

Lower North Island Upgrade Project

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April 2011

TRANSPOWER

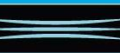
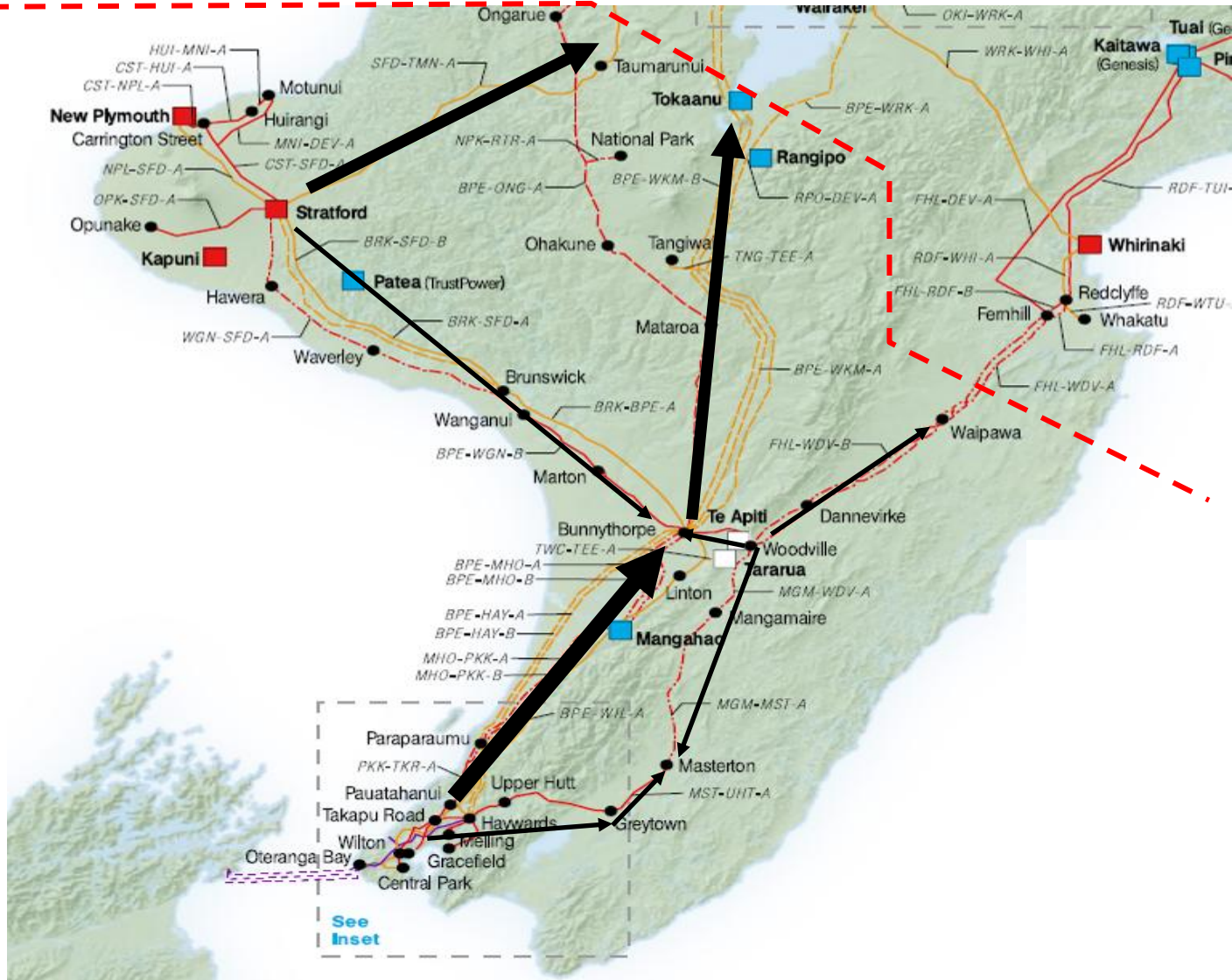


Introduction

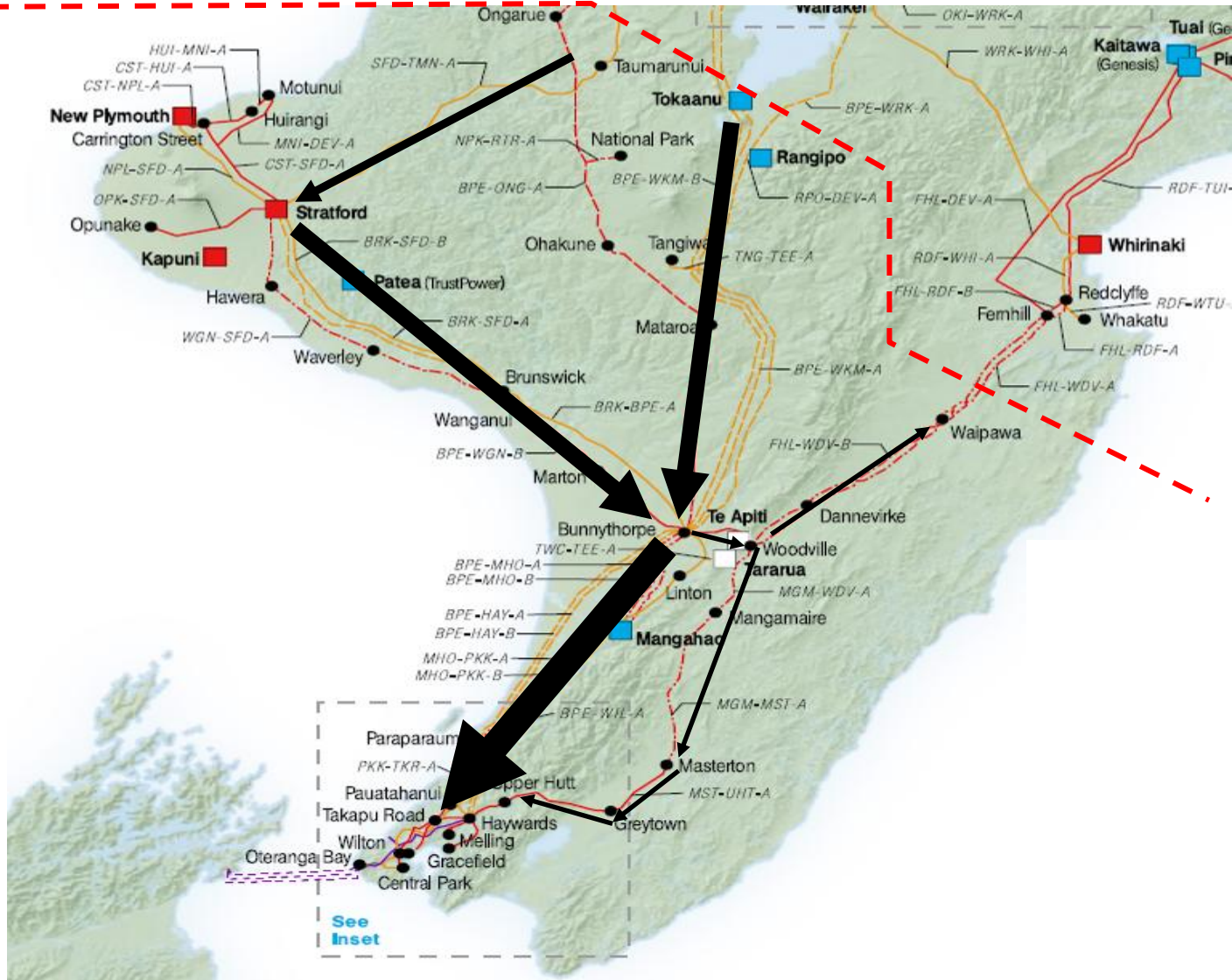
- No doubt NZ has wind generation potential.
- CW (now AURECON) identified significant economic wind resource in LNI region.
- Over 1GW presently being investigated there.
- At this stage, likely to connect:
 - near BPE220,
 - Wairarapa, and
 - Southern Hawkes Bay



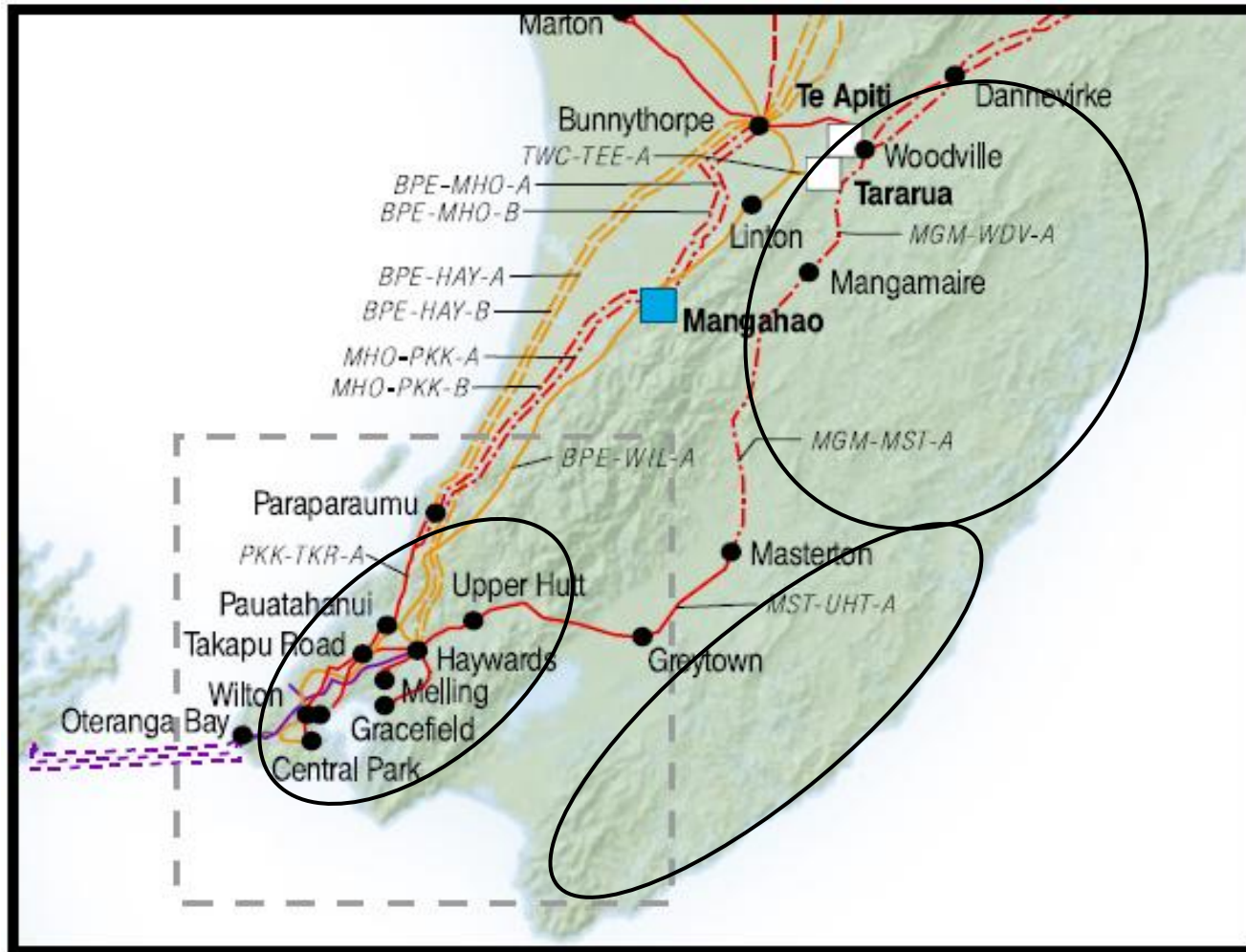
Power flow – high DC north



Power flow – high DC south



Potential LNI wind resource

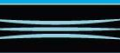


Potential North Island wind generation (CW 2008)

Tranche 1	Total Area (km ²)	Wind farm area (km ²)	Capacity (MW)	Annual Energy (GWh)
Northland	12,444	39	390	1,370
Auckland	5,743	3	30	110
Waikato	22,234	14	140	490
Great Barrier	290	42	420	1,470
Bay of Plenty	10,392	16	160	560
Taranaki	11,065	20	200	700
Taupo/Wanganui	13,518	56	560	1,960
Hawkes Bay	19,661	168	1,680	5,890
Manawatu	11,261	323	3,230	11,320
Wellington	8,131	210	2,100	7,360
North Island	114,729	890	8,910	31,230

CW report

- Carried out as part of EC SOO scenario analysis in 2008.
- Connell Wagner (now AURECON) analysis in 2008 identified:
 - approx. 5GW;
 - >8.0m/s wind speed;
 - 40% capacity factor; and
 - Possible LRMC \$75-\$90/MWh.
- Mesoscale modelling using NIWA historical data.



Existing LNI wind generation

- Te Apiti (90MW) – WDV 110kV
- Tararua (161MW) – BPE and BPE-WIL220kV
- Te Rere Hau (38.5MW) – BPE-LTN 220kV
- West Wind (142.6MW) – CPK-WIL 110kV
- Hau Nui (8.7MW) – GYT 110kV

Total LNI wind generation – 450.8MW

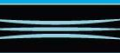
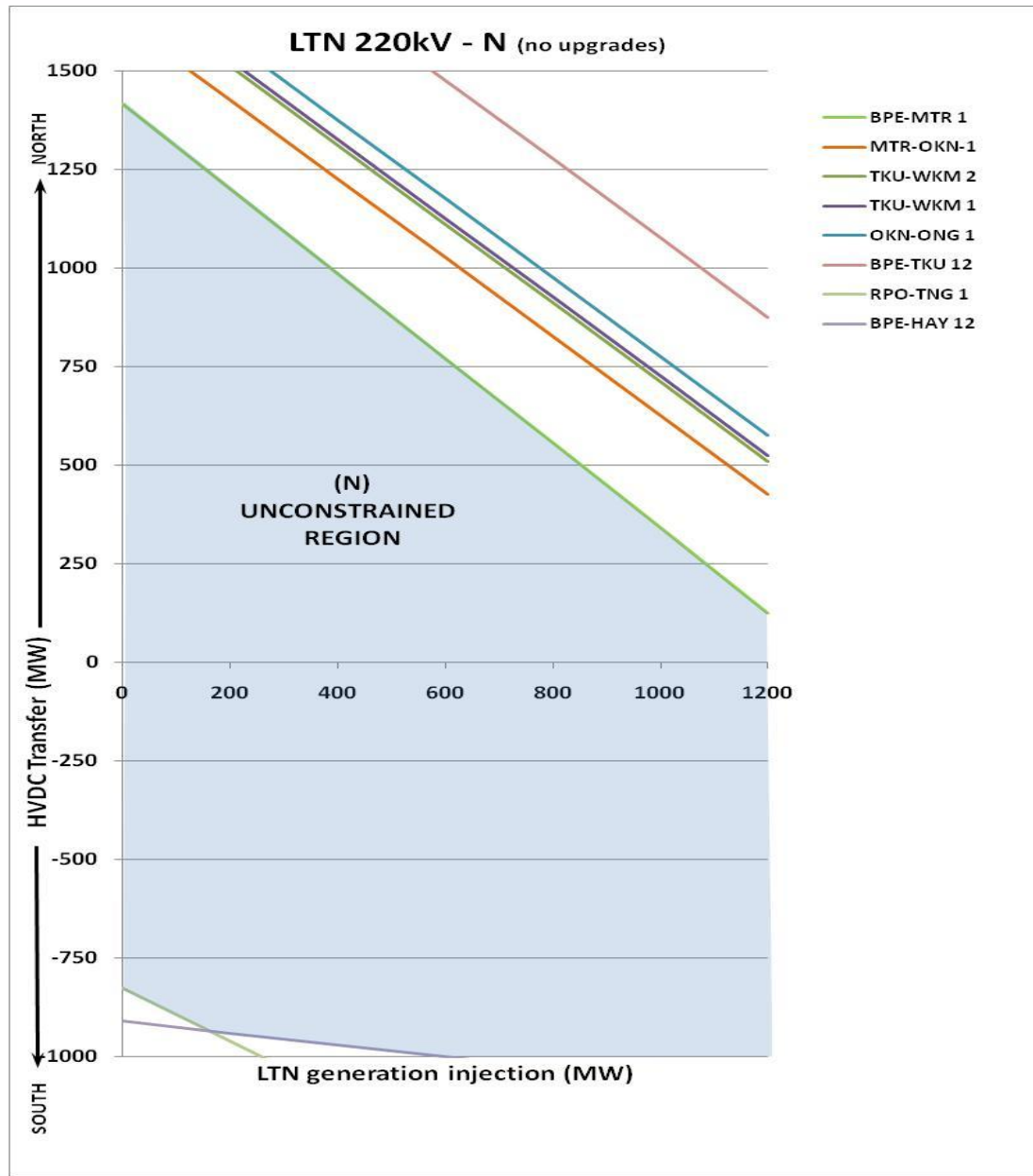


Proposed LNI wind generation

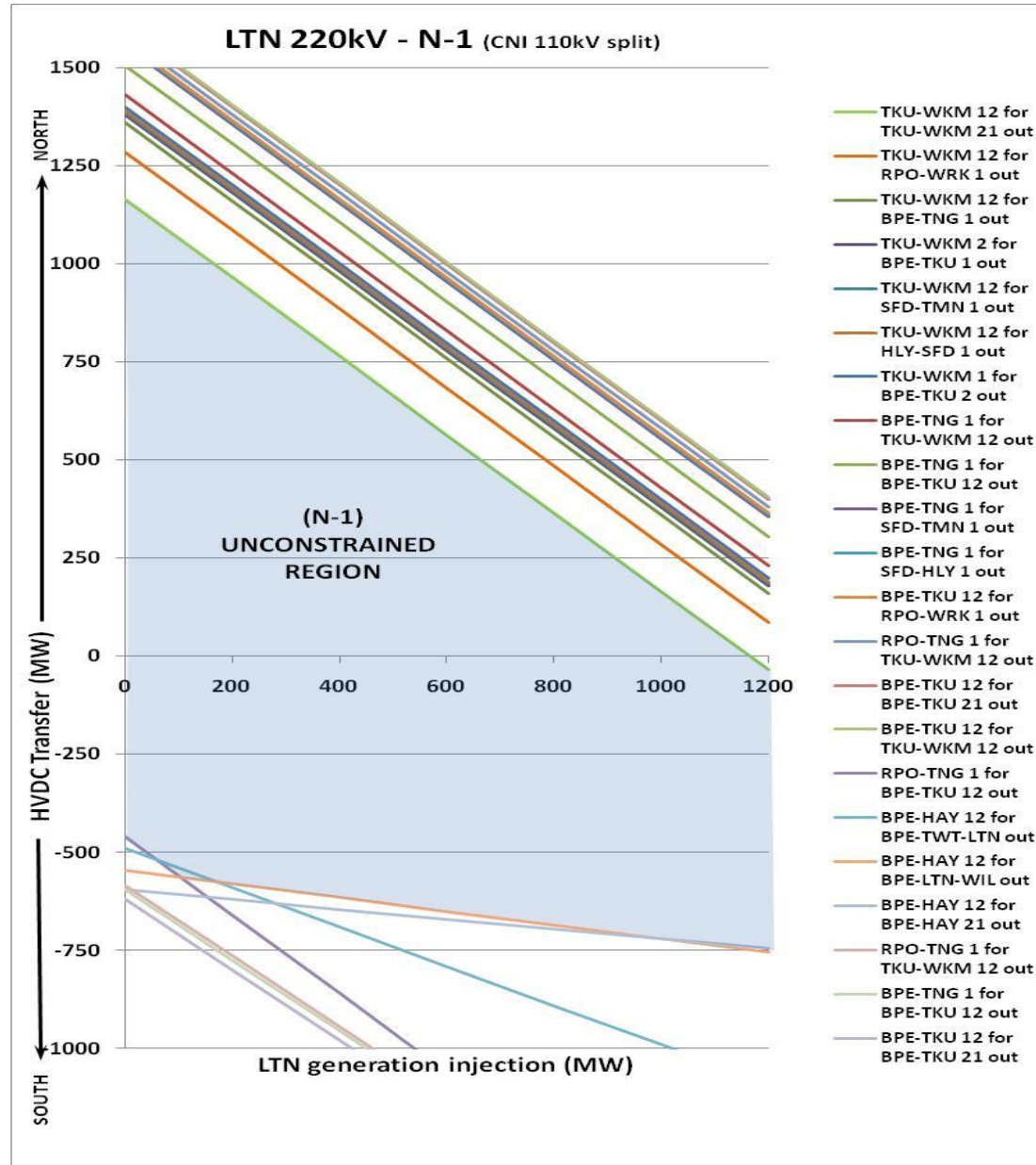
Wind farm	Capacity (MW)	Possible connection?	Where in the process?
Waitahora	156	WDV 110kV	Consented Nov 2010
Central Wind	130	BPE-TNG 220kV	Consented Jan 2010
Turitea	183	LTN 220kV	Draft EC decision Feb 2011
Castle Hill	600	LTN 220kV	Under investigation
Long Gully	12.5	11kV connection to WE network at Karori	Consented Oct 2009
Mill Creek	71	HAY-WIL 220kV	Consent under appeal
Puketiro	120?	PKK-TKR 110kV	Under investigation
Te Rere Hau Stage 4	10	LTN 220kV	Under construction
Total	1282.5		



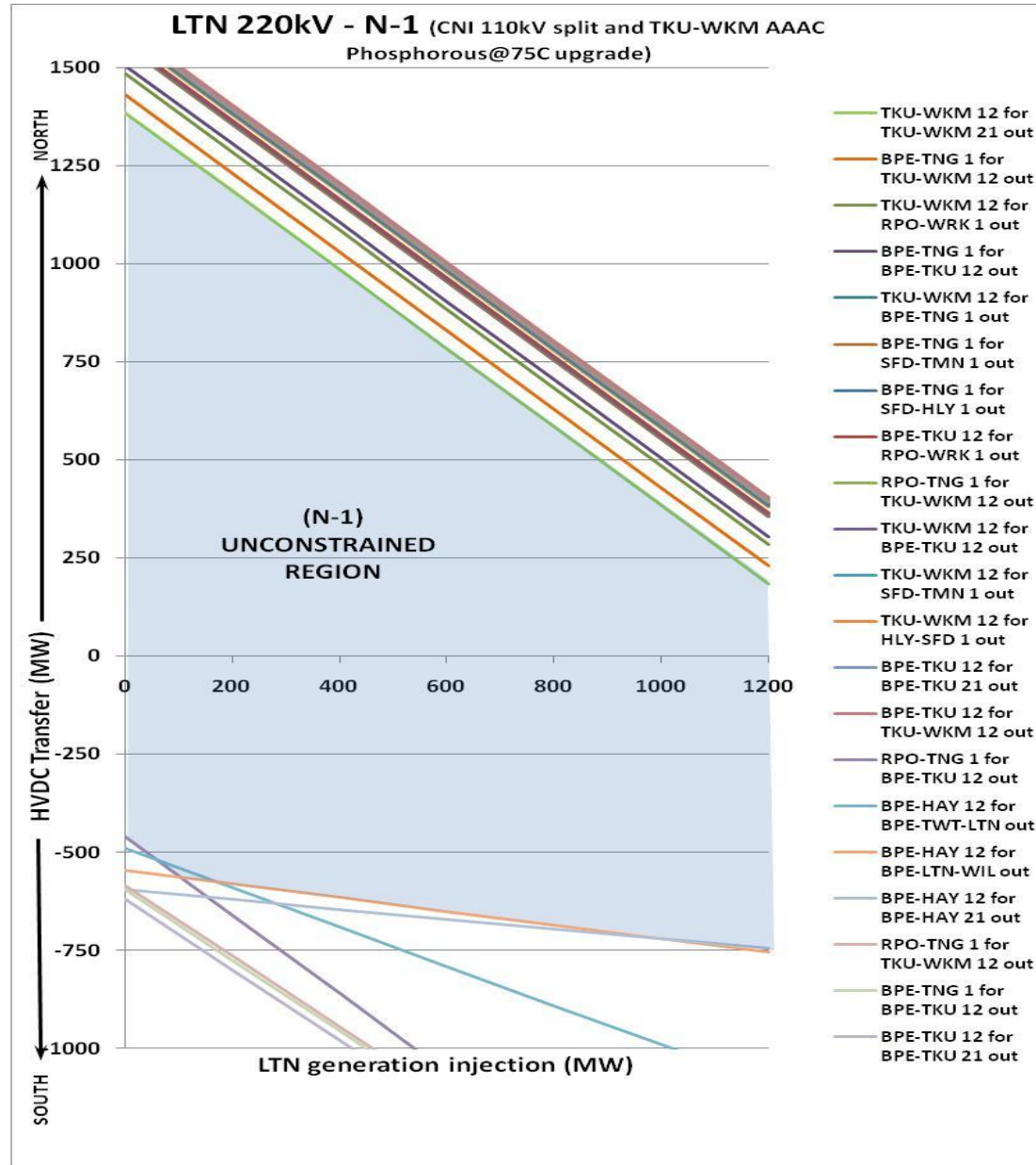
LTN - N (no upgrades)



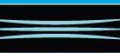
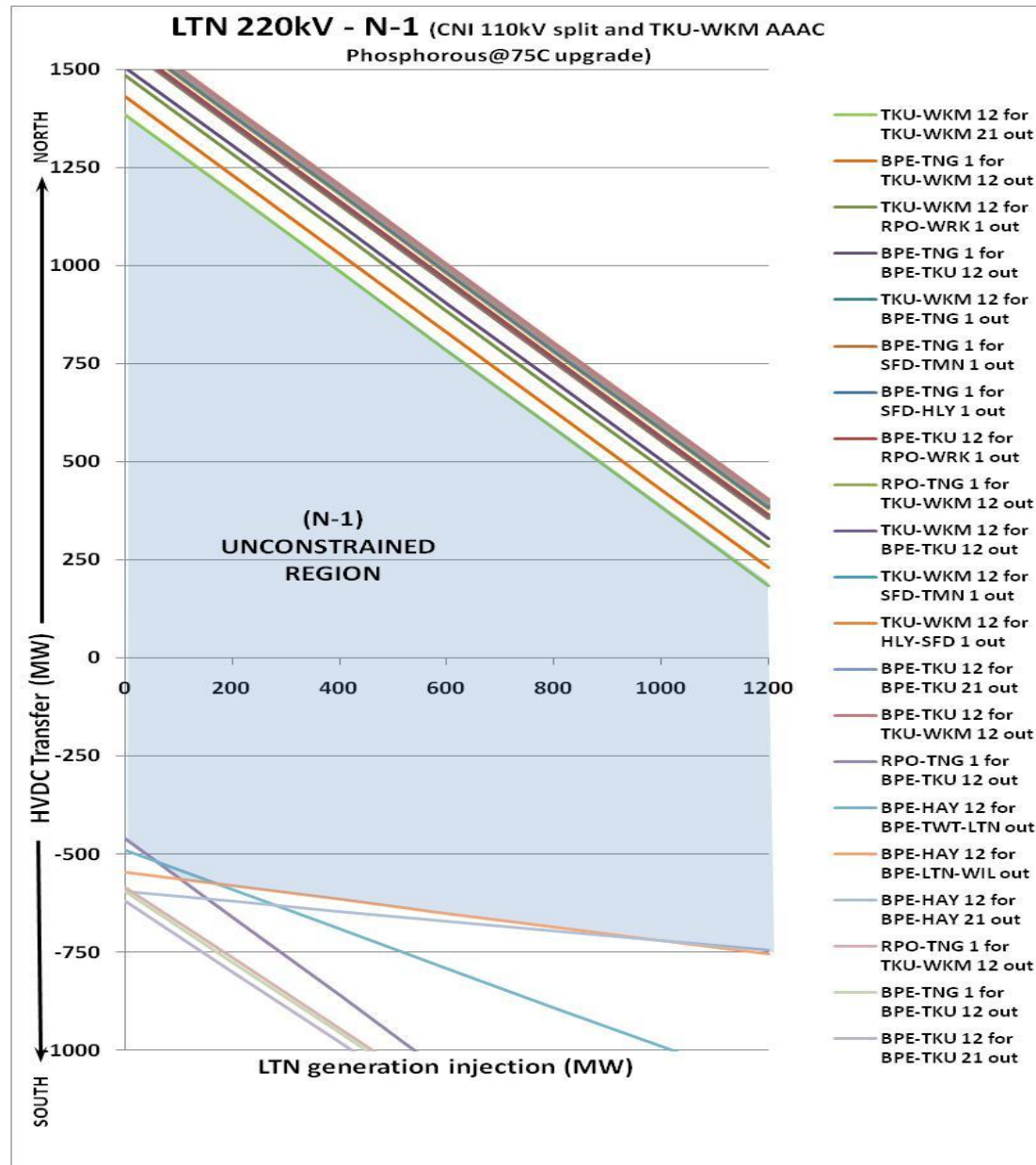
LTN – N-1 (CNI 110 split)



LTN – N-1 (CNI 110 split and TKU-WKM AAAC upgrade)

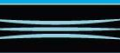


LTN – N-1 (CNI 110 split and TKU-WKM AAAC upgrade)



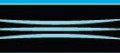
Possible LNI upgrades – Tranche 1

- CNI 110kV network split.
- AAAC re-conductor or duplex TKU-WKM 220kV.
- Thermal upgrade of BPE-TNG and RPO-TNG 220kV.
- BPE-WDV 110kV AAAC re-conductor.
- Possible cost range \$100m-\$150m.
- Enables approximately 500MW of new wind generation at or near BPE.



Possible LNI upgrades – Tranche 2

- Duplex BPE-TKU 1 and 2 and re-conductor existing 220kV north of BPE?
- LNI region wide System Protection Scheme similar to Tasmanian SPS?
- New transmission capacity?
 - convert existing 220kV sgl cct line to dbl cct,
 - new dbl cct 220kV or 400kV line,
 - HVDC Light between BPE and WKM.
- New 220kV transmission into Wairarapa.
- Losses will likely be key input.

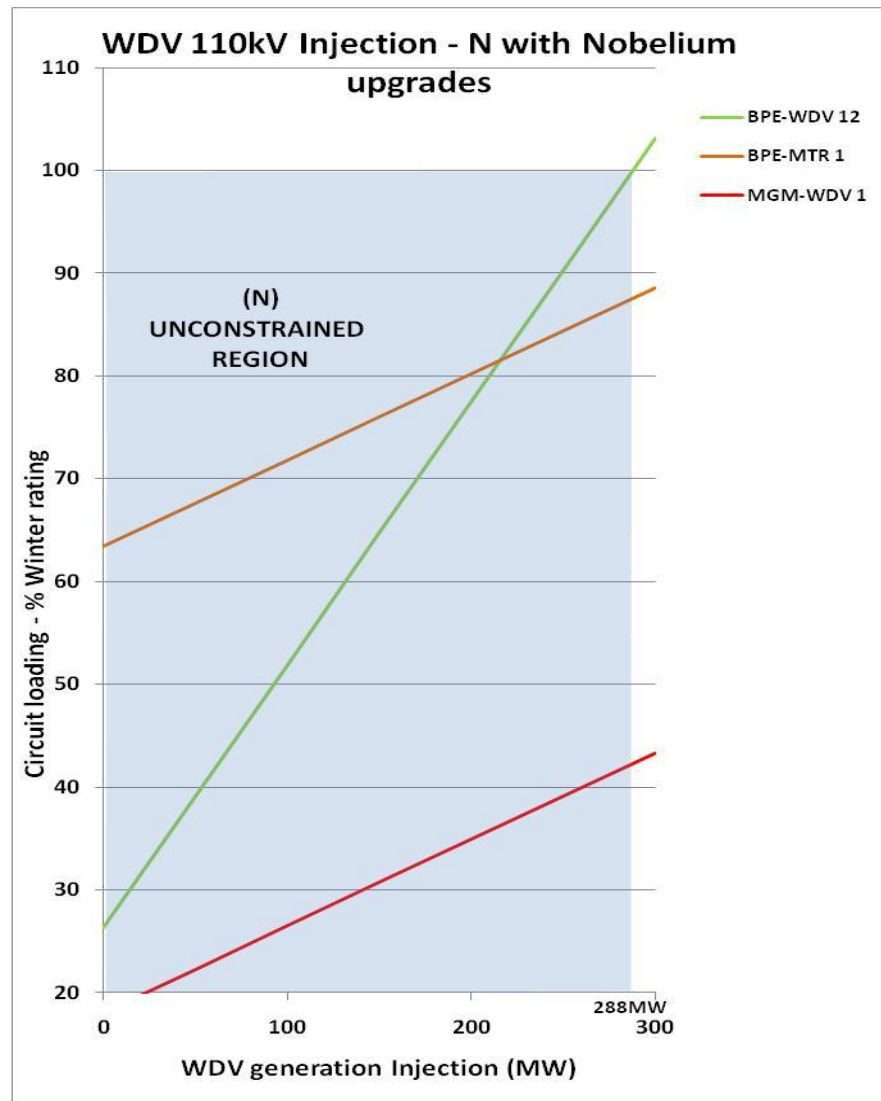


LNI System Protection Scheme

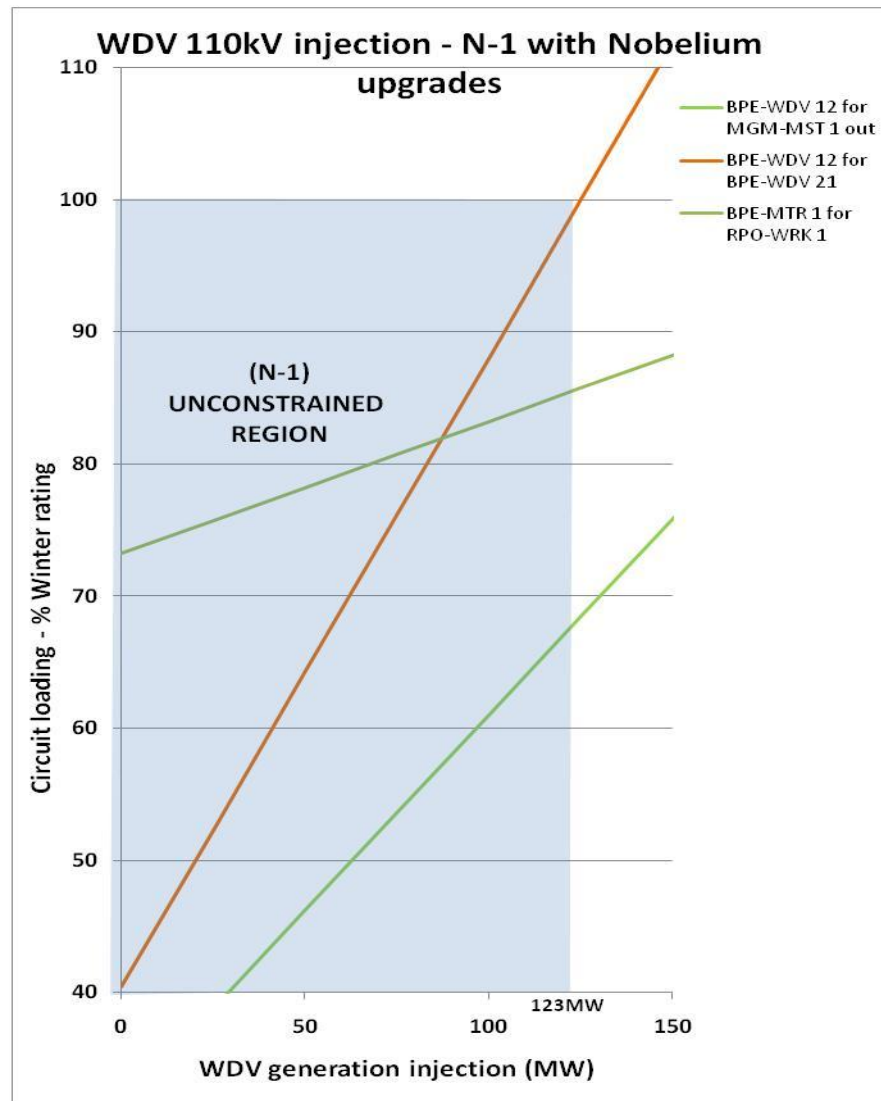
- High level feasibility study complete to understand design/implementation issues.
- Generation runback to relieve post contingent circuit overloads.
- Significant analysis and design required to ascertain runback regime.
- Wind generators will need runback capability, but grid access significantly increases if operated at 90% N.
- High losses may sink this option.



Wairarapa constraint analysis



Wairarapa constraint analysis



Wairarapa analysis summary

- Indicative early analysis to ascertain upgrade possibilities.
- Upgrade results assume AAAC Nobelium on BPE-WDV and MST-UHT.
- A greater level of generation will require new line.

GXP	Existing network		Nobelium AAAC @75°C upgrades	
	N (MW)	N-1 (MW)	N (MW)	N-1 (MW)
WDV	150	80	290	120
MGM	190	80	240	150
MST	300	180	480	300
GYT	260	170	440	280



Summary

- Known large economic wind resource in LNI region.
- 450MW installed and 1300MW either consented or being seriously investigated.
- Upgrades have been investigated on 220kV core grid.
- Tranche 1 investments may cost between \$100m and \$150m and enable about 500MW
- Tranche 2 investment may be more re-conductoring, an SPS or new transmission.
- Any significant Wairarapa wind generation will likely necessitate new transmission.

