# SPD Summary of Changes for Commissioning Risk

|  |  |  |  |
| --- | --- | --- | --- |
| Version | Author | Date | Comments |
| 1.0 | David Bullen | 13-Dec-2024 | Initial |
| 1.1 | David Bullen | 17-Dec-2024 | Updated to remove the references to changing IGPotentialMW |
| 1.2 | David Bullen | 29-Jan-2025 | Reviewed and revised and added reference to examples |

# Summary

## SPD Version

New Version: 46.X.X

Current production: 45.1.4

## Planned Go Live Date

20-March-2025

## Overview

Risk Group Improved Input Model

* Risk group inputs moved from UnitRisk to new input sections

Add Link Risk

* New input sections for link risk
* New output section for link risk
* New variables and constraints to model link risk (formulation change)

Commissioning Risk

* New fields in existing UnitData input section
* New fields in existing output sections Island and Pnode
* Risk adjustment: Change to existing risk constraints (formulation change)
* Zeroing reserve offers on commissioning risk: Change to pre-processing (formulation change)

Manual Risk Reporting

* New fields in RiskParamSchedule existing input section
* Changes to data in existing fields in output section Island

Risk Setter Reporting

* New fields in existing output section RiskSetter

# Risk Group Improved Input Model

## Overview

Currently a unit is assigned to a risk group by the CE and ECE risk ID columns in DAILY.UNITDATA:

INTERVAL

PNODENAME

UNITID

SETRISK

ISPRIMARYNODE

ISIG

FKBANDMW

ACRISKIDCE

ACRISKIDECE

ISPRICERESPONSIVEIG

This existing input prevents a unit from being in more than one risk group. Because there are windfarms that need to be modelled in more than one risk group, the risk group input is being changed.

The existing input columns (ACRISKIDCE and ACRISKIDECE) will remain in DAILY.UNIT for now but will not be populated. This will allow for regression testing, i.e., new cases will be able to be run in old SPD.

## New SPD Inputs

Improved modelling of risk group inputs.

New input section: PERIOD.RISKGROUP

|  |  |
| --- | --- |
| Field | Description |
| INTERVAL |  |
| RISKGROUPID | AC Risk ID |
| RISKGROUPNAME | AC Risk Name |
| RISKTYPE | 'CE' , 'ECE' or 'CE+ECE' |

New input section: PERIOD.RISKGROUPPNODE

|  |  |
| --- | --- |
| Field | Description |
| INTERVAL |  |
| RISKGROUPID | AC Risk ID |
| PNODENAME | Pnodename of generator in risk group or link risk |

## Example case

10:00 New input format for risk setting risk group [TUR0;NZW0;TWF0]

# Add Link Risk

## Overview

Generation export from an area can be put at risk by the possibility of losing a branch, e.g., see Figure 1.

A diagram of a computer

Description automatically generated

Figure 1: With TAB\_WRK out of service Hawkes Bay generation export relies on WHI\_WRK

Currently the only option to account for generation that is at risk due to a branch risk is to add the at-risk generation to a risk group. However, this can over-estimate the link risk if the load in the area results in the link flow being less than the sum of the generation, e.g., see Figure 2.

A diagram of a line

Description automatically generated with medium confidence

Figure 2: Example of link risk less than sum of generation

The change is to add link risk modelling:

* If a risk group input to SPD has an associated branch or branches then SPD will treat the risk group as a link risk and model the branch flow as the risk, not the pnode generation.
* SPD will ensure that the pnodes associated with the link risk cannot provide reserve to cover the link risk.
* Any IL in the area is also ineligible to cover the risk, hence the link risk modelling includes associated IL pnodes.
* The branch flow risk is dependent on direction. The link risk input specifies a towards bus, if this matches the to-bus of the branch then a DirectionalRiskFactor of +1 is applied to the branch flow risk otherwise a DirectionalRiskFactor of -1 is applied.

## New SPD Inputs

Link risk will use the same input fields as a risk group, together with the following inputs.

New input section: PERIOD.RISKGROUPBRANCH

An entry in this input section will identify an AC Risk as a link risk.

|  |  |
| --- | --- |
| Field | Description |
| INTERVAL |  |
| RISKGROUPID | AC Risk ID |
| KEY1 | Market branch identifier key1 |
| KEY2 | Market branch identifier key2 |
| KEY3 | Market branch identifier key3 |
| TOWARDSBUS | Identifies the direction of flow that will be covered as a risk. |

New input section: PERIOD.RISKGROUPIL

|  |  |
| --- | --- |
| Field | Description |
| INTERVAL |  |
| RISKGROUPID | AC Risk ID |
| PNODENAME | Pnodename of IL pnode in link risk area |

## New SPD Outputs

The risk calculated for the link risk is written out so that RMT can use it as the risk for the group.

New output section: ACRISKBRANCHFLOW

|  |  |
| --- | --- |
| Field | Description |
| INTERVAL |  |
| ACRISKID | AC Risk ID |
| BRANCHFLOWMW | The branch flow MW amount that was covered as a risk by SPD for an AC risk that models a branch risk. Not necessarily the risk setter. Used by RMT as the risk MW for the pnodes in the link risk group. |

## Formulation changes

Pre-processing to determine DirectionalRiskFactor.

Link risk calculation equation.

## Example case

10:30 Link Risk example data: Hawkes Bay link risk, as per Figure 1

Link risk modelling:

I,MSSDATA,RISKGROUP,1.0,INTERVAL,RISKGROUPID,RISKGROUPNAME,RISKGROUPRISKTYPE

D,MSSDATA,RISKGROUP,1.0,27-JAN-2025 10:00,12345,BPE-WIND-FARMS,CE+ECE

D,MSSDATA,RISKGROUP,1.0,27-JAN-2025 10:00,6789,TWC-ONLY,CE

D,MSSDATA,RISKGROUP,1.0,27-JAN-2025 10:30,5547757131,HWKSBAY-EXPORT,CE+ECE

I,MSSDATA,RISKGROUPPNODE,1.0,INTERVAL,RISKGROUPID,PNODENAME

D,MSSDATA,RISKGROUPPNODE,1.0,27-JAN-2025 10:00,12345,LTN2201 TUR0

D,MSSDATA,RISKGROUPPNODE,1.0,27-JAN-2025 10:00,12345,TWC2201 NZW0

D,MSSDATA,RISKGROUPPNODE,1.0,27-JAN-2025 10:00,12345,TWC2201 TWF0

D,MSSDATA,RISKGROUPPNODE,1.0,27-JAN-2025 10:00,6789,TWC2201 TWF0

D,MSSDATA,RISKGROUPPNODE,1.0,27-JAN-2025 10:30,5547757131,HRP2201 HRP0

D,MSSDATA,RISKGROUPPNODE,1.0,27-JAN-2025 10:30,5547757131,TAB2201 TAB0

D,MSSDATA,RISKGROUPPNODE,1.0,27-JAN-2025 10:30,5547757131,TUI1101 KTW0

D,MSSDATA,RISKGROUPPNODE,1.0,27-JAN-2025 10:30,5547757131,TUI1101 PRI0

D,MSSDATA,RISKGROUPPNODE,1.0,27-JAN-2025 10:30,5547757131,TUI1101 TUI0

D,MSSDATA,RISKGROUPPNODE,1.0,27-JAN-2025 10:30,5547757131,WHI2201 WHI1

D,MSSDATA,RISKGROUPPNODE,1.0,27-JAN-2025 10:30,5547757131,WHI2201 WHI2

D,MSSDATA,RISKGROUPPNODE,1.0,27-JAN-2025 10:30,5547757131,WHI2201 WHI3

I,MSSDATA,RISKGROUPBRANCH,1.0,INTERVAL,RISKGROUPID,KEY1,KEY2,KEY3,TOWARDSBUS

D,MSSDATA,RISKGROUPBRANCH,1.0, 27-JAN-2025 10:30,5547757131,WHI,WHI\_WRK1,1,WRK220

I,MSSDATA,RISKGROUPIL,1.0,INTERVAL,RISKGROUPID,PNODENAME

D,MSSDATA,RISKGROUPIL,1.0,27-JAN-2025 10:30,5547757131,PEN0331

Branch removed via time-based MSSNET file:

I,NETDATA,BRANCHBUS,1.0,ID\_BRANCH,ID\_FROMBUS,ID\_TOBUS,SUSCEPTANCE,RESISTANCE,REMOVE

D,NETDATA,BRANCHBUS,1.0,TAB TAB\_WRK1 1 ,253,296,-20768.082, 0.0556,1

Island result:

|  |  |
| --- | --- |
| RISKNODESIXTYSEC | RISK60SSTATN |
| GEN\_CE;LINK\_CE | HLY5CE;LINK[HRP0;TAB0;KTW0;PRI0;TUI0;WHI1;WHI2;WHI3]CE |
| MANUAL\_CE;OTHISL\_CE | Manual[SIACCEMinRiskMW]CE;OtherIslandCE |

AcRiskBranchFlow result:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ACRISKBRANCHFLOW | 1 | INTERVAL | ACRISKID | BRANCHFLOWMW |
| ACRISKBRANCHFLOW | 1 | 27/01/2025 10:30 | 5547757131 | 174.5006 |

# Commissioning Risk Inputs and Outputs

## Overview

The new commissioning risk inputs are used for various purposes:

1. to be written back to the database for use by post-schedule checks and displays
2. to adjust the risk on commissioning pnodes to account for the commissioning risk component of the NFR input provided by RMT.
3. to zero the reserve offers on commissioning risk pnodes

## New SPD Inputs

New commissioning risk inputs.

Additions to existing input section: DAILY.UNITDATA

|  |  |  |
| --- | --- | --- |
| Field | Description | Categorisation |
| PNODENAME |  | Existing |
| UNITID |  |
| ... | ... |
| ISPRICERESPONSIVEIG |  |
| ASSOCPNODENAME |  |
| COMMRISKMWCE | CE commissioning risk level calculated by RMT. For reporting and used by SPD to adjust the risk on commissioning pnodes to account for the commissioning risk component of the NFR | Used by SPD and written out |
| COMMRISKMWECE | ECE version of the above |
| ISPARTCOMM | A value of 1 for a commissioning pnode indicates that only part of the output was considered as commissioning risk by RMT. For reporting and used by the SPD logic that zeroes the reserve on a commissioning risk pnode (reserve is not zeroed if part commissioning is true). |
| ISCOMMISSIONING | A value of 1 indicates that the pnode was treated as a commissioning risk by RMT. For reporting and used by the SPD logic that zeroes the reserve on a commissioning risk pnode (reserve is zeroed if commissioning is true provided that part commissioning is false). |
| CEFULLYCOMMISSIONED | A record of the value used by RMT. For reporting only. | Not used by SPD. Written back to the database so that checks can recalculate CommRiskMW using the generation result. |
| CECOMMLEVEL | A record of the value used by RMT. For reporting only. |
| MAXCOMMMW | A record of the value used by RMT. For reporting only. |
| RMTCASEID | Identifies the RMT case that was the source of the RMT data | Not used by SPD. Not written out |

## New SPD outputs

New commissioning risk outputs.

Addition to existing output section: ISLAND

|  |  |
| --- | --- |
| Field | Description |
| INTERVAL | Existing |
| ISLANDNAME |
| ... |
| HVDCRESIDUAL |
| COMMRISKMWCE | Sum of inputs taken over all pnodes in the island |
| COMMRISKMWECE |

Addition to existing output section: PNODE

|  |  |
| --- | --- |
| Field | Description |
| INTERVAL | Existing |
| PNODENAME |
| ... |
| CAPACITYGENRESIDUAL |
| COMMRISKMWCE | RMT data that was read in as described in the SPD Inputs above |
| COMMRISKMWECE |
| ISPARTCOMM |
| ISCOMMISSIONING |
| CEFULLYCOMMISSIONED |
| CECOMMLEVEL |
| MAXCOMMMW |

# Risk Adjustment for Secondary Risk

## Overview

SPD schedules reserve to cover the primary risk less the Net Free Reserve (NFR).

RMT calculates the NFR as the primary risk less the reserve required to maintain frequency after an event.

Hence the NFR allows SPD to schedule the reserve necessary to maintain frequency after the tripping of the primary risk.

However, the RMT event includes the tripping of the primary risk *and* any secondary risks, hence cover for the secondary risk is implicit in the NFR (reduces the NFR). If the secondary risk is part of a primary risk, e.g., if the secondary risk is a commissioning windfarm in a risk group, or a primary risk unit that is commissioning, then the secondary risk component of the primary risk is already covered by the NFR and therefore needs to be removed from the reserve cover that SPD requires for that primary risk. This avoids any double-cover that would occur if the primary risk with the commissioning component happened to be the risk setter.

## SPD Option

|  |  |
| --- | --- |
| CommRiskDoRiskAdjustment | SPD Option. If set to 1 then the risk is adjusted to account for the secondary risk in the NFR. If set to 0 then no risk adjustment occurs. The SPD default is 1. |

## Reporting

If the risk setter was adjusted to remove its commissioning risk then this is indicated by including the commissioning amount in the reported risk name, e.g.,

Because the commissioning risk is part of the NFR it is effectively part of the risk and therefore is included in the list of reported risk names, e.g., TUR0CE;SRCE[HLY5]

## Formulation changes

Adjust the following risk calculation constraints when the primary risk is also a secondary risk:

* Unit Risk
* Risk Group
* Link Risk
* DC Secondary Risk (Unit)

## Example case

11:00 HLY5 is not the risk setter because even though 240MW would be the highest risk, HLY5 has 240MW of commissioning risk which is subtracted from its risk calculation.

Because HLY5 secondary risk is implicit in the NFR it is included in the risk setter string to indicate that it contributed to the risk:

|  |  |
| --- | --- |
| RISK6SSTATN | RISK60SSTATN |
| TUR0CE;SRCE[HLY5] | TUR0CE;SRCE[HLY5] |
| Manual[SIACCEMinRiskMW]CE;OtherIslandCE | Manual[SIACCEMinRiskMW]CE;OtherIslandCE |

11:30 The risk group is the risk setter, the risk MW excludes the commissioning risk of 10MW on NZW0, this amount is indicated in brackets after the risk setter string (and also included in the string to indicate its contribution to the risk via the NFR):

|  |
| --- |
| RISK6SSTATN |
| [TUR0;NZW0;TWF0]CE(SR10.00);SRCE[NZW0];SRECE[NZW0] |
| Manual[SIACCEMinRiskMW]CE;OtherIslandCE |

Note that because the risk setter string is only used by the coordination centres the exact format of this commissioning risk reporting may change as a result of UAT.

# Zeroing Reserve Offers on Commissioning Risk

## Overview

A commissioning generator is modelled as a secondary risk in RMT. A secondary risk should not be providing reserve because this generator will most likely trip if there is a frequency event. To cover the possibility of reserve inadvertently offered on a secondary risk the SPD pre-processing will zero reserve offers on any generator that has all of its capacity modelled as a secondary risk.

## SPD Option

|  |  |
| --- | --- |
| CommRiskDoCheckResOffers | SPD Option. If set to 1 then the reserves on will be zeroed on a commissioning risk. If set to 0 then no action will be taken. The SPD default is 1. |

## Pre-processing

Zero the reserve offers on a pnode where ISCOMMISSIONING = 1 and ISPARTCOMM = 0.

## Logging

If reserve offers are zeroed on a commissioning unit then the details are logged, and an alert is raised.

## Formulation changes

Pre-processing to zero reserve offers on secondary risks.

## Example case

10:00 HLY5 is commissioning risk with offered reserves. SPD pre-processing sets reserve offers to zero and logs the following CLU message:

D,SOLUTION,CLUMESSAGE,1.0,SPD,SPD,TP-5CG3351JHJ,261322025012100401,PreProc: ExtractTraderPeriodData,28-01-2025 08:49:58.85|Reserve offer 30.000 zeroed on commissioning pnode HLY2201 HLY5 for 27-JAN-2025 10:00 (CaseID=261322025012100401),NULL,Warning

# Manual Risk Reporting

## Overview

The manual risk specifies a risk quantity that must be covered by SPD. A manual risk is either a default minimum for the island or an AC Risk created by the operator.

Currently if the manual risk is the risk setter then SPD reports the risk name as MANUAL.

Externally the manual risk has an identifier, the change is to read this identifier into SPD and include it in the risk reporting if the manual risk is the risk setter.

## New SPD Inputs

New inputs to identify the manual risk.

Update and additions to existing input section: PERIOD.RISKPARAMSCHEDULE

|  |  |
| --- | --- |
| Field | Description |
| PNODENAME | Existing |
| UNITID |
| MANUALMINACCE | Renamed for consistency with other inputs.  Was MANUALLYENTEREDMIN. |
| MANUALMINACECE | Existing |
| ... | ... |
| ManualMinACCEName | The name of the Pnode, or AC Risk, or Parameter that is setting CE manual risk, e.g., BEN2201 BEN0, or TWF\_TUR, or SIACECEMinRiskMW, or NI |
| ManualMinACECEName | Ditto for ECE |
| ManualMinACCEPnodeID | If the manual min CE is a single pnode then this will be its PnodeID |
| ManualMinACECEPnodeID | Ditto for ECE |
| ManualMinACCERiskGroupID | If the manual min CE is a risk group then this will be its ACRiskID. |
| ManualMinACECERiskGroupID | Ditto for ECE |

## Reporting

If the manual risk is the risk setter then the risk will be reported as MANUAL[Manual Risk Name].

## Formulation changes

No change, reporting only.

## Example case

See any of the example cases, where SI manual risk is reported as: Manual[SIACCEMinRiskMW]

# Risk Setter Reporting

## Overview

An IG (intermittent generator e.g., wind) is free to not follow dispatch (e.g., follow the wind) unless they are sent a constraint flag. Currently the constraint flag is sent if the SPD result is less than the potential output of the IG.

The IG also needs to be sent a constraint flag if they are a risk setter, or if they are in risk group that is a risk setter. To identify this situation the PnodeID and AC Risk ID are being added to the risk setter outputs, along with some other fields that are useful for explaining risk setter results.

## New SPD Outputs

Additions to output section SPDSOLVED.RISKSETTER

|  |  |
| --- | --- |
| Field | Comments |
| CASEID |  |
| MKTTIME |  |
| ISLANDNAME |  |
| RESERVECLASS |  |
| RISKCLASS |  |
| RISKSETTERID |  |
| RISKTYPE |  |
| COVEREDENERGY |  |
| COVEREDRESERVE |  |
| COVEREDMODULATION |  |
| SUBTRACTOR |  |
| RESERVE |  |
| SHORTFALL |  |
| DEFICIT |  |
| RESERVEPRICE |  |
| PNODEID | PnodeID of unit risk setter |
| ACRISKID | ACRiskID of risk group risk setter |
| COMMRISKMW | Commissioning Risk on the risk setter |
| RMTNFR | Component of the subtractor that is AC NFR or DC NFR as supplied by RMT |
| ACINERTIA | Component of the subtractor that adjusts the AC NFR based on inertia |
| DCSUBTRACTOR | Component of the subtractor that is DC ramp up or secondary risk subtractor |
| ISLANDRESERVE | Component of the reserve that is cleared within the island |
| SHAREDRESERVE | Component of the reserve that is received as reserve shared from the other island |

## Formulation changes

No change, reporting only.

## Example case

Risk setter reporting is in every results file.