

N-1-1



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Introduction



- Purpose:
 - Present existing features that may be helpful
 - Present some possible ideas for an N-1-1 tool
 - Present questions related to the working of N-1-1 tools
 - Get feed back to understand desired working of real tool

Outline



- Combinatorial explosion
- LODF screening tool (existing)
- Join Active Contingencies
- Combination of two lists in contingency analysis tool

Combinatorial Explosion



- For L lines with k outages the number of combinations is given by

$$\binom{L}{k} = \frac{L!}{k! (L - k)!}$$

- This gets big fast. It very quickly gets infeasible to solve every double outage contingency

Lines	Contingencies
100	4,950
1000	499,500
5000	12,497,500
10000	49,995,000

LODF Screening Tool



- LODF Screening tool added to attempt to screen out the combinations that don't matter
 - Two outages that are far away from each other in the system start to look like independent events
 - Outages that impact each other (measured by LODFs) are more likely to have something interesting happen when they both go out
 - Single outage contingencies that nearly cause overloads are also (usually) likely to cause overloads when more than one line is outaged

Join Active Contingencies



- The existing join active contingencies feature allows users to create an n-1-1 contingency list from a primary list and a secondary list
- First build or load primary list
- Then choose aux file with secondary contingencies
- The tool will create a new contingency for every combination of the primary and secondary contingences (primary contingency definitions are not changed)

Join Active Contingencies



The screenshot shows the 'Contingency Analysis' software interface. The main window displays a table with columns: Label, Skip, Category, Processed, Solved, Post-CTG AUX, Islanded Load, Islanded Gen, Global Actions, Transient Actions, Remedial Actions, and QV Aut. The table contains 10 rows of contingency data. A context menu is open over the table, listing various actions. The 'Join Active Contingencies...' option is highlighted with a red rectangle.

	Label	Skip	Category	Processed	Solved	Post-CTG AUX	Islanded Load	Islanded Gen	Global Actions	Transient Actions	Remedial Actions	QV Aut
1	L_000001One-000002TwoC	NO		NO	NO	none						NO
2	L_000001One-000003Three	NO		NO	NO	none						NO
3	L_000002Two-000003Three	NO		NO	NO	none						NO
4	L_000002Two-000004Four					none						NO
5	L_000002Two-000005Five					none						NO
6	L_000002Two-000006Six					none						NO
7	L_000003Three-000004Four					none						NO
8	L_000004Four-000005Five					none						NO
9	L_000007Seven-000005Five					none						NO
10	L_000006Six-000007Seven					none						NO

Context Menu Options:

- Show Dialog...
- Display/Column Options...
- Find... Ctrl+F
- Find a Contingency containing a
- Search for Text...
- Insert...
- Insert Special
 - Quick Insert of Single Element Contingency...
 - Auto Insert Contingencies...
 - Merge Contingency Block Elements
 - Convert Global Actions into Remedial Action
 - Merge Pairs of Selected Contingencies
 - Clone Contingencies...
 - Join Active Contingencies...
- Delete
- Contingency records
- Set/Toggle/Columns
- Copy/Paste/Send
- Save As
- Load

Combination of Contingency Lists



- Basic idea is to
 - Allow for two lists of contingencies (list 1, list 2) in the contingency analysis tool
 - Generate combinations of contingencies from these lists
 - Still a lot of contingencies, but having separate lists allows for finer control

Questions: N-1-1 Details?



- Need separate solution options for primary and normal?
- When to include RAS
 - Add new field “available to each RAS (primary only, secondary, both)
- How to deal with make up power
- Do limit monitoring settings need to be modified?