TPM beneficiaries-pay working paper Discussion forum

29 January 2014

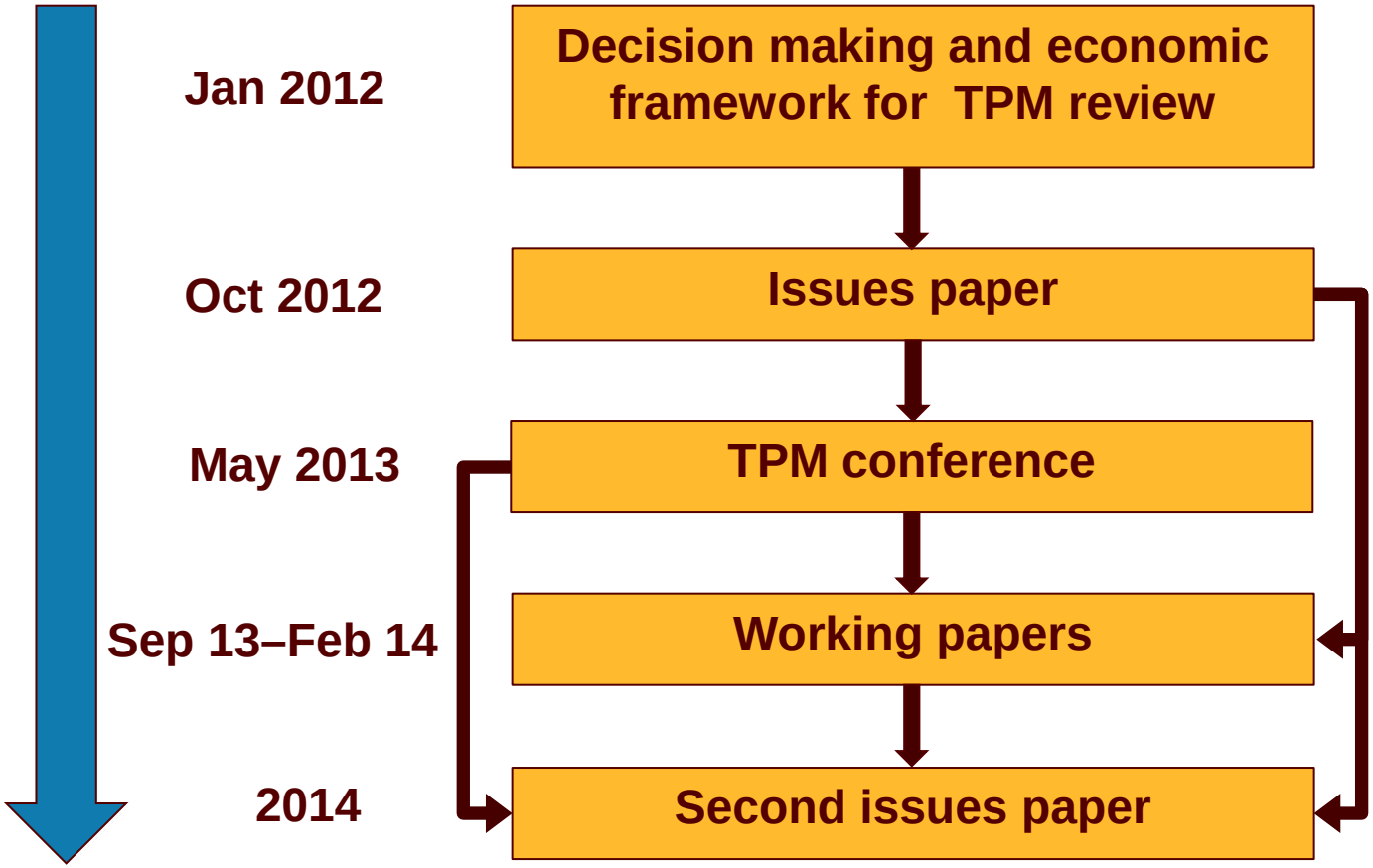
Agenda

1. Introduction and context
2. Beneficiaries-pay
   - Submitters' views on Proposal in October 2012 issues paper
   - Beneficiaries-pay options (Chapters 6-10)
3. Evaluation of options (Chapter 11)
4. Other matters

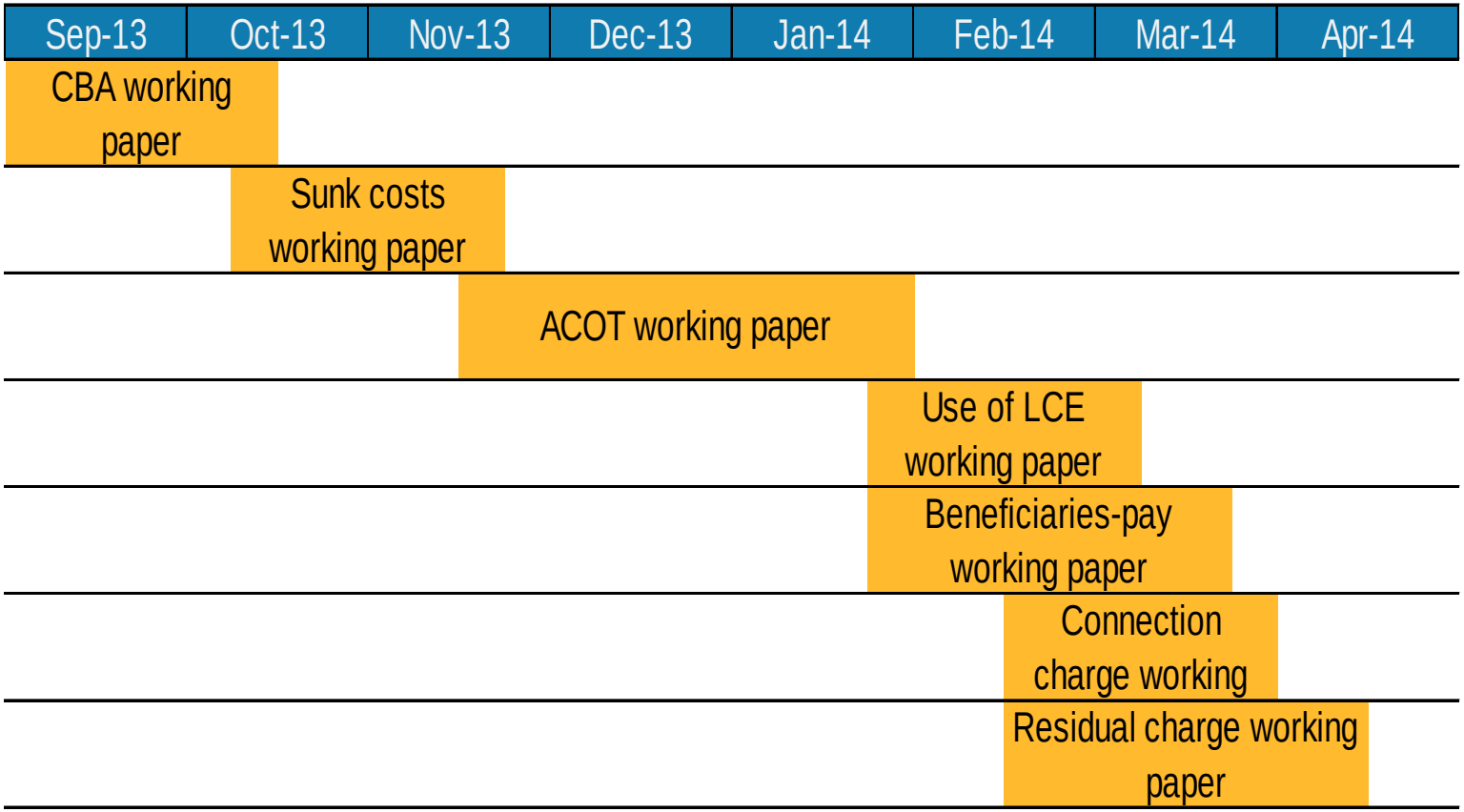
Agenda

1. Introduction, context, reasons for focusing on beneficiaries-pay options (Chapters 2-5)
2. Beneficiaries-pay options (Chapters 6-9)
3. Evaluation of options (Chapter 10)
4. Other matters

TPM process


Jan 2012
Decision making and economic framework for TPM review
Oct 2012
Issues paper
May 2013
TPM conference
Sep 13–Feb 14
Working papers
2014
Second issues paper

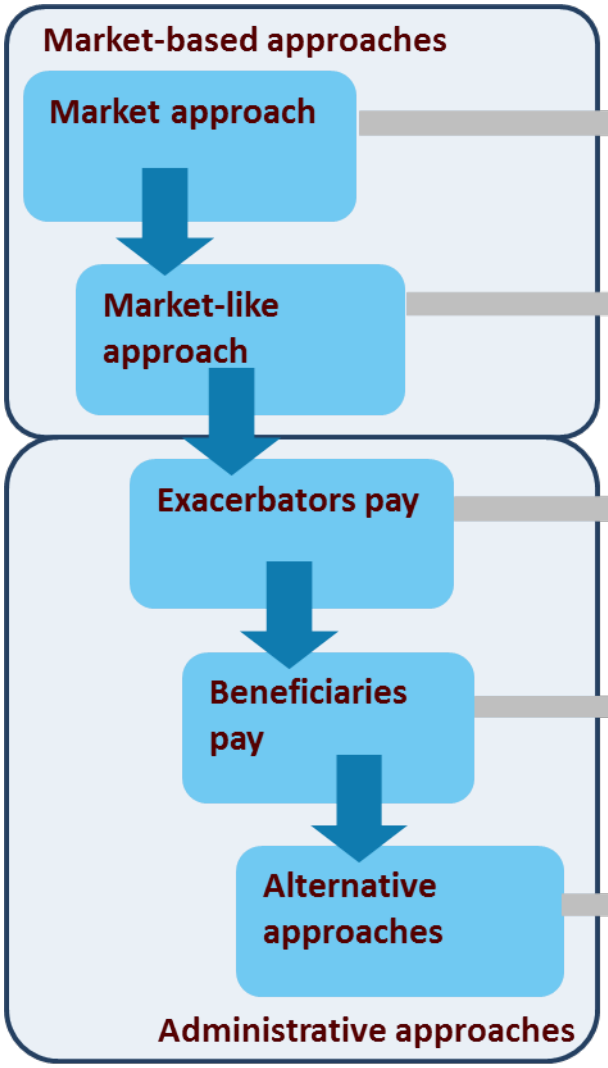
Working paper consultations



Why is the Authority reviewing the TPM

- Authority is reviewing the TPM
  - TPM specifies how Transpower recovers the costs of the transmission grid
  - Material change in circumstances (see October 2012 issues paper)
  - Authority considers that the current TPM can be improved so as to better meet the Authority's statutory objective of promoting competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers
  - Authority will be guided by its statutory objective, Code amendment principles and TPM decision-making and economic framework

Reasons for focusing on beneficiaries-pay options



Use of LCE is efficient and practicable but doesn't fully fund cost of transmission

Efficient and practicable for connection assets but not for other transmission assets

Efficient and practicable for static reactive support but not for other transmission assets

Focus of this paper

Residual charge(s)

Reason for focus on beneficiaries-pay options

- Dynamic efficiency promoted by market and market-like arrangements haven't found a practicable means of applying these approaches to non-connection assets
- Meshed nature of interconnected grid and large number of parties using it means likely to be impracticable to use market/market like mechanisms such as capacity rights or contracts to establish prices for the interconnected grid
  - An administrative approach for establishing prices is likely to be required
- Charging according to incremental benefit based on fact that consumers are only likely to be willing to purchase service up to the point where their marginal private benefit equals their marginal private cost
- Beneficiaries pay gives consumers incentives to make broadly efficient decisions, as resulting charge allows consumers to consume no more of the service than their private benefit

Previous consideration of beneficiaries-pay options

- October 2012 issues paper proposed the "SPD method" to recover HVDC and interconnection costs
  - *"The Authority considers that wholesale electricity market outcomes, assessed using the SPD model, provide the best available method for implementing the beneficiaries-pay charge. The beneficiaries identified by this method would be charged for the cost of each investment in proportion to their share of the private benefits from each investment, but with their maximum charge not exceeding their private benefit in each case." (Executive summary, para 32)*
- Other beneficiaries-pay options, considered less preferable:
  - Use of economic models to identify beneficiaries
  - Flow tracing
  - Zonal beneficiaries-pay

Submitter views on the SPD method

- 45 submissions commented on the merits of the SPD method
  - 7 submitters partially supported the proposal
  - 38 submitters did not support the proposal
- Key issues identified by submitters:
  1. Calculating the charge using half-hourly calculations of private benefit would result in an uncertain, complex and volatile charge
  2. Capping the revenue recovered in each half-hour to the half-hourly share of the annual costs of an investment undermines the beneficiaries-pay principle by preventing the full costs of an investment being recovered from the parties that benefit from the investment

Submitter views on the SPD method (cont.)

- Key issues identified by submitters:

3. An ex-post charge (that is, a charge that is determined after the charging period) will cause uncertainty and volatility that is difficult to manage

4. Generators will be able to alter their offer behaviour to avoid the SPD charge, which will cause inefficient dispatch and enable them to pass a greater share of the costs to consumers

5. The proposal to use the SPD method to allocate costs for investments made since May 2004 and Pole 2 involves reallocating sunk costs which would give rise to economic inefficiency

Submitter views on the SPD method (cont.)

- Key issues identified by submitters:

6. The SPD charge should apply to a much more limited set of historical investments, such as those with a cost greater than $100 million
7. The SPD charge should reflect disbenefits as well as benefits
8. Key design elements, such as assumptions around the wholesale demand curve for electricity and, in particular, the assumption of no demand response and the cost of alternatives in the event of non-supply as a result of removal of the investment, are not consistent with efficiency

Submitter views on the SPD method (cont.)

- Key issues identified by submitters:

9. The SPD method should not disincentivise embedded generation where this is efficient, or disincentivise generation built to support industrial load

10. There should be a minimum threshold for application of the SPD charge to generation of 10MW

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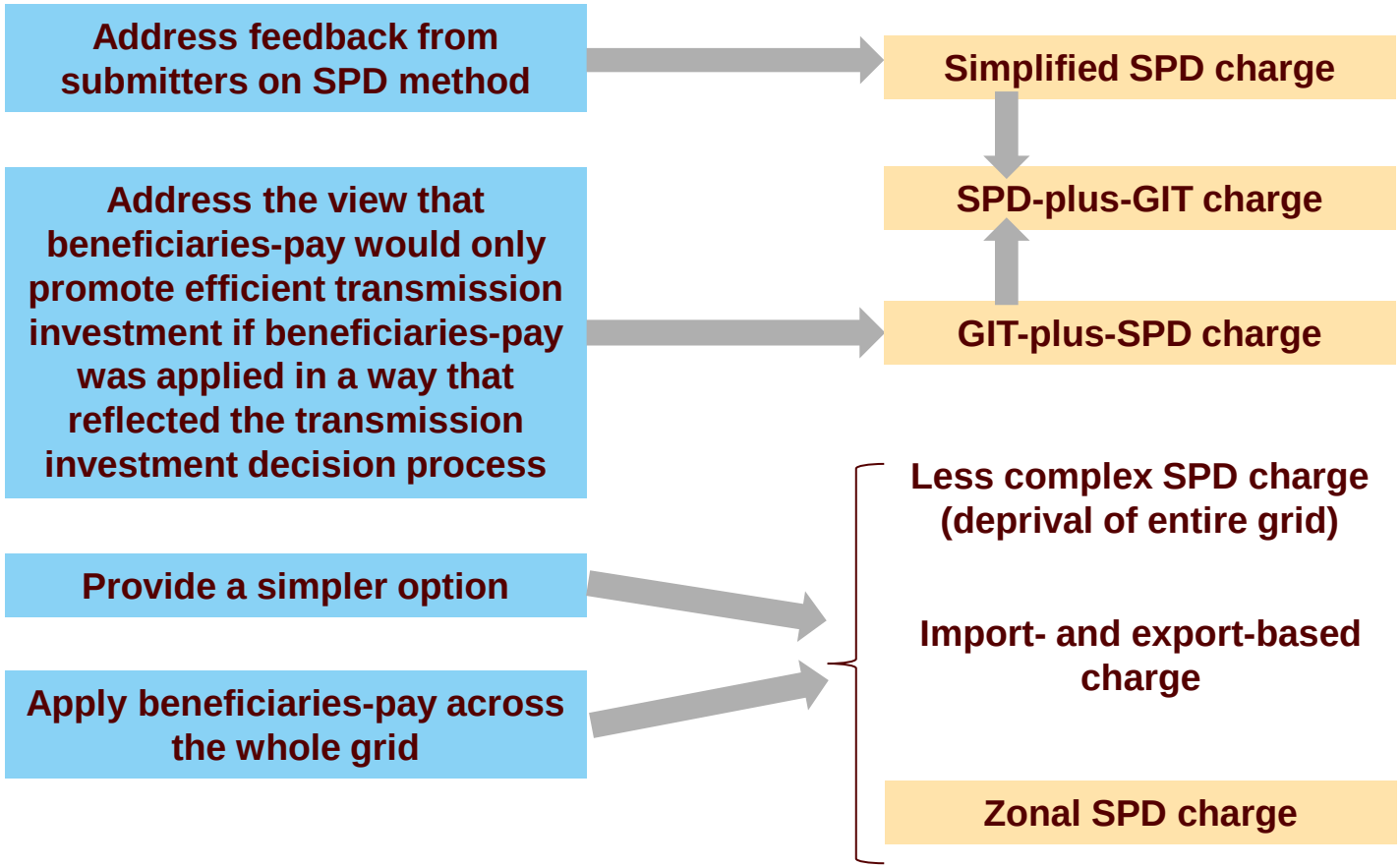
4. Next steps

Identification of options



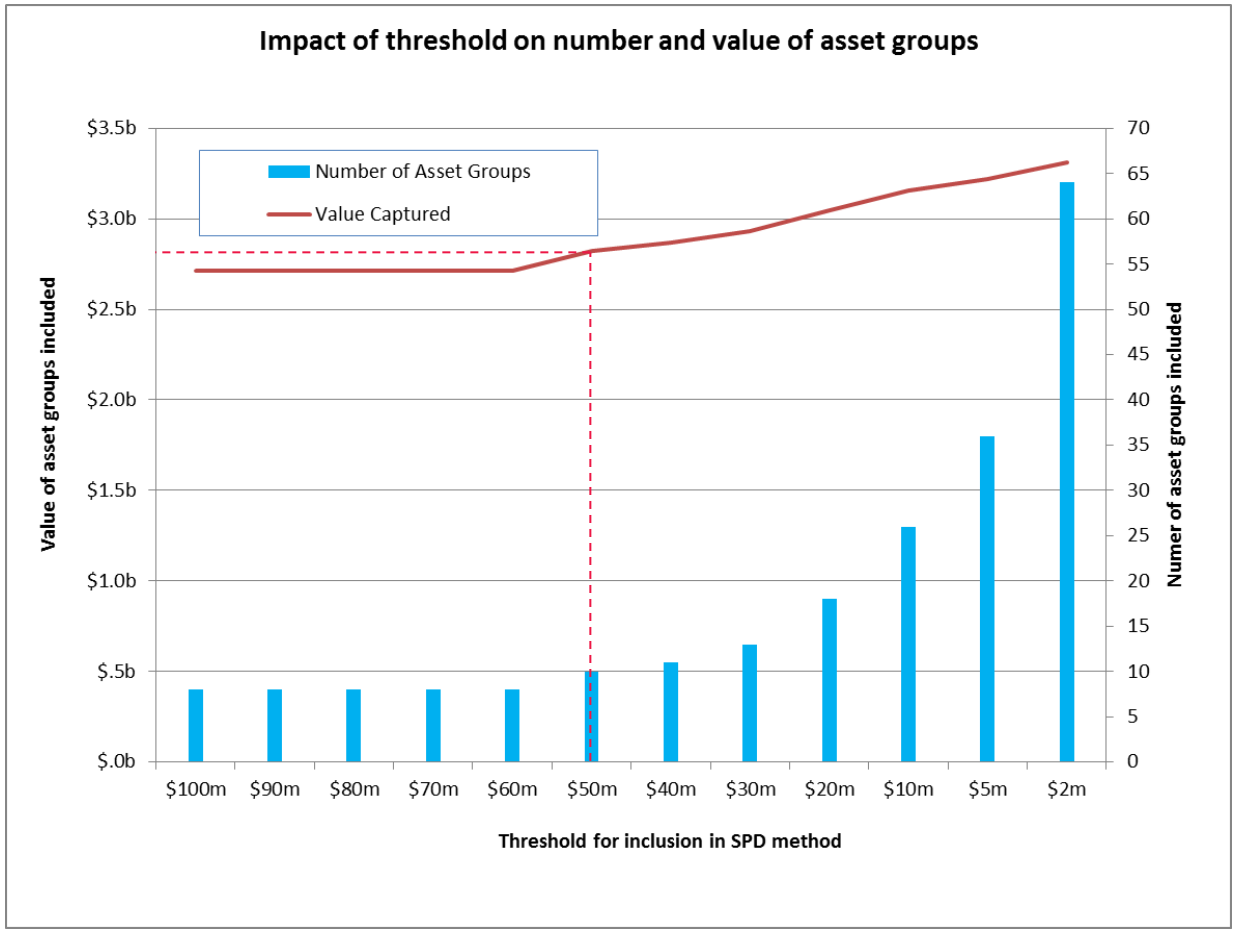
Option 1: Simplified SPD charge

- Same concept as original SPD charge
  - For each eligible investment, compare SPD outcomes between the actual grid and the pre-investment grid
  - Private benefits are estimated as the difference in producer surplus (for generators) or consumer surplus (for wholesale purchasers)
  - Charges are proportional to private benefits, and capped to avoid recovery exceeding private benefits
  - Under-recovery is handled using a residual charge

Investments that would be covered

- Proposed list:
  - HVDC Pole 2
  - Investments, including replacement assets, added to Transpower's regulatory asset base after 28 May 2004 but before 10 October 2012 with a cost greater than $50m
  - Investments, including replacement assets, added to Transpower's regulatory asset base from 10 October 2012 with a cost greater than $20m
- Authority has made assumptions about the revenue to be recovered for each investment, based on information provided by Transpower

Effect of the $50M threshold compared with previous proposal



Comparison between the original and simplified charge

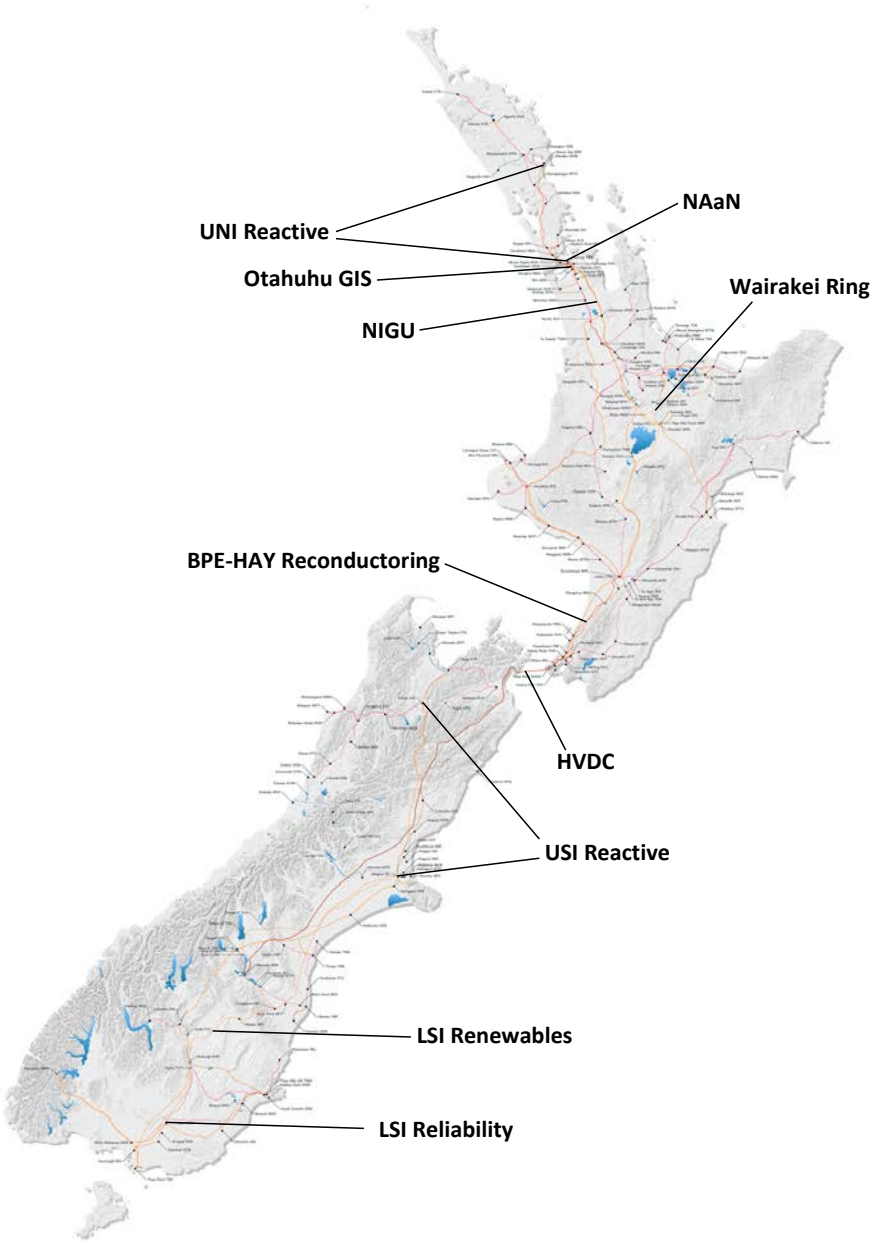
Original SPD charge	Simplified SPD charge
Charges would be based on gross benefits (disbenefits would be ignored)	Same
Half-hourly capping (i.e. charges for an investment in a half-hour would be capped at a half-hour's share of annualised costs)	Daily capping
Demand-side response would not be modelled Assumed all demand perfectly inelastic	Dispatchable demand bids would be included, all other demand would be assumed to be slightly elastic
Price of non-supply would be set to $3,000/MWh	Price of non-supply would be set to $1,000/MWh in the HVDC Pole 2 counterfactual and $3,000/MWh otherwise

Comparison (cont.)

Original SPD charge	Simplified SPD charge
Charges would be calculated monthly, based on a one-month period	Charges would be calculated annually, based on the previous three years
Charges on embedded generation would be based on gross injection	Charges on embedded generation might instead be based on net injection
Embedded generation over 1 MW would be subject to the charge	Embedded generation schemes over 10 MW would be subject to the charge
Benefits to IR providers would not be considered	Benefits to IR providers would be included
Charges on load would be paid by retailers and direct-connect customers	Same

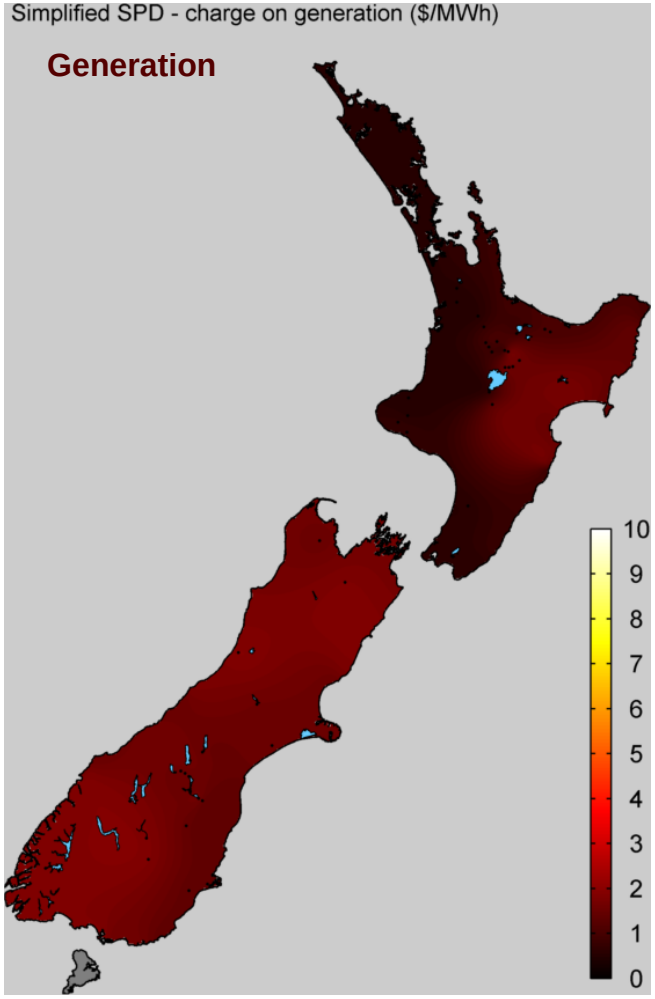
Modelling of the simplified SPD charge

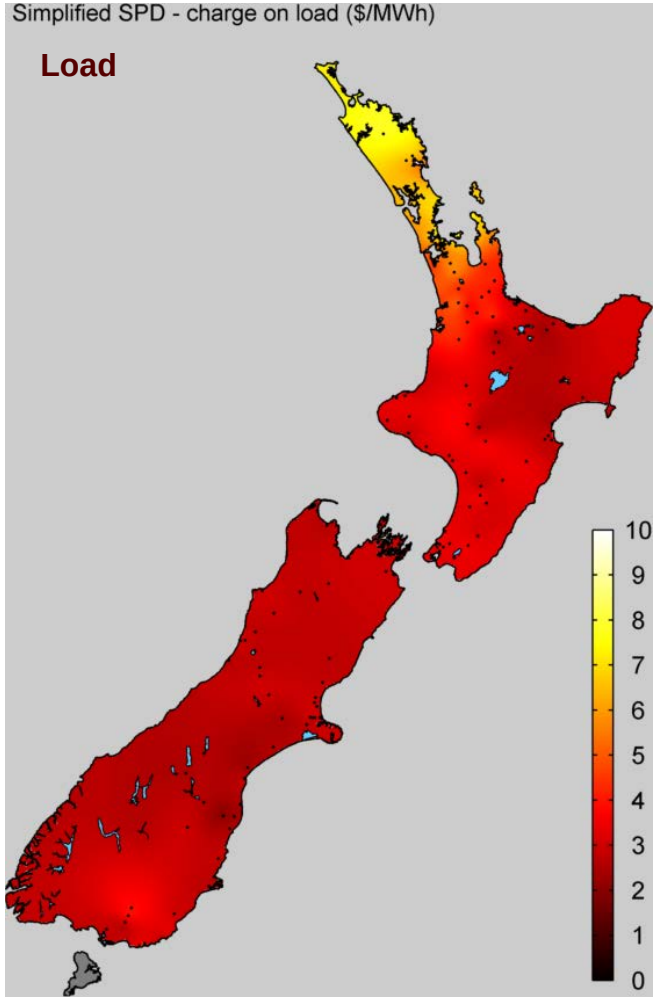
- Mainly based on a “future” 4-month scenario representing July-October 2017
  - Closely based on actual market conditions during July-October 2012
  - Assume 7% demand increase (except at Tiwai and Kawerau)
  - Down to two coal-fired Huntly units
  - New geothermal, wind, and peakers
  - Network configuration as per 31 July 2013, plus new Tx investments
  - Transmission group constraints turned off in the base case
- Longer 33-month scenario also used to test volatility of the charge
- Simplified SPD charge estimated for 11 investments *(see next slide)*
- Base case uses VoLL=$3,000/MWh and does not model demand-side response or benefits to IR providers – these are covered in sensitivities only



Investments included in the modelling

Incidence of simplified SPD charge

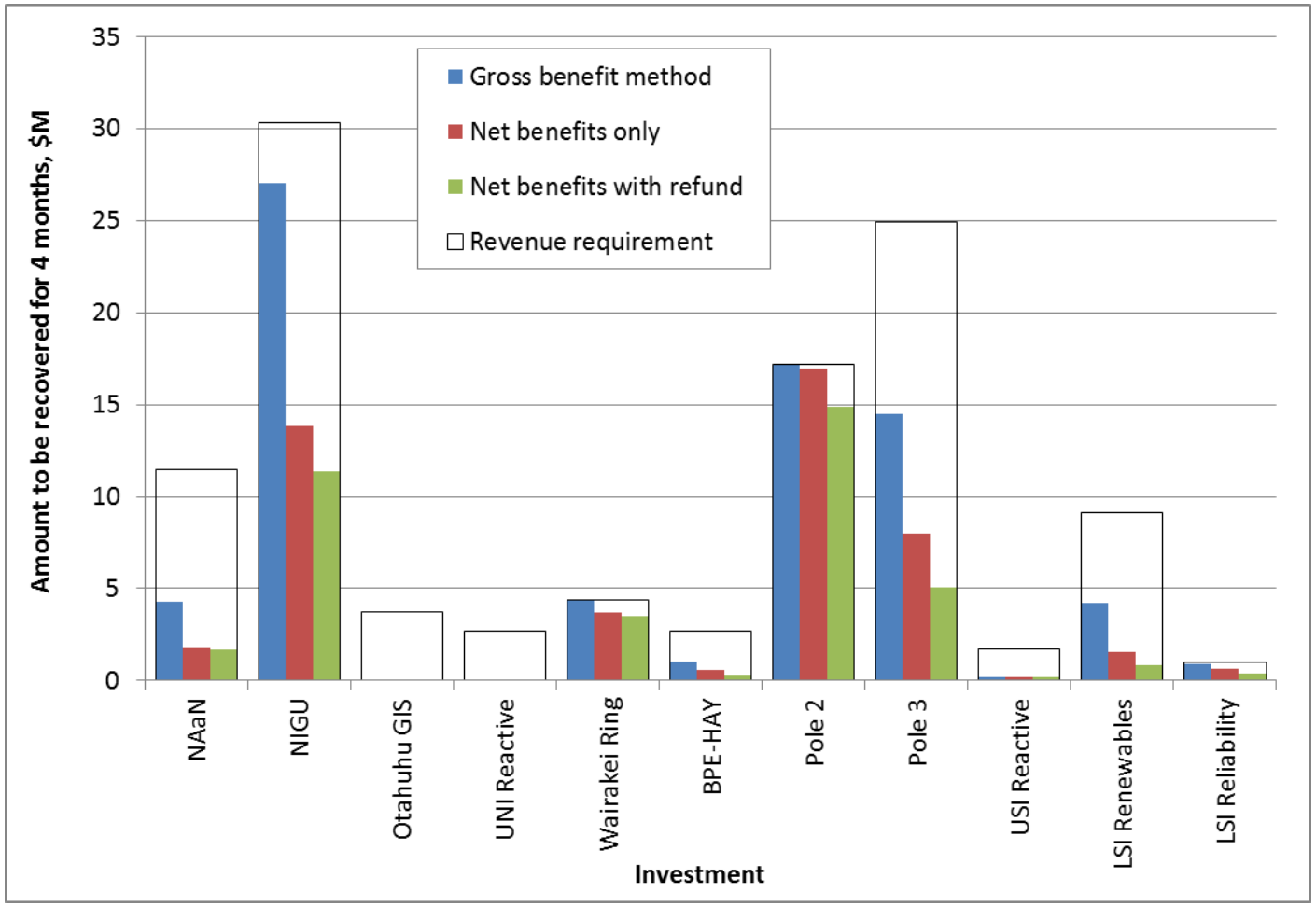




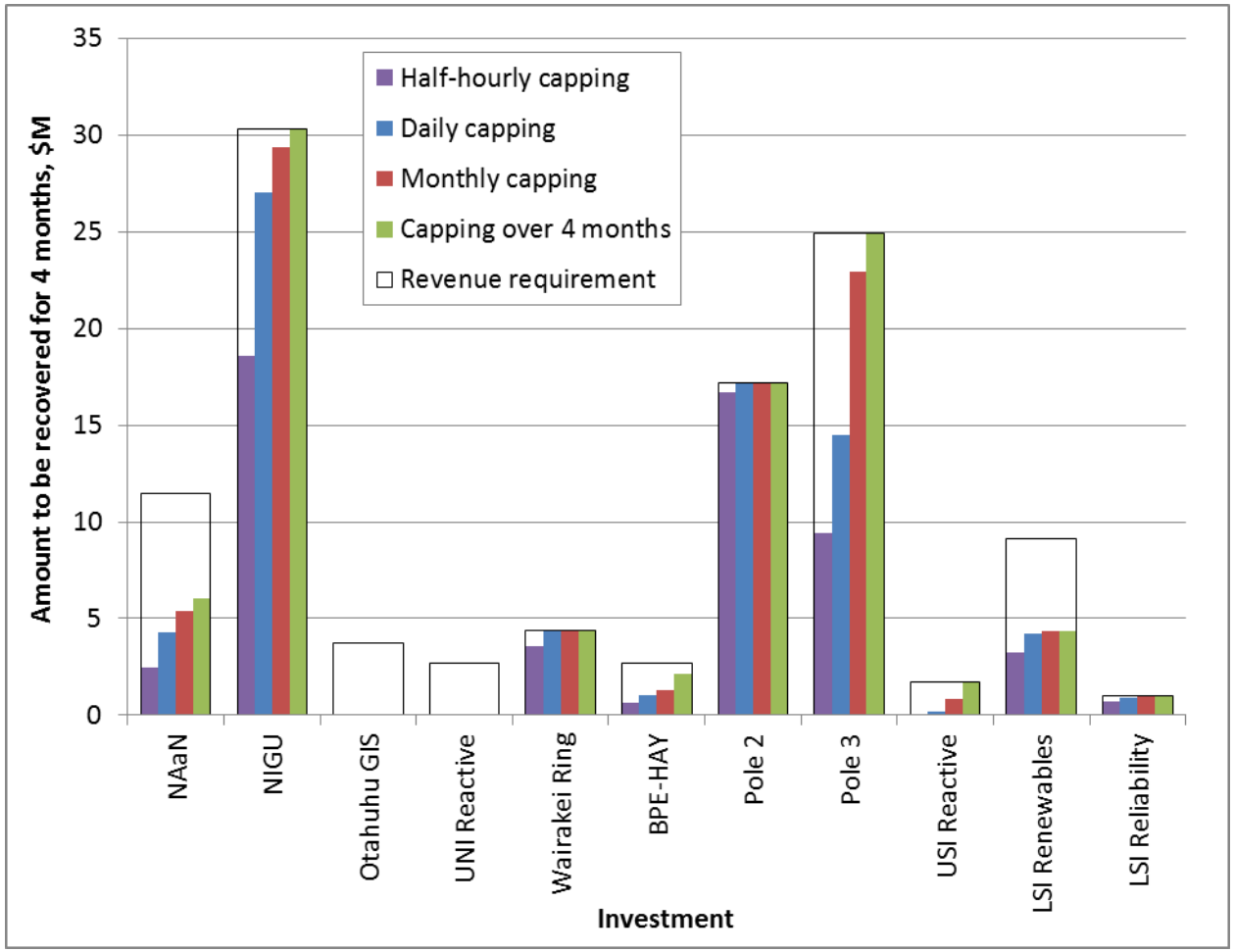
Design issues for simplified SPD charge

1. Gross versus net benefit
2. Capping period
3. Treatment of demand-side response
4. Assumed cost of non-supply
5. Volatility
6. Treatment of embedded generation
7. Threshold for charging generation
8. Treatment of IR providers
9. Charge retailers or distributors?

Design issue 1: gross vs net benefit

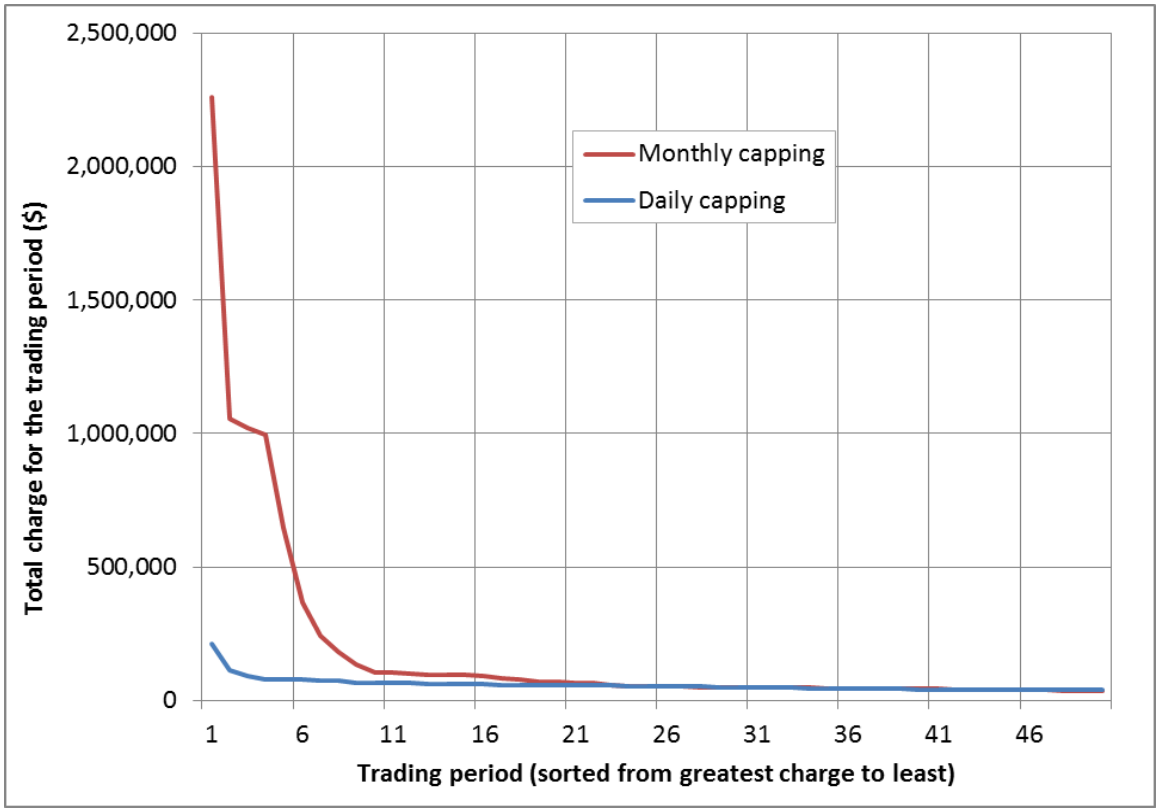


Design issue 2: capping period



Design issue 2: capping period

Charges in top 50 trading periods - NIGU



Design issue 3: treatment of demand-side response

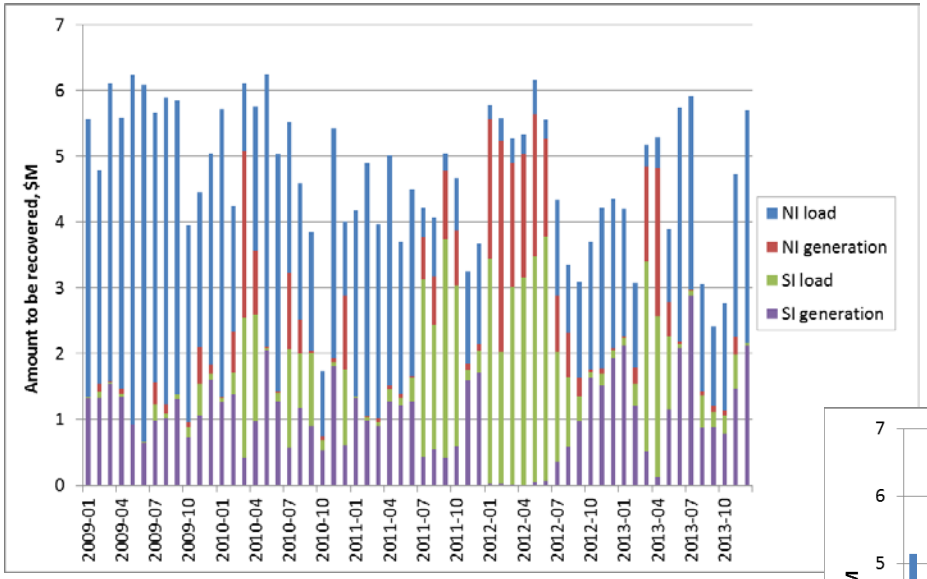
- Original SPD method assumed perfectly inelastic demand (up to VoLL)
  - Does not reflect reality
- Several alternatives considered
  - A. Incorporate actual demand bids into the price-responsive schedule
  - B. Incorporate actual dispatchable demand bids
  - C. Incorporate nominal demand-side bids at known price-responsive nodes
  - D. Model a low level of elasticity at all nodes
- Preference at this point is for both B and D

Design issue 4: assumed cost of non-supply

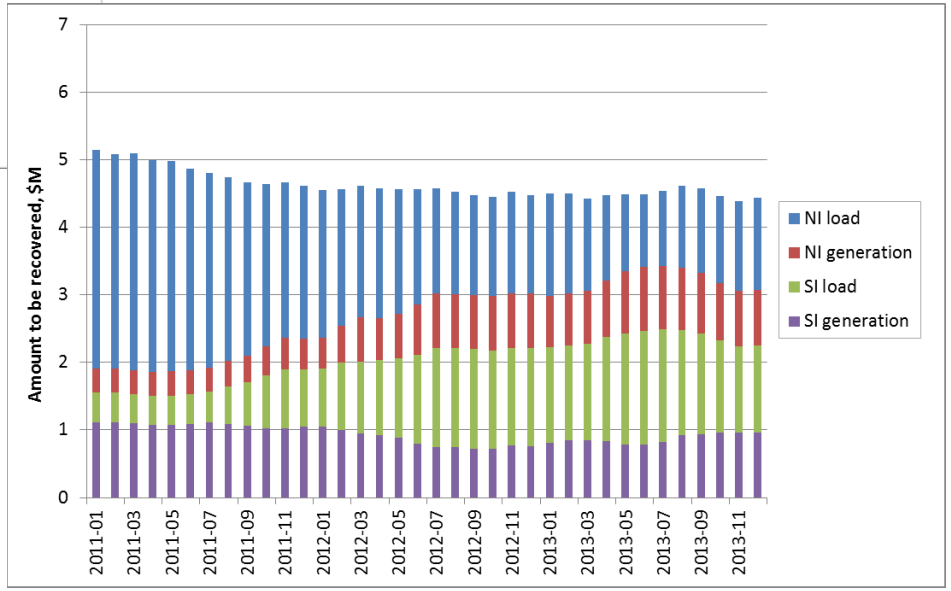
- If the SPD charge were introduced a price for non-supply should apply that reflected the incidence of non-supply in the absence of the investment. This would mean that the price would reflect the LRMC of the alternative that would have been built in the absence of the transmission investment
- In the scenario considered:
  - Frequency of nonsupply < 1% in most counterfactuals, use VoLL = $3K
  - Frequency of nonsupply = 3% in Pole 2 counterfactual, use VoLL = $1K

Design issue 5: volatility

Pole 3 charge based on 1 month (uses 5 years of data)



Pole 3 charge based on rolling 2 years (uses 5 years of data)



Design issue 6: treatment of embedded generation

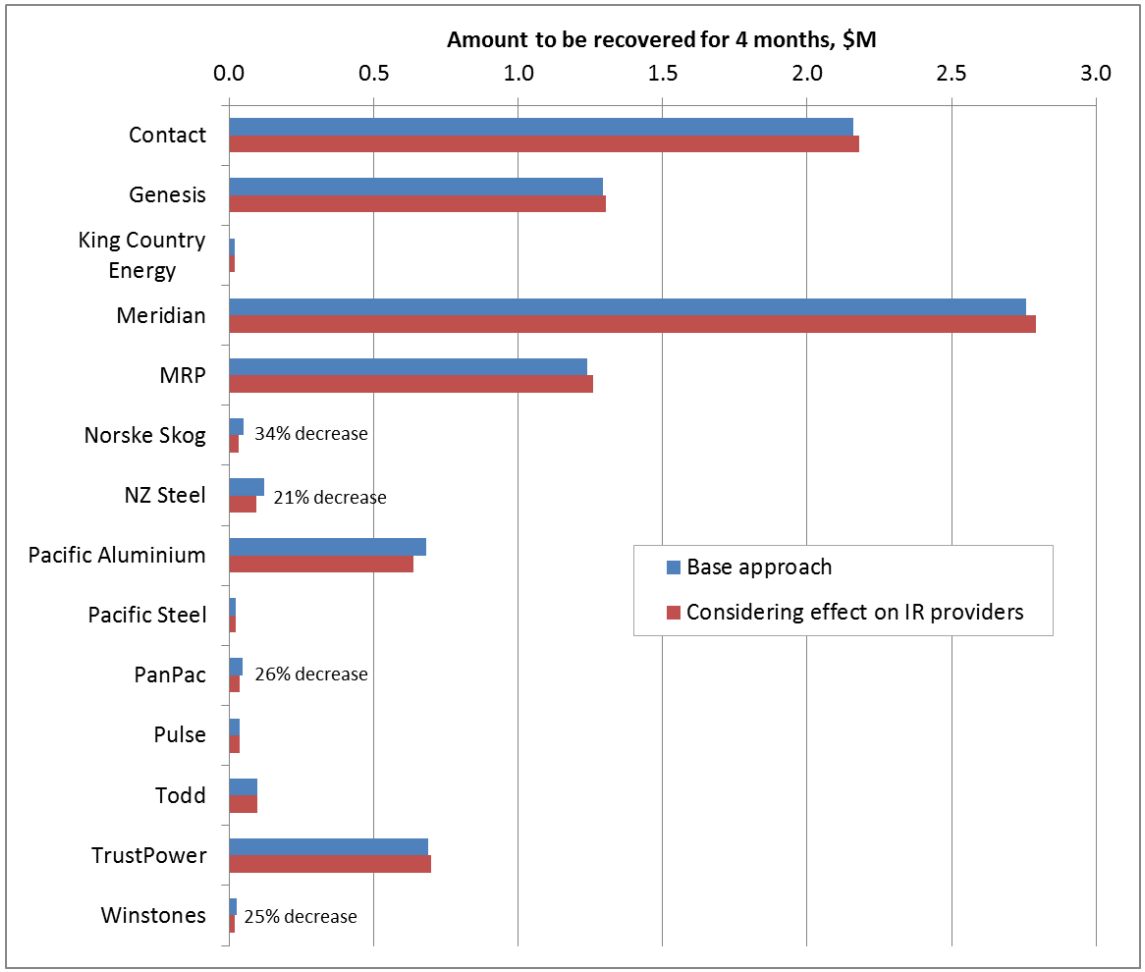
- Three options for charging embedded generation
  - Based on gross injection (into the local network)
  - Based on net injection (at the GXP)
  - For industrial consumers with grid-connected generation, could also consider charging based on total net injection at the substation level
- Authority has no particular preference at this stage. Welcomes views as to how to proceed

Design issue 7: threshold for charging generation

- A threshold of 10MW by scheme should provide an appropriate balance between:
  - ensuring broad coverage of the SPD charge
  - minimising incentives for avoidance of the charge through sub-optimal generator capacity
  - ensuring the parties paying the charges have the necessary scale to cope with the complexity of the charge, to the extent this is an issue
  - keeping transactions costs to a reasonable level

Design issue 8: treatment of IR providers

Simulated Pole 3 charge:



Design issue 9: charge retailers or distributors?

- Relative advantages of charging retailers:
  - More familiar than distributors with the wholesale market so may be better placed to deal with the SPD charge
  - May have greater incentives to scrutinise charges
  - Lower transactional costs as distributors need not be involved
- Relative advantages of charging distributors:
  - Most are already transmission customers
  - Continuous relationship with end consumers
  - Lower credit risk
  - More familiar with the regulatory regime applying to transmission so may better understand transmission investment proposals
  - Less likely to bundle transmission charges paid by large consumers

Option 2a: GIT-plus-SPD charge

- For 'reliability' investments, a GIT-based charge would be used
  - Charges would be allocated to all load in the "area of benefit" of the investment
  - The full revenue requirement would be recovered from load in the "area of benefit" in each year
  - The allocation of the charge would be in proportion to energy consumed
- For other investments, the simplified SPD method would be used

Which investments would be eligible for the GIT-based charge?

- Investments approved primarily on the basis that it:
  - is necessary to meet the N-1 limb of the grid reliability standards, or
  - reduces expected unserved energy
- Authority would make the determination

How would the “area of benefit” be determined?

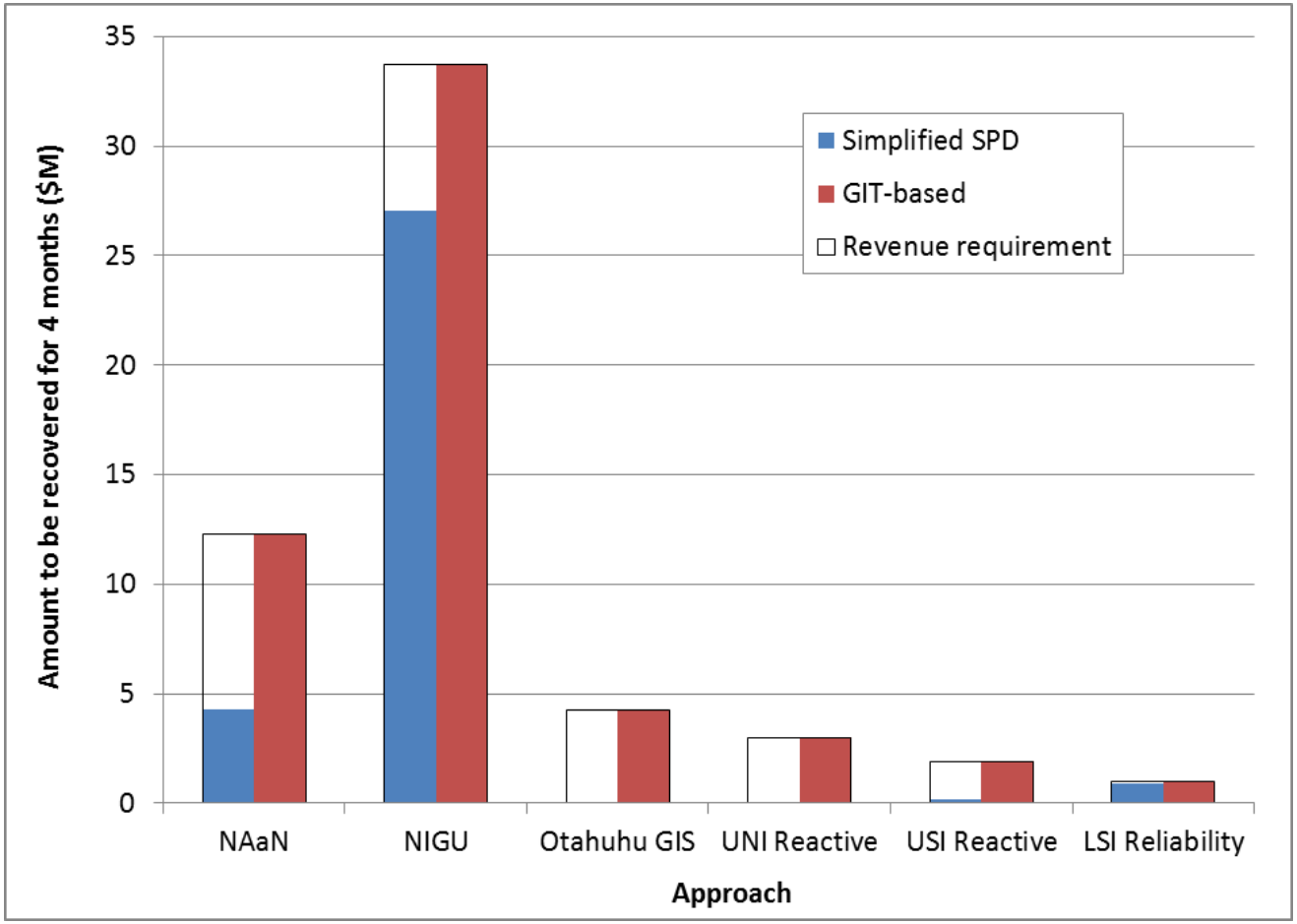
- “Area of benefit” would be the GXPs that benefit from the investment
- In identifying the “area of benefit”, only reliability benefits stemming from the main function of the investment would be considered

Investments covered by the GIT-based charge

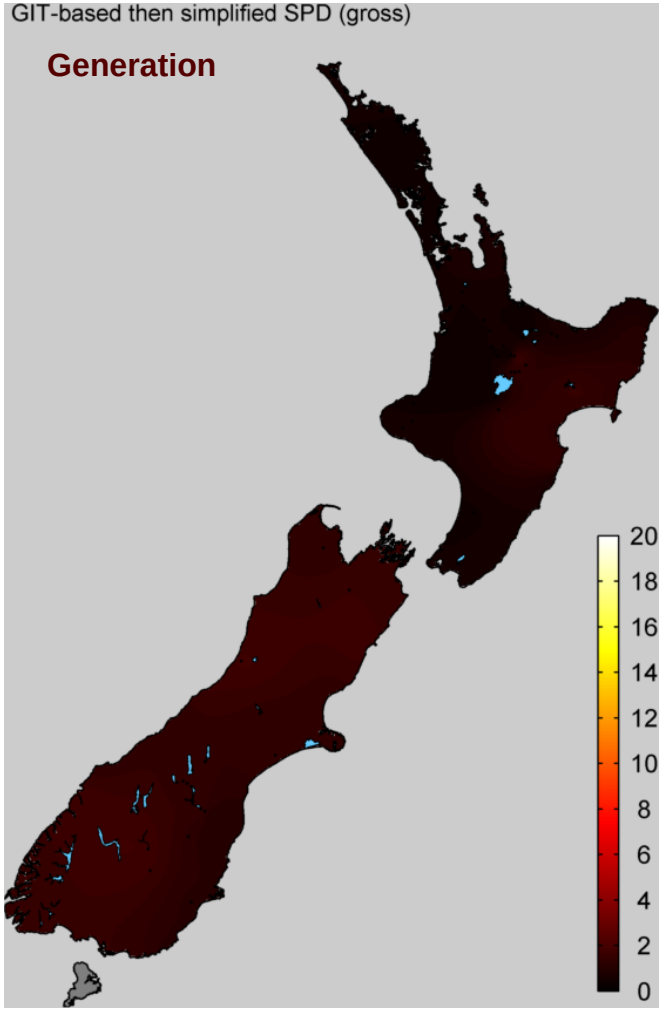
- Based on work so far:

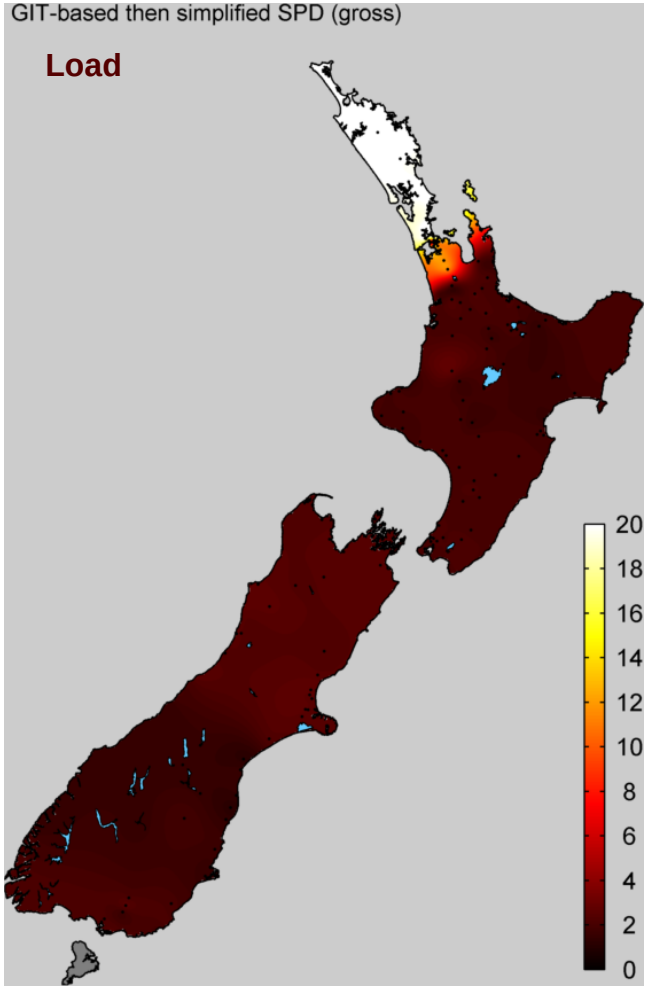
Investment	Beneficiaries that would pay the GIT-based charge	Estimated charging rate ($/MWh)
NAaN	North of (and including) Hepburn Rd	8.2
NIGU Otahuhu substation diversity UNI dynamic reactive	North of (and including) Bombay	9.6
USI reactive support	Upper South Island (including Christchurch)	0.9
LSI Reliability	South of (and including) Gore	0.5

GIT-based approach recovers full costs of investments



Incidence of “GIT plus SPD” charge ($/MWh)

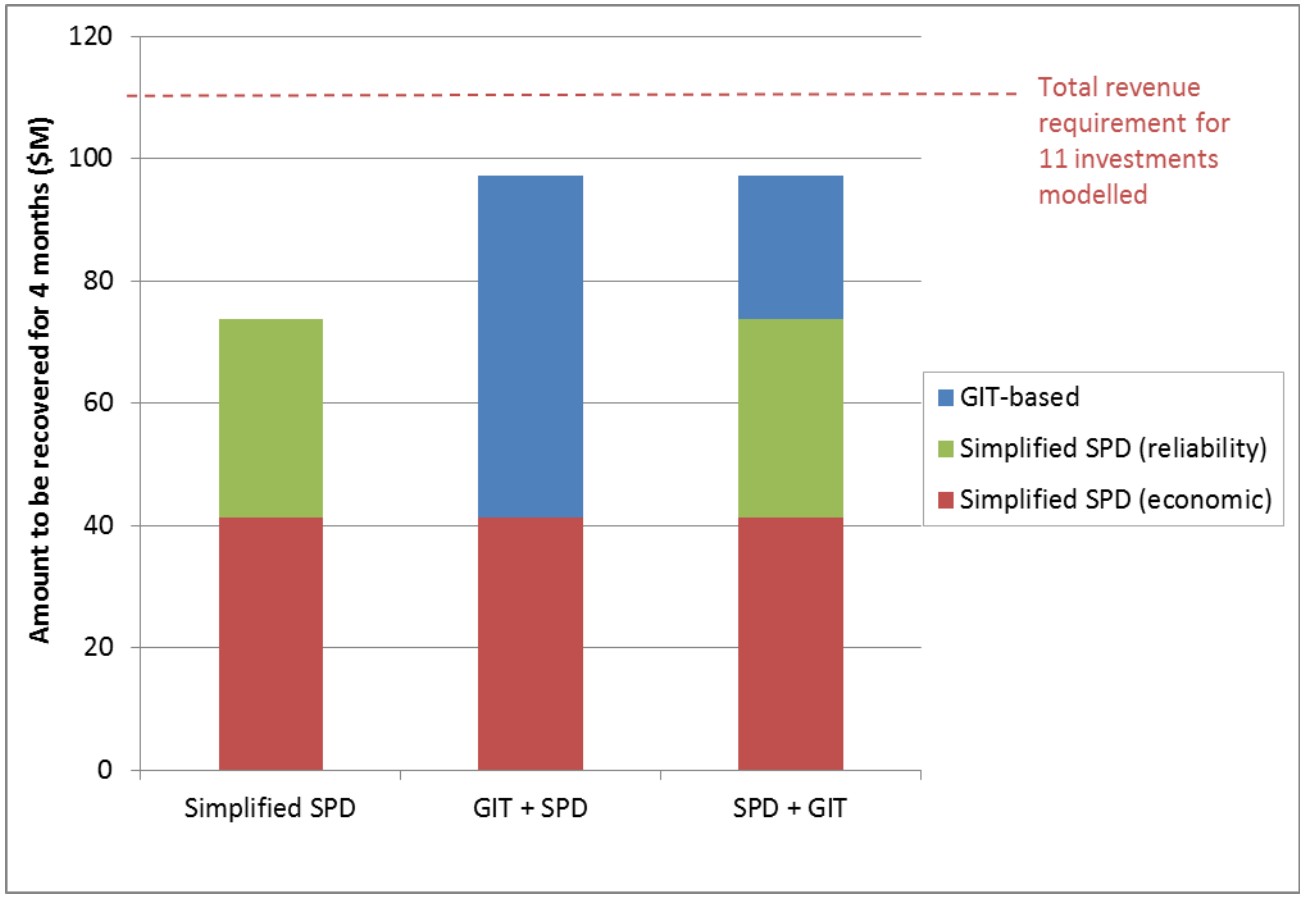




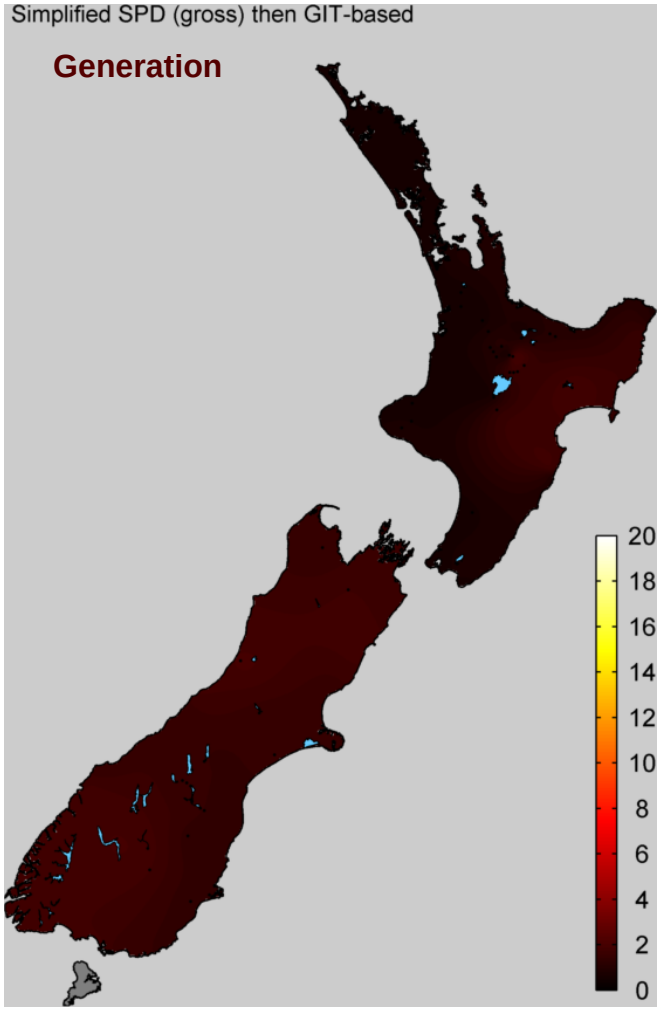
Option 2b: SPD-plus-GIT charge

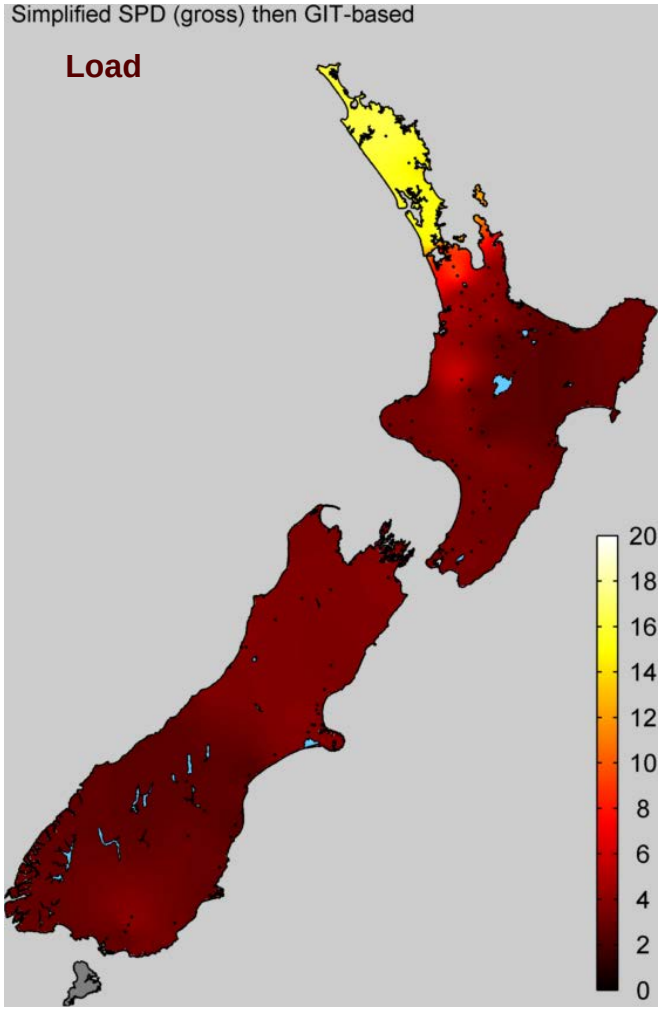
- First apply “simplified SPD” charge
- For reliability investments, remaining costs would be recovered through a GIT-based charge
  - which would work the same way as under the “GIT plus SPD” option

Comparison of the three approaches discussed so far



Incidence of “SPD plus GIT” charge ($/MWh)



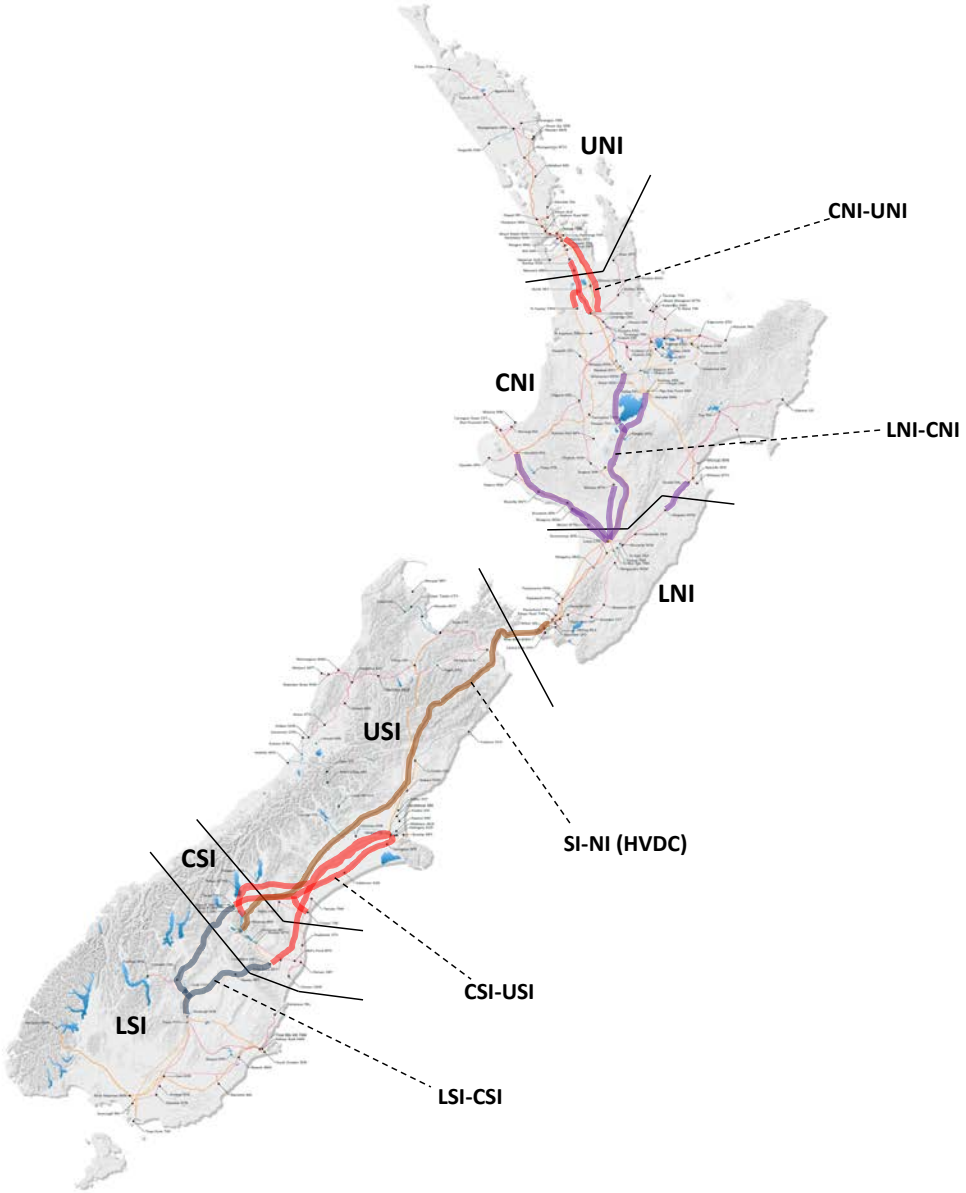


Relative merits of options 2a and 2b

- Relative to “GIT plus SPD”:
  - it would better promote efficient investment in assets providing reliability benefits, as the SPD charge would enable other benefits to be taken into account in beneficiaries-pay charging, and charging would be more dynamic as it would reflect changing patterns in benefits over time
  - it would better promote efficiency, as charging across a broader base of beneficiaries would mean lower charges to beneficiaries and a reduction in any incentives to seek to avoid the charge

Option 3: Zonal SPD charge

- Simpler version of SPD charge
- Recovers all costs (no residual charge required)
- Three components
  - **Inter-zonal charge** – recovers costs of assets that enable transmission between zones
  - **Within-zone asset charge** – recovers costs of assets that enable transmission within each zone
  - **Non-asset-specific charge** – recovers all other Transpower costs (except connection, static reactive, SOSPA, etc)



Zones and interconnectors

Inter-zonal charge

- Recovers costs of assets that enable transmission between zones
  - e.g. NIGU assets enable transmission between CNI and UNI
  - e.g. existing lines extending north from Bunnythorpe enable transmission between LNI and CNI
  - e.g. HVDC enables transmission between CSI and LNI
- An “interconnector” is defined as all assets connecting two zones
- Recover the cost of each interconnector using the SPD method
  - Factual uses the actual grid
  - Counterfactual removes the entire interconnector

VoLL assumptions for inter-zonal charge

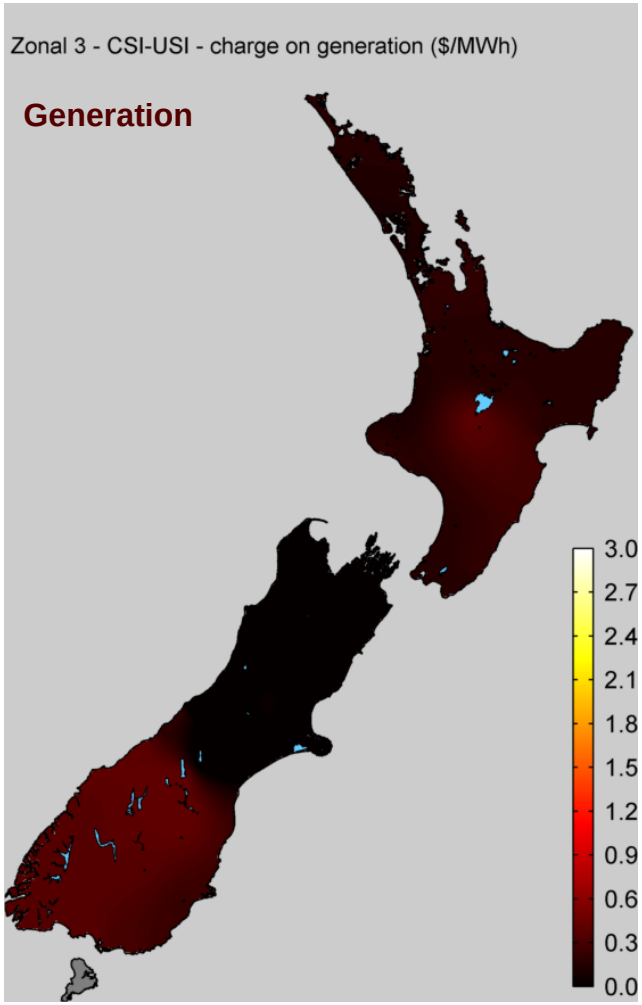
- Use a value of VoLL that reflects the frequency of nonsupply in the counterfactual
  - generally $3,000/MWh
  - $1,000/MWh for regions where non-supply is reasonably common (in the absence of the interconnector)
  - $300/MWh for small areas where load cannot be served (in the absence of the interconnector)
  - $150/MWh for wider areas where load cannot be served (in the absence of the interconnector)
- E.g. for CSI-USI interconnector, use VoLL of $150/MWh – because USI load cannot usually be served without the interconnector

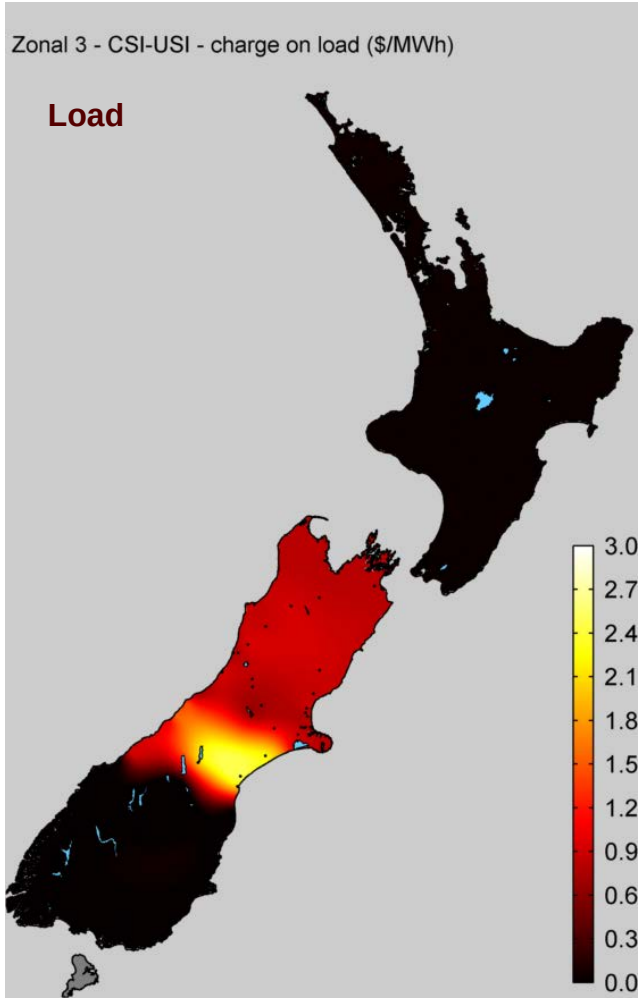
Other assumptions for inter-zonal charge

- Similar design questions as for “simplified SPD” method – e.g.
  - charge based on gross benefit or net benefit?
    (Preference for gross benefit at this point)
  - half-hourly, daily or monthly capping?
    (Preference for daily capping at this point)
  - charge distributors or retailers?
    (Preference for retailers at this point)
  - charge monthly or annually?
    (Preference at this point is for charging annually, based on the previous two years)

Incidence of inter-zonal charge

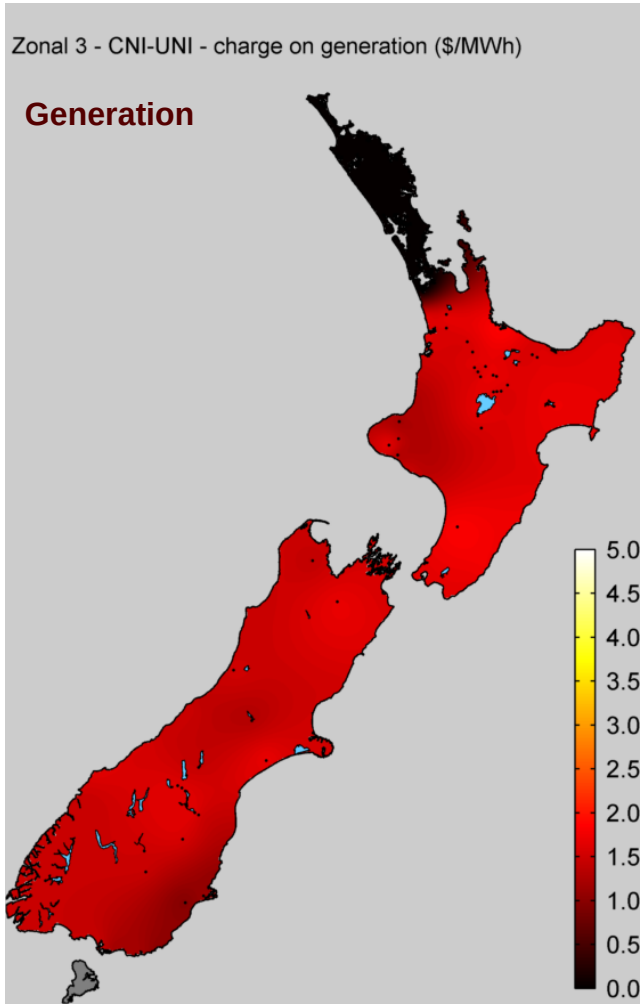
(example: CSI-USI interconnector)

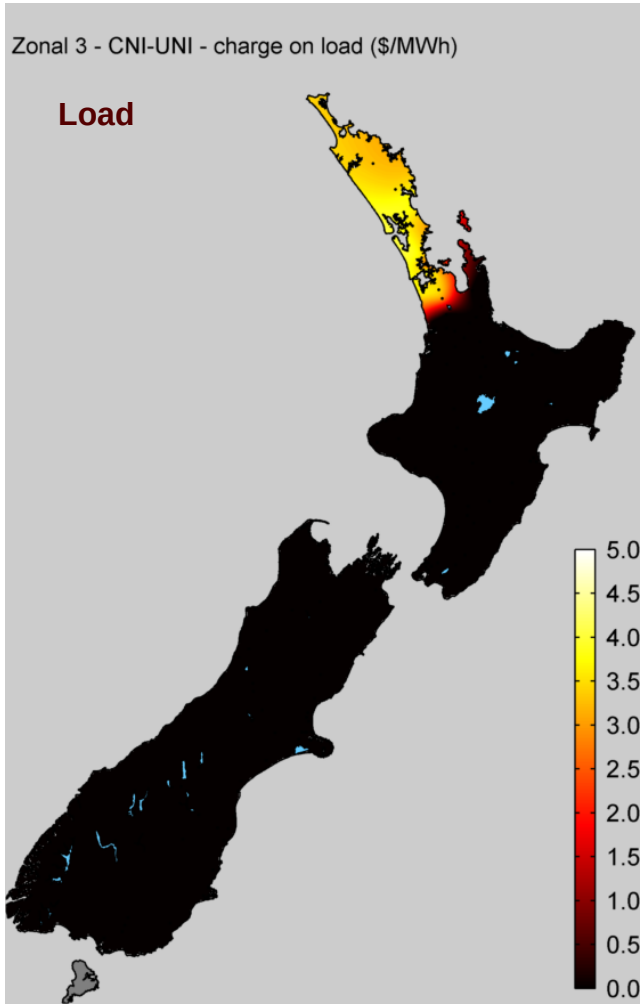




Incidence of inter-zonal charge

(example: CNI-UNI interconnector)





Within-zone asset charge

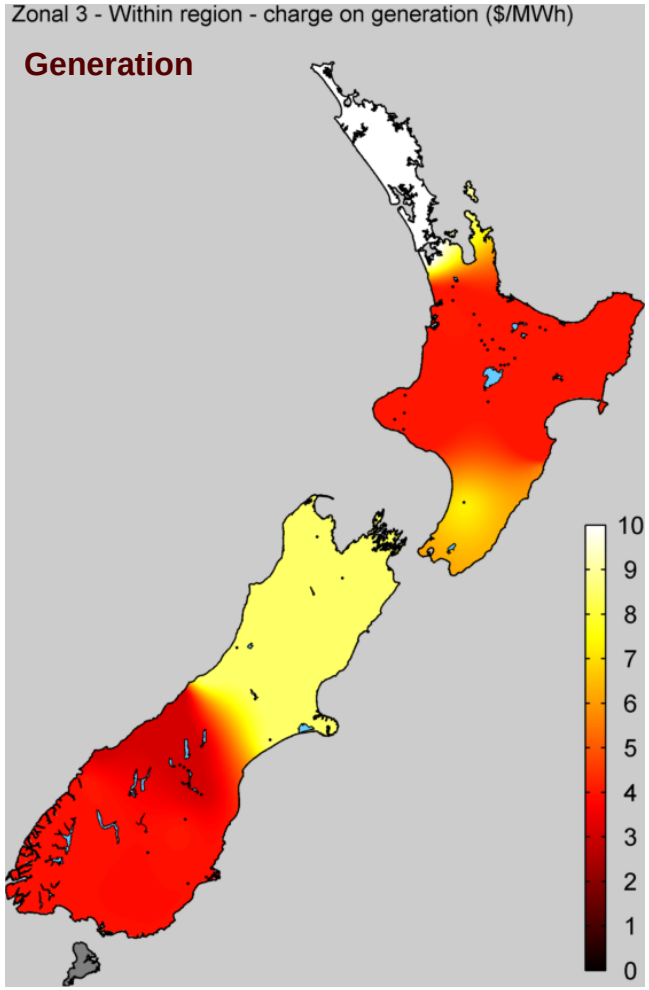
- Recovers costs of assets that enable transmission within a zone
  - e.g. NAaN assets enable transmission within UNI
  - e.g. existing lines north of Christchurch enable transmission within USI
- Costs are recovered through a constant per-MWh charge within each zone
  - Various other options could be used, e.g. peak charge

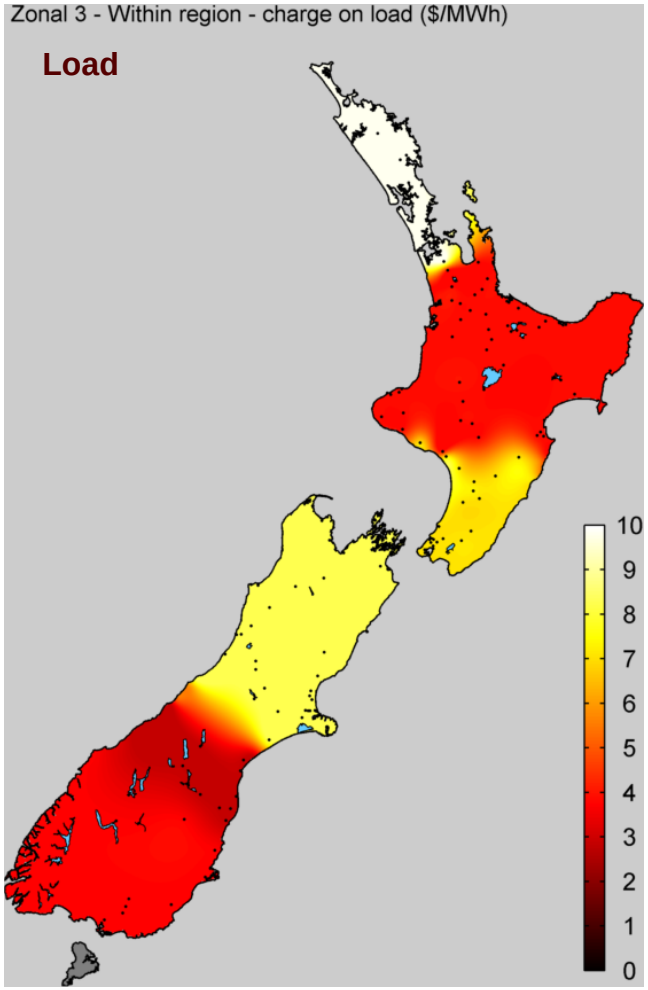
Non-asset-specific charge

- Recovers all other Transpower costs (except connection, static reactive, SOSPA, etc)
- Costs are recovered through a constant per-MWh charge
  - Various other options could be used, e.g. peak charge

Incidence of within-zone asset charge

+ non-asset-specific charge





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Qualitative assessment

Criterion	Original SPD	Simplified SPD	GIT plus SPD	SPD plus GIT	Zonal SPD
Prices reflect benefit of investment	✓✓	✓✓	✓✓	✓✓	✓
Extent of application of beneficiaries-pay	✓	✓	✓✓	✓✓	✓
Recovery of costs of reliability investments	✓	✓	✓✓	✓✓	✓✓
Simplicity	5th	3rd	2nd	4th	1st

Qualitative assessment (cont.)

Criterion	Original SPD	Simplified SPD	GIT plus SPD	SPD plus GIT	Zonal SPD
Avoid inefficiently altering use of the grid	✓	✓	✓	✓	✓
Incentives for evolution of more efficient charging	✓✓	✓✓	✓✓	✓✓	✓
Implementation costs					
Incremental participation costs					
Risk of inefficient disconnection		Low	Medium	Medium	Low - medium

Criterion 1: Prices reflect benefit of investment

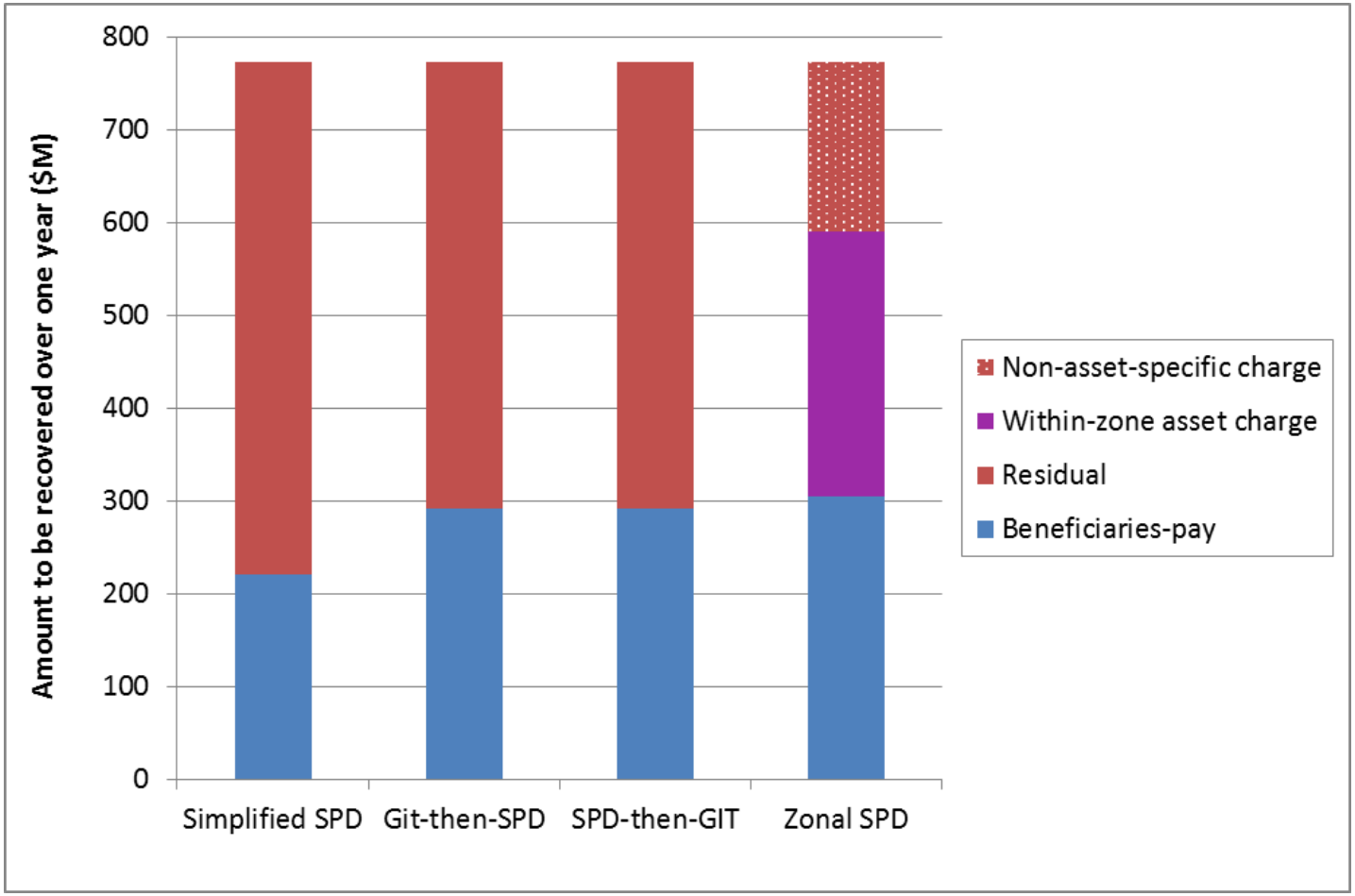
- **Yes** for “original SPD”, “simplified SPD”, “GIT plus SPD” and “SPD plus GIT”
- **Partially** for “zonal SPD”

Criterion 2: Extent of application of beneficiaries-pay

- **Partial** for all four options
- More for “GIT plus SPD” and “SPD plus GIT” than for “simplified SPD”, as the GIT-based options apply beneficiaries pay to reliability benefits

Breakdown of amount to be recovered

(based on modelling)



Criterion 3: Recovery of costs of reliability investments

- **Partial** for “original SPD” and “simplified SPD”
- **Full** for “GIT plus SPD”, “SPD plus GIT” and “zonal SPD”

Criterion 4: Simplicity

- **Relatively simple – “**GIT plus SPD”, “zonal SPD”
- **More complex** – “simplified SPD”, “SPD plus GIT”
- **Most complex** – “original SPD”

Criterion 5: Avoid inefficently altering use of the grid

- **Partially** in all five cases but limited as charges proportional to private benefit

Criterion 6: Incentives for evolution of more efficient charging

- **Yes** for “original SPD”, “simplified SPD”, “GIT plus SPD” and “SPD plus GIT”
- **Partial** for “zonal SPD”

Criterion 7: Implementation costs

- All methods require implementation of a SPD-based charge
- "GIT plus SPD" and "SPD plus GIT" also require implementation of a GIT-based charge
- "Zonal SPD" also requires implementation of a within-zone charge

Criterion 8: Incremental participation costs

- All methods impose costs on participants directly subject to charges to understand application of SPD-based charge
- "GIT plus SPD" and "SPD plus GIT" also require participants directly subject to the GIT-based charge to understand this charge(but relatively straightforward)
- "Zonal SPD" also requires affected participants to understand within-zone charge (but relatively straightforward)

Criterion 9: Risk of inefficient disconnection

- Lowest for “original SPD”
- Next most for “simplified SPD”
- Next most for “zonal SPD”
- Highest for “GIT plus SPD” and “SPD plus GIT”

Agenda

1. Introduction, context, reasons for focusing on beneficiaries-pay options (Chapters 2-5)
2. Beneficiaries-pay options (Chapters 6-9)
3. Evaluation of options (Chapter 10)
4. Other matters

Other matters

- Authority staff happy to meet parties on a one-to-one basis to discuss the beneficiaries-pay working paper or other working papers out for consultation
- Parties wishing to do this should contact David Lewis: David.Lewis@ea.govt.nz