Constraints Development Process

SO Industry Workshops
April 2007

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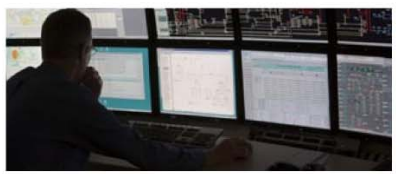
TRANSPOWER



SYSTEM OPERATOR

Constraints Development Process: Agenda

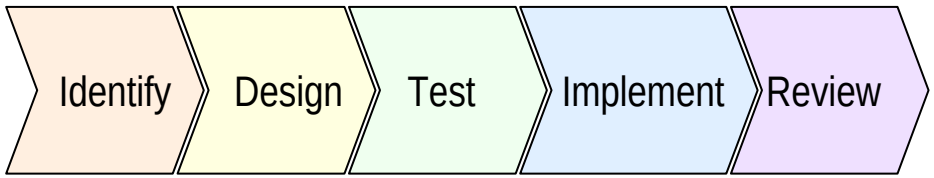
- provide insight to the constraints development process
- constraint lifecycle
- linkages to key operational processes
- constraint quality assurance

Lifecycle

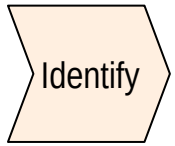
- constraint purpose

  The purpose of a constraint is to define the operational parameters of system capability within SPD.

- constraint lifecycle -5 phases
  - identify
  - design
  - test
  - implement
  - review

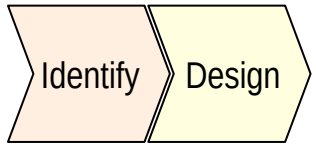


Identify



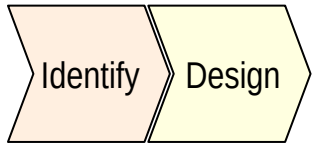
- planning time frame -3 inputs trigger need for constraint:
  - outage planning –typically 4-6 weeks from outage start
  - commissioning (Gen & Tx) – typically 4-6 weeks from commissioning
  - ratings change –2 weeks from advised date of change to capability
  - timing influenced by numerous variables:
    - outage timing
    - provision of asset capability information
- real time system management:
  - immediate temporary constraints can be applied
  - unusual or unforeseen circumstance :
    - forced outages
    - forced system re-configuration
  - rarely used.

Design

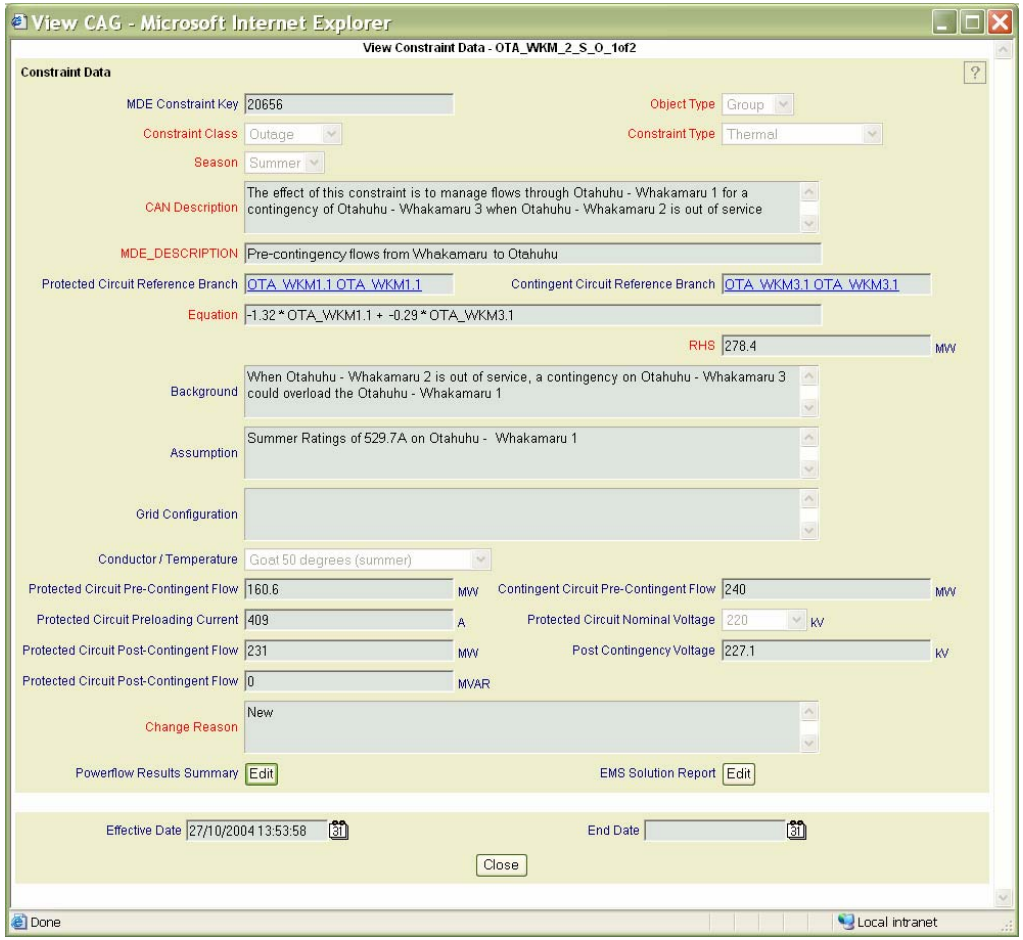


- single outage constraint - typically 6-8 hrs effort
  - developing credible range of scenarios
  - powerflow studies to identify critical branches
  - confirming branch ratings and flow direction conventions
  - determining factors for load distribution and pre/post contingent loading
  - entering data into ACI constraints builder, peer review and market notification
- designed for credible range of load and generation scenarios
  - generation north/south
  - hydro wet / dry
  - load peak /trough
- use of ACI constraint builder displays to eliminate data entry error risk
  - drop down menus
  - conductor thermal operating characteristics

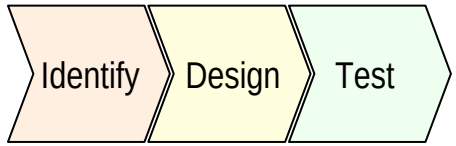
Design



Screen shot of ACI constraints builder



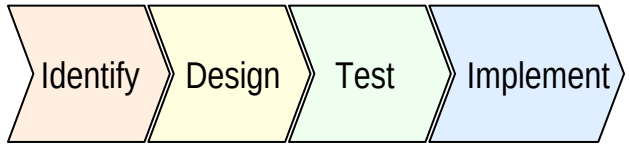
Test



constraint testing and validation

- Powerflow testing / peer review
  - utilised for all constraints
    - thermal / component limit constraints
    - permanent / outage constraints
  - load flow conditions re-created
  - checks for:
    - branches, flow directions, distribution factors, system conditions
- type testing
  - utilised in addition to powerflow testing and peer review for new class or type of constraint
    - e.g. mixed integer HVDC constraints, voltage stability constraints
  - offline SPD testing in ESCHED
  - tested for range of dispatch scenarios

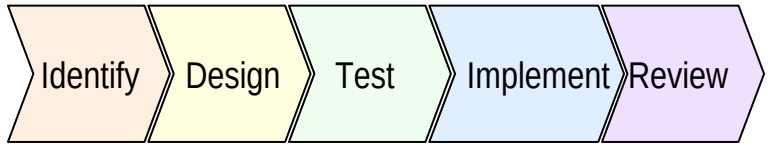
Implement



- loading into SO real time tool set
  - constraints data transfer from ACI to MDE (PSCHED)
  - available in MDE (PSCHED) to be scheduled as required

- market notification
  - implementation of "new constraint situation" is identified
    - new permanent constraint due to re-rating or commissioning of new equipment
    - 2 week consultation period
    - generation /load scenarios provided with description of constraint effect via Customer Advice Notice (NMDATA)
  - scheduling of existing constraints in PSCHED
    - constraints library posted on SO website
    - notified 1 week in advance
    - automatic constraint notification via M-CO Energy Traders account.

Review



review of constraint performance

- daily review and look-ahead
  - unusual or unexpected constraint/dispatch outcomes identified and corrected for pricing
  - market analysts and operations engineers for off line analysis
- monthly reporting on constraint activity
  - SO performance report to EC
  - constraints that bound, number of trading periods and accuracy
  - Inaccuracies / unexpected results tagged for review

Review

Identify | Design | Test | Implement | Review

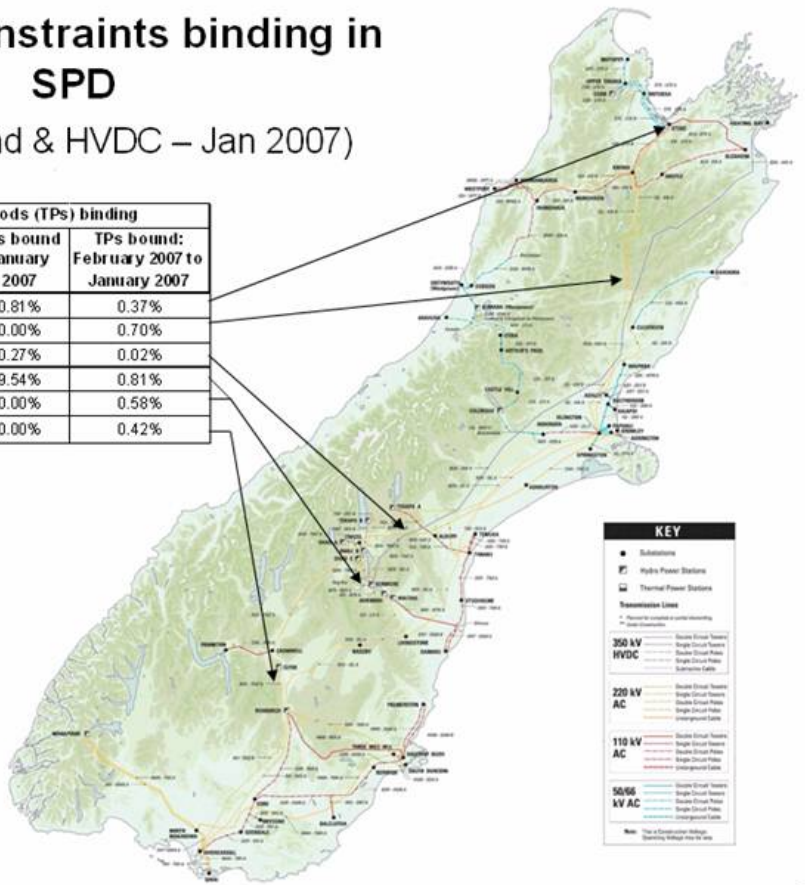
Constraint Accuracy Report –January 2007

Security constraints binding in SPD

(South Island & HVDC – Jan 2007)

Security constraints: % trading periods (TPs) binding		
South Island	TPs bound January 2007	TPs bound: February 2007 to January 2007
oke T3	0.81%	0.37%
ington-Kikiwa (stability)	0.00%	0.70%
enmore-Haywards	0.27%	0.02%
ierrore-Benmore (outage)	9.54%	0.81%
ierrore-Waitaki (outage)	0.00%	0.58%
de-Twizel (outage)	0.00%	0.42%

The above constraints have been binding for a minimum of 4 trading periods in the current month and/or 48 trading periods in the last 12 months



Review

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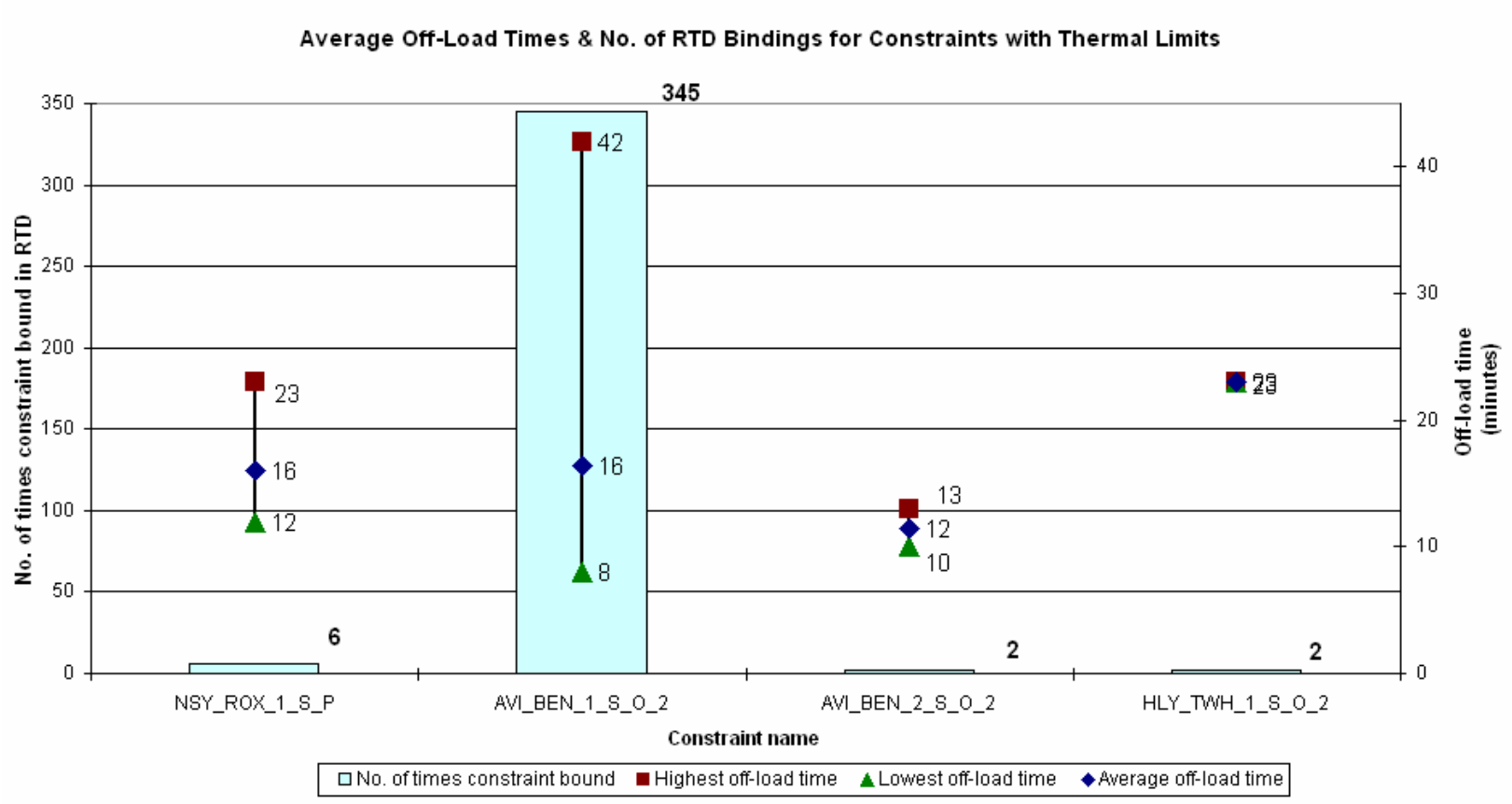

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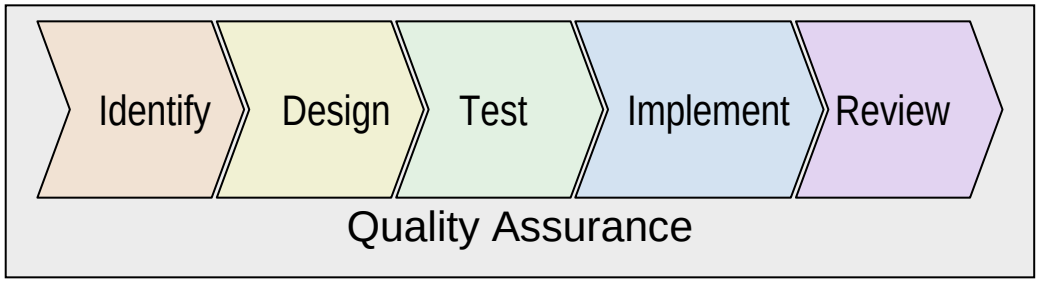
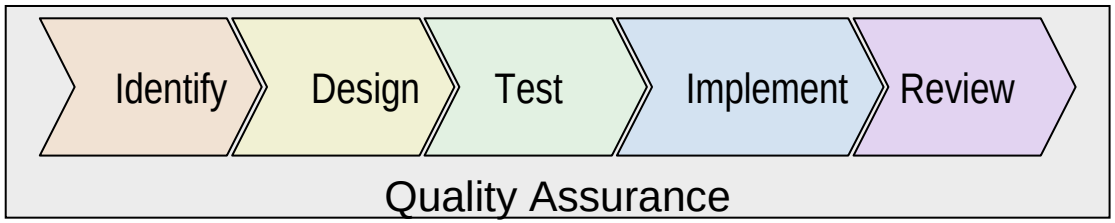
Quality assurance



- quality assurance measures
  - process documentation
  - process training and competency assessment
  - peer review and type testing
  - data integrity checks between ACI / PSCHED
  - SO internal audit teams
  - event review process

Constraints Development Process: further information



- further information on constraints at:
  - library of current constraints
    - http://www.transpower.co.nz/?id=5979
  - constraint process documentation
    - http://www.transpower.co.nz/?id=5979
  - monthly reporting constraint accuracy –System Performance Report
    - http://www.transpower.co.nz/?id=5978