises with DNOs, NGESO, wind farm operators, not training in this way risks poor outcomes to major events etc</p>	Likely	Severe	Severe	A new training simulator in the two new control centers which will allow a streamlined approach to training operators continuously and for major incidents such as blackstart		Hardly Ever	Minor	Low	<p>Fully trained and qualified operators improve grid reliability, ensuring effective, efficient and accurate response to major disturbances when they occur.</p> <p>Faster response to blackstart and restoration reduces economic impacts of loss of electricity on wider society.</p>
11	Cyber Security	<p>There is a risk to the security of supply on the system with a cyber intrusion from a bad actor potentially gaining acessess to the EMS/SCADA system. This risk entails nefarius switching activity to disconnect load and switch on the system when field workers are working near live equipment.</p> <p>There is also a risk of theft or manipulation of sensitive docuemnts or system critical data.</p> <p>The risk are real and some system operators have reported breaches in Europe in 2020.</p>	Almost Certain	Severe	Severe	<p>Highest standards of cyber security protection impleneted based on CISC guidelines and CPNI hardening requirments.</p> <p>Seperation and redundancy of new cyber communication equipment in new facility.</p>		Possible	Major	High	<p>Ensured reliability of supply to customers with reduced risk of nafarious actors performing switching or interfering in system operation.</p> <p>Improved safety to field staff when working on live plant</p> <p>Secure system data, data exchange and documents</p>

Project Risk & Benefit Matrix - Minimum Standard

Risk ID	Risk Title	Risk	Unmitigated Risk Likelihood	Unmitigated Risk Impact	Unmitigated Overall Risk Rating	Mitigation Action		Mitigated Risk Likelihood	Mitigated Risk Impact	Mitigated Overall Risk Rating	Benefits
1	Failure to Observe System conditions (Situational Awareness)	<p>Inadequate system overview due to the lack of space and positions of the desks means reduced situational awareness and lack of visibility of key information.</p> <p>The increased complexity of the network creates a need for greater awareness. Presentation of information is key to managing this successfully. This includes managing the islands and offshore grids. The need to commission new equipment and test existing equipment is also increased</p> <p>Restoring the system following a major incident or blackout is hindered by the lack of a system overview and key indicators during the emergency. There is risk of delays to restoration and a risk of inability to act as the system operator during a blackstart.</p>	Almost Certain	Severe	Severe	<p>Improve existing smaller displays on the control room walls to improve operator situational awareness.</p> <p>Bank screen monitors on desks to show greater ammount of pertinent information for system control</p>		Likely	Major	Severe	<p>Slightly Increased awareness in observing events and high level overview visible would provide more understanding of conditions but not a full system overview of the system under control, no ability to monitor blackstart conditions as required of system operator</p> <p>May have slightly improved restoration times during blackouts or major disturbances, reduces cost to wider society of delays in restoration.</p>
2	Operational Safety	<p>Distractions and interruptions to control centre operators Increased stress often occur as people traverse along the accessways next to them.</p> <p>Concentration whilst working can be disrupted, impacting on safety coordination. With the growing responsibilities needs are increasing in volume as more interfaces with offshore, new users and interconnectors builds.</p> <p>Incorrect or sub-optimal decisions made during anticipated and unanticipated events due to distraction, noise and/or interruptions</p>	Likely	Serious	High	<p>If possible to create noise free zones or no-interruption zones for operators by moving existing office staff away from control room desks may reduce noise and distraction which might reduce chances of hunman errors and mistakes during switching or safety coordination</p>		Possible	Major	High	<p>Moderatley improved safety critical work zones, which may result in less distractions and improve accuracy of work.</p> <p>Error reduction, less reworking and reduced stress on team members.</p>

3	Space	<p>The size and configuration of the building has meant splitting the members away into 3 different areas. This has reduced the mutual benefit of close communication and collaboration with subsequent inefficiencies and errors likely.</p> <p>The dislocation between team members can result in miscoordination and suboptimal planning of outages and creates barriers to general awareness of activities within the team. This can also reduce communication and ideas sharing between the year ahead team and the current year team and the manager's awareness is reduced for half of the group</p> <p>The growth in network and consequent team size to manage it, will mean increased desk numbers. The current building will not accommodate these without severe disruption to TCC and other parts of the business.</p> <p>Lack of capacity and space for operational, user or commissioning testing, relies on using existing monitoring screens for testing while also monitoring the system.</p>	Almost Certain	Major	Severe	<p>Attempt to modify the office space to allow more space for closer work coordination between outage planning and other operational teams and the control room operators. This may not be feasible given space constraints and limitations</p> <p>Provide collaboration space close to the workplace without disruption to others.</p>	Likely	Serious	High	<p>Increased collaboration and efficiency of business processes through improved communications.</p> <p>Continue to meet the high performance of the team from plan to delivery, by working better as a team.</p> <p>Formal, disciplined and dedicated areas for early stage commissioning, data preparation and project testing give improved capacity and more rigor in commissioning, data preparation and live projects.</p>
4	Physical Security	<p>Site security is poor, allowing the potential for intrusion and consequent danger to the network or staff resulting personal injury or system disruption. For the importance of the TCC, it does not compare favourably to the security protocols in other control rooms around the world</p>	Almost Certain	Severe	Severe	<p>Harden the physical security of the existing facility in Inveralmond to improve physical security. This will impact control room staff and regular office staff but will require a retrofit of existing facilities and buildings.</p> <p>New security arrangements should meet CPNI standards for CNI building.</p>	Likely	Major	Severe	<p>Safety of the operators is improved, reducing risk of intrusions</p> <p>Safety of field workers is improved, reducing risk of nefarious switching from intrusions</p>
5	Control Centre Resilience/Integrity (Business Continuity)	<p>Loss of the current TCC would result in occupation of the DR site at Burghmuir. This would only allow a bare minimum number of staff to operate the system and emergency support. No full contingency site is prepared to regain business as usual. Furthermore should the Perth area be affected there is no alternative site for contingency or DR out of the area.</p> <p>In the event of an extended loss of grid, the site risk being unusable due to shared facilities and its reliance on mains services such as water and sewage.</p>	Almost Certain	Catastrophic	Severe	<p>Use 3 site system, with Inveralmond as the main, Burroughmuir as the backup contingency control center and a geographically diverse third site for disaster recovery. This would mean a deep retrofit of the Burroughmuir site to make it applicable for business continuity needs and a retrofit of the Inveralmond site, both of which are space constrained</p>	Possible	Severe	Severe	<p>Introduction of the third site will protect against an incident preventing use of both Perthshire sites.</p> <p>Independence from external services still not met.</p>
6	Control Centre Resilience/Integrity (Business Continuity)	<p>Long term loss of the Main TCC, causing enduring loss of full facilities in maintaining operational readiness and business continuity for delivery of the system plan, data preparation and technical support.</p>	Likely	Serious	High	<p>Use 3 site system as it exists today, with Inveralmond as the main, Burroughmuir as the backup contingency control center and a geographically diverse third site for disaster recovery. This would mean a deep retrofit of the Burroughmuir site to make it applicable for business continuity needs and a retrofit of the Inveralmond site, both of which are space constrained</p>	Likely	Serious	High	<p>No change</p>

7	Control Centre Resilience/Integrity (Welfare)	<p>Welfare is a concern as should the teams be required to remain on site for any length of time such as in a blackstart space for accommodating rest areas. Food, water and sanitation services would be unavailable in the hours after an extended loss of grid.</p> <p>In particular the option for segregation of teams under bio security is impossible at the present site, with 3 other business operating from the same floor.</p>	Almost Certain	Catastrophic	Severe	<p>Use 3 site system as it exists today, with Inveralmond as the main, Buroughmuir as the backup contingency control center and a geographically diverse third site for disaster recovery. This would mean a deep retrofit of the Buroughmuir site to make it applicable for business continuity needs and a retrofit of the Inveralmond site, both of which are space constrained.</p> <p>Space limitations means it is unlikely to be able to accomodate facilities upgrade</p>		Likely	Severe	Severe	
8	Future Needs	<p>Inability or high cost to adapt current TCC to future business needs, when the network operation is changing so rapidly, in turn losing the ability to operate safely, securely and efficiently.</p> <p>Failure to meet statutory obligations, resulting fines or loss of Transmission license.</p> <p>New obligations and services that align with the TCC operations will not be met due to lack of flexibility at the current TCC. This includes new data modelling, management processes and secure transfer to other stakeholder</p> <p>New equipment such as active network management devices, will need to be controlled, monitored, trained for.</p> <p>The actual gird is likely to be "weaker" meaning degree of difficulty managing the system increases and HILP events increased</p>	Likely	Severe	Severe			Likely	Major	Severe	Existing space has familiarity to opperators to operate the future system depending on future needs
9	Failure of Telephony	In the current control center there is a risk of the telephony system failing, due to increased demands on the system	Possible	Major	High	Existing TCC telephony needs will be upgraded as part of existing infrstructure upgrade plans		Unlikely	Serious	Medium	Full controllability of the grid is assured at all times, communications is maintained to field staff to coordinate safety activities and switching
10	Deficiencies in Training	<p>The lack of a training simulator in the current facility and the limits to on the job training during a pandemic has exposed risks to operational capability among staff. This is especially acute since the risk of an outbreak of disease among existing staff is increased.</p> <p>The future system will be very much more complex, requiring extensive and continuous training, certification and assessment</p> <p>The likelihood of a blackout or a major system disturbance in future is increasing, these major events can only be trained for in a simulator.</p> <p>The interdependence of the future system needs coordinated blackstart training exercises with DNOs, NGESO, wind farm operators, not training in this way risks poor outcomes to major events etc</p>	Likely	Severe	Severe	With a retrofit of facilities in inveralmond some space may be opened up for classroom based training which will be an improvement over existing facilities, a blackstart simulator room may not be acoomodated in the existing facilities which is a gap for future operator training processes		Likely	Severe	Severe	Improved classroom based training and on the job training, allows stream ined approach to training without a simulator

11	Cyber Security	<p>There is a risk to the security of supply on the system with a cyber intrusion from a bad actor potentially gaining access to the EMS/SCADA system. This risk entails nefarious switching activity to disconnect load and switch on the system when field workers are working near live equipment.</p> <p>There is also a risk of theft or manipulation of sensitive documents or system critical data.</p> <p>The risk are real and some system operators have reported breaches in Europe in 2020.</p>	Possible	Severe	Severe	<p>Highest standards of cyber security protection implemented based on CISC guidelines and CPNI hardening requirements.</p> <p>Separation and redundancy of new cyber communication equipment in existing facilities although equipment and system may not be new</p>		Possible	Severe	Severe	<p>Ensured reliability of supply to customers with reduced risk of nefarious actors performing switching or interfering in system operation.</p> <p>Improved safety to field staff when working on live plant</p> <p>Secure system data, data exchange and documents</p>
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Impact

It is necessary to determine an Impact Score to compliment the Likelihood Score for each risk. To determine the most appropriate score for each risk, consider the potential impact of the risk in the context of each of the categories below.

Impact	People	Environment	Asset	Reputation (inc. Regulatory/Compliance)
Catastrophic	> 10 (People Affected) - Fatalities - Life threatening health effect.  Inability to operate within business or market sector due to resource or skill gaps	- Impact of International Environmental Significance	1. Significant impact on dividend policy and impact on SSE valuation and strategy. 2. Destruction of Entire Asset. 3. 1 year P&L impact threatens credibility.  Quantifiable Costs: - Band A > £350M - Band B > £50M - Band C > £10M	1. International Media Coverage. 2. International Political Reaction. 3. Multiple non compliance with any regulatory requirement affecting major operation/ service commitment.
Severe	4-9 (People Affected) - Fatalities - Serious Disability - Life threatening health effect  Extended disruption to operations resulting from resource or skill gaps	- Impact of International Environmental Significance	1. Requirement for stock exchange announcement / profits warning. 2. Disruption to Asset (< 3 years).  Quantifiable Costs: - Band A £50M - £350M - Band B £25M - £50M - Band C £5M - £10M	1. Significant Adverse National Media Coverage. 2. Significant disruption to scheduled services over an extended period of time. 3. Investor Reaction. 4. National Political Reaction. 5. 2-5 Non compliance areas with any regulatory requirement affecting major operation / service commitment.
Major	1-3 (People Affected) - Fatalities - Serious Disability - Life threatening health effect  Regular short periods of disruption to operations / customer service failures resulting from resource or skills gaps	- Major Environmental Impact - Major Permit Breach	1. Potential requirement for stock exchange disclosure. 2. Damage to Key Operational Component 3. Disruption to Operation (<1 year)  Quantifiable Costs: - Band A £25M - £50M - Band B £10M - £25M - Band C £1M - £5M	1. Regional Media Coverage. 2. Regional Political Reaction. 3. Organised Protest. 4. Fine and disruption to scheduled services. 5. 1-2 Non compliance areas with any regulatory requirement affecting operation / service commitment.
Serious	- Serious Injury (reportable) - Lost Time Injury (>3 days) - irreversible health effect  Occasional disruption to operations resulting from resource or skills gaps. Lack of succession plan & / or over reliance on key staff for critical functions	- Serious Environmental Impact - Serious Permit Breach - Prohibited activity	1. Damage to Major Item. 2. Disruption to Operation (< 1 month). 3. Severe damage to key stock item/ supply chain interruption.  Quantifiable Costs: - Band A £10M - £25M - Band B £1M - £10M - Band C £100K - £1M	1. Prolonged local Media Coverage. 2. Local Political Reaction. 3. Local Protest. 4. Fine but no disruption to scheduled services. 5. No fine or disruption to scheduled services, but costs and disruption associated with a regulatory investigation.
Minor	- Minor Injury (Medical Treatment, <3 days lost time) - Reversible Health Effect - Restriction to Work Activity  Occasional errors or customer service failures due to resource or skill gaps. Lack of succession plan & / or over reliance on key staff for necessary but non-critical functions	- Minor Environmental Impact - Minor Permit Breach	1. Damage to large stock item. 2. Disruption to Operation (< 1 week).  Quantifiable Costs: - Band A £1M - £10M - Band B £100K - £1M - Band C £50K - £100K	1. Local Media Coverage. 2. Regulatory breach but no fine - no disruption to scheduled services - no significant investigation.
Incidental	- Slight Injury (first aid) - Slight Health Effect  Minor instances of error or customer service failure resulting from resource / skill gaps	- Incidental Environmental Impact	1. Damage to small stock item. 2. No Disruption to Operation  Quantifiable Costs: - Band A <£1M - Band B <£100K - Band C <£50K	1. Complaints from Neighbours. 2. Minor/ inadvertent breach by individual staff member.

Likelihood

To obtain a Likelihood score for each risk. Consider the likelihood of the risk occurring by referring to the table below and selecting the score (A-F). For these purposes the likelihood of the risk occurring is to be considered in the context of the forthcoming 12-18 month period.

Definition	Explanation	Probability
Almost Certain	Event is expected to occur in most circumstances. Frequently occurs within Business Unit.	>90%
Likely	Event is likely to occur in most circumstances. Frequently occurs within SSE.	71-90%
Possible	Event is likely to occur at some time. Event has occurred within SSE.	51-70%
Unlikely	Heard of, or has occurred at some time within SSE.	31-50%
Hardly Ever	Heard of within Industry / work type / discipline	11-30%
Almost Never	Never heard of within Industry / work type / discipline	0-10%