

Submission summary for consultation on normal frequency generator AOPOs

Key issues

Issue	Action/Comment
<p>1. Dead bands are inherent in all governors and common in other jurisdictions (ME). Without defining a maximum dead band, the standard is open to interpretation by the generator and System Operator and could place an excessive burden on thermal units, which will be forced up and down constantly due to normal frequency variations. This will result in damage, reduce asset life and possibly increase risk of tripping (GE, CE). Provision for a small dead band would not materially affect frequency response and provide for inherent dead band without requiring debate with SO (ME). Suggested maximum dead bands are 25 mHz (ME, TP), and 100 mHz (TE).</p>	<p>Discuss with SO the option to include a maximum dead band to allow for inherent delays in governor response (including using error from nominal vs error from edge of dead band).</p>
<p>2. Standard focuses on droop when other settings (eg gain, damping) are also important (GE, NZWEA). Standard should also contemplate modern control settings such as sliding scale droop and other logic for altering settings according to the circumstances (GE). Generators can still dampen their response and still comply with requirements (ME, GE). Presume that requirements excludes units on TWD (ME)</p>	<p>At present, governor operation must demonstrate that it is stable, adequately damped, and droop must be agreed and set between 0-7%. Discuss issues and possible alternatives with SO, eg</p> <ul style="list-style-type: none"> • Do requirements adequately cope if generators wish to over-dampen their response? • To what extent can generators apply different settings for different conditions and still comply (discuss Genesis experience at Tokaanu)? • Are units on TWD or similar required to comply with rule 2.1?
<p>3. The Commission should have compared option to create separate requirements for wind farms with single standard for all (NZWEA).</p>	<p>The Commission considered the option for specifying separate requirements for different generation technologies. However, this would require the Commission to determine which generation technologies it should favour over others and the basis for doing so. It preferred instead to create a level playing field with respect to generation technologies so investors themselves receive the right economic signals to make the tradeoffs required.</p>
<p>4. The Commission should implement the Australian frequency deviations market rather than this proposal (TP)</p>	<p>The paper only suggests that the frequency deviations market is too large a step to take in one stride. The steps the Commission is making now (standards, cost allocations, AGC-based frequency regulation market) might eventually lead to that outcome, should</p>

	the benefits be expected to outweigh the costs.
5. Question justification for changing minimum droop from 7% to 6% (ME, TE). Confirm that proposal would not require generator to apply for new dispensations (TP, CE).	Does narrowing the range provide a net benefit? It appears generators are more concerned about provision for dead bands than the reduction in the droop range.
6. Proposal wrongly treats generators that do not comply with the standards as “causers” (GE).	Disagree - see cost allocation summary for response
7. Limit requirement to agree settings with SO to those that affect governor performance (NZWEA, TP, TE)	Seems reasonable - discuss with SO
8. Some experience that ‘catch all’ rules have scared off generator manufacturers (TP)	Is this a real issue? If so, the requirement for assets not to adversely affect SO’s ability to meet its PPOs is generic and might be reviewed at a later date.
9. Change 5.1.1.1 from support PPOs to ‘does not adversely affect’ PPOs (TE)	Discuss with SO
10. SO should be obliged to process applications for a change in settings within a reasonable timeframe (NZWEA, TE)	Encourage SO to add target response times in their published business charter? Could be added to list of possible development items for policy statement review?
11. Do not go ahead with the proposal until an AGC-based frequency regulation market is in place (NZWEA, TE). These proposals are a distraction (TE).	Disagree. The Commission is committed to facilitating the development of an AGC-based frequency regulation market. The Commission, the System Operator, and the generators are collectively responsible for the timeframe in which this might be achieved. Halting work on confirming the standards would not speed up the progression of this project.
12. Question whether proposal will improve frequency response by generators and/or reduce frequency keeping requirements (ME, GE). Accept that there is some benefit in clarifying the requirements (ME).	It is possible that the clarifications contained in the proposal may clear up misunderstandings and result in generators sharpening their response to frequency under normal conditions. However, the principal benefit expected is the improvement in dynamic efficiency that stems from a level investment environment with respect to generator technology choices as investors make more appropriate tradeoffs between different capabilities.
13. Want to be able to aggregate performance across stations and have System Operator approve equivalence (GE)	Isn’t practicable - see cost allocation summary for response

Full table summary of submissions

Question	Submitter	Submission	Preliminary comment
Q1 - With respect to normal frequency management, are there features of other grid codes you think the Commission should consider?	Genesis Energy	<p>Genesis Energy recommends that the performance obligations need to be defined with regard to the actual performance of generation assets in New Zealand, current operational practice, the objectives and design of the overall frequency keeping regime and the performance tradeoffs inherent in setting the performance obligations.</p> <p>Genesis Energy recommends that the regulator should engage with technical experts from each generation asset owner to develop a better set of performance obligations. A technical workshop may be an effective way of doing this.</p>	Proposal clarifies existing requirements. A technical workshop to provide more sophisticated set of requirements is not considered a priority at this stage but it may be appropriate to do so after the frequency regulation market has been implemented.
	Meridian Energy	<p>Yes. In Meridian's view the Commission should consider the establishment of a maximum frequency deadband requirement for governor controls (eg similar to UK & Ireland Codes).</p> <p>Meridian notes that some level of frequency deadband is inherent in all governors. Such a requirement should not allow generators to intentionally restrict operation, but should define a maximum permissible inherent deadband.</p> <p>Meridian submits that, without a deadband requirement, the rule change is open to more than one interpretation, such as what might or might not be a normal and/or acceptable frequency deadband.</p> <p>Meridian further submits that, provided the maximum frequency deadband is small, there should be no real increase in frequency keeping and reserve requirements (and the costs associated).</p>	[Discuss two alternatives (with and without max frequency deadband) and pros and cons of each with the SO]
	MEUG	No.	Noted
	Mighty River Power	No – The NZ system is unique and it is hard to find parallels with any other countries due to our isolation and lack of interconnection with other grids.	Noted
	NZWEA	The Executive Summary of the paper discusses that in Australia “there are greater opportunities/penalties...associated with supporting frequency under normal conditions” and that the requirements to support frequency	The paper only suggests that the Australian model is not practicable now. The Commission is nevertheless

		<p>are “reinforced with a relatively sophisticated market...” These then provide generators with “an incentive to make additional capability available” and other generators and loads “an incentive to change behaviours to lessen any adverse impacts”. The paper then goes on to note that the Commission is not proposing to establish a sophisticated market like Australia’s at this time, but that it is hoping to achieve the same goals through applying generic standards and cost allocation principles. It is difficult to see how this approach would be able to emulate the perceived success of the Australian arrangements, as cost allocations and the limits to our existing procurement arrangements will not provide any incentive to provide additional capability, or any benefits from changing behaviour. NZWEA suggests that if Australia is to be used as a reference that this should be for its full, sophisticated market arrangements and not just selected components.</p> <p>The consultation paper has included extracts from the grid codes from some other power systems, such as the NEM, EIR Grid, PJM, etc. In some cases these codes identify that there are separate requirements for wind farms, but only the requirements of the conventional generators have been presented in the paper. This makes it impossible to determine what the implications of these alternative requirements might be, compared to the suggested ‘generic’ approach. Given that the paper has been prepared as a result of the Wind Generation Investigation Project (WGIP) perhaps it might have been appropriate for the paper to consider these “alternative” arrangements for accommodating wind generation in more detail?</p>	<p>taking steps that might eventually lead to that outcome, should the benefits be expected to outweigh the costs.</p> <p>The Commission considered the option for specifying separate requirements for different generation technologies. However, it preferred instead to create a level playing field with respect to generation technologies as it provides investors the right economic signals to make the tradeoffs required.</p>
	TrustPower	<p>Yes, TrustPower does not agree with the statement in paragraph 5.2.1 stating that “... unrestricted governor control appears to be a standard feature in grid codes.” By undertaking a quick Google search it is evident that many other jurisdictions such as BC Hydro, Ontario, Alberta, Finland, Romania and we expect many others allow a small deadband typically in the order of 50mHz (+/- 25mHz from nominal) to be introduced much like that of the UK and Ireland.</p> <p>TrustPower considers the Australian frequency deviations market to be a very good mechanism as it incentivises both load and generation to perform prudently. Given that the cost of frequency keeping in New Zealand has averaged approximately \$60M per annum over the last 5 years and that with the introduction of further windfarms, frequency keeping is expected to become more of an issue in the future, TrustPower firmly believes that a sophisticated frequency deviations market similar to that of Australia can be</p>	<p>[Discuss two alternatives (with and without max frequency dead band) and pros and cons of each with the SO]</p> <p>The paper only suggests that the Australian model is not practicable now as its first priority is to create an AGC-based frequency regulation market.</p>

		justified.	
	Todd Energy	<p>Neutral</p> <p>We would make the general comment that the current inflexible and competition-lacking frequency keeping (FK) procurement arrangements result in inefficient pricing of the ancillary service. The proposed changes will do nothing to address this key issue.</p>	Noted
	Contact Energy	Contact submits that the particulars of the NZ market need to be accounted for when considering appropriate rules for the provision of governor control.	Noted
Q2 - Do you agree with the proposal to clarify rule 2.1 so that generators must ensure their generating units operate under unrestricted governor control?	Genesis Energy	<p>No.</p> <p>This places an excessive burden on thermal units which will be forced up and down constantly due to normal frequency variations. This will result in damage and ultimately reduce asset life. These costs were not transparent upon commissioning and will present significant challenges to commercial planning.</p> <p>Genesis Energy does not believe that droop alone is an accurate measure of frequency support.</p> <p>A hydro unit with a responsive droop setting but a very low gain setting is likely to provide less support (particularly in the normal frequency band) than a thermal unit with a moderate droop and gain setting.</p>	The proposal does not change the decisions facing generators - It has always been up to the generator to determine whether or not it considers it more economic to comply or apply for a dispensation, a condition of which has always been to pay any attributable costs.
	Meridian Energy	<p>Meridian agrees that unrestricted governor control creates a level playing field. Meridian is concerned, however, that the rule change may not have the desired effect (ie to improve primary frequency control and reduce the amount of frequency keeping procurement). This is because the level of improvement will depend on stability settings applied to affected governors.</p> <p>In the worst instance, Meridian submits that generators can still limit governor action while complying with EGR requirements, by reducing governor responsiveness (ie increasing damping, as opposed to increasing droop). This would have a negative impact on frequency following the sudden loss of generation or load.</p> <p>Meridian understands that "injecting electricity into the grid" means injecting real power into the grid. Meridian therefore assumes that generating units in</p>	<p>Discuss with SO:</p> <ul style="list-style-type: none"> • Will requirement for speed governors to provide stable performance with adequate damping (5.1.3.1 in tech code A) address this concern? • Does "injecting electricity into the grid" accidentally include units on TWD or similar mode of operation?

		synchronous condenser, TWD or similar mode of operation, can be connected to the grid while not being required to meet this requirement.	
	MEUG	Agree with the proposal	Noted
	Mighty River Power	Yes, the rules should be clarified. However we disagree that plant with deadbands on their governors contribute to frequency deviations.	Note your support for clarifying the rules. Agree that plant with dead bands do not contribute to frequency deviations but, given that frequency must be kept relatively stable and generators can practicably made to do so, the distinction being drawn is one between plant that is deemed to be contributing to frequency stability and plant that is not.
	NZWEA	The use of the term “unrestricted” may need appropriate qualifications to suit the nature of the particular generating unit. Some small amount of dampening may be required to prevent excessive wear and tear on the generator and/or its control equipment.	The System Operator approves the speed governor settings, including its inherent limitations, under rule 5.1.4.
	Transpower	Transpower supports the recommendation to clarify rule 2.1 in section III of Part C as set out in the consultation paper	Noted
	TrustPower	<p>No.</p> <p>New Zealand’s generation capacity is dominated by hydro generators and the governing systems of hydro generators contain a number of reasonably significant mechanical components which are subject to reasonable levels of wear and tear. Mechanical governor heads, hydraulic actuation valves and servos, wicket gate bushes etcetera.</p> <p>TrustPower therefore believes that a small deadband, in the order of +/- 25mHz from nominal, such as that applied in the UK, Ireland, BC Hydro, Ontario, Alberta, Finland, Romania and we expect many other jurisdictions is prudent.</p> <p>TrustPower presently applies a small deadband to minimise wear and tear on hydro/mechanical plant and considers this prudent engineering practise. For avoidance of doubt, TrustPower does not configure it’s governors with a</p>	[Discuss two alternatives (with and without dead band) and pros and cons of each with the SO]

		deadband spanning the “normal band” (+/- 200mHz) as it considers this excessive.	
	Todd Energy	<p>No.</p> <p>There needs to be an allowed small dead band or insensitivity range as there is a considerable maintenance penalty incurred by some plant (eg. wear of parts and/or reduction in operating hours between maintenance intervals) in providing full FGA response from 50Hz. The cost of this maintenance penalty is a component of the offer from the FK willing to provide the service.</p> <p>It is unreasonable to expect generators who can maintain a firm or constant dispatch set point to incur additional operational costs through providing completely unrestricted free governor action to support normal frequency fluctuations caused by real time changes from the demand-side and non-firm generation. It is these participants that cause the need for the FK service.</p> <p>Further, and perhaps hypothetically, if full FGA was provided with no dead band setting there would be no steady-state frequency error for the FK to provide the integral control that is contracted under the FK ancillary service, and generators providing FGA would move further from their dispatch set point until re-dispatch occurs.</p> <p>Without an appropriate dead band allowance in the rules there would need to be consideration given to the level of non-compliance in determination of any costs associated with a dispensation under rule 2.1 for the ECs proposal to have the desired effect.</p> <p>Eg. A generator may be required by the manufacturer to have a minimum dead band of +/-25 mHz for which it requires a dispensation. Under the EC’s FK cost allocation proposal, once the generator has a dispensation it would then be allocated an unavoidable portion of total FK costs based solely on the generators reconciled kWh volume for the month regardless of the magnitude of non-compliance. Under the current proposal, once a dispensation is required there is no incentive for the generator to contemplate setting the required dead band to the minimum level practicable for the machine as the generator will incur additional maintenance costs in doing so. The outcome could be less FGA provided by generators requiring a dispensation, potentially increasing the FK band</p>	[Discuss two alternatives (with and without dead band) and pros and cons of each with the SO].

		<p>required.</p> <p>Also on a 'level playing field' basis, the magnitude of non-compliance with rule 2.1 should be taken into account in allocating costs to each generator, though it is acknowledged that this will add further complexity to the dispensation assessment and cost allocation process.</p> <p>An appropriate dead band or insensitivity should be allowed under rule 2.1 (eg. 50% of the normal band) as a workable compromise.</p>	
	Contact Energy	No. Contact believes that this is likely to introduce unnecessary costs on existing providers of governor control, and that the proposal would not take into account the characteristics of NZ generation plant, and their limitations.	Disagree
	Contact Energy	<p>Where generators don't provide unrestricted FGC (as per the EC interpretation of the rules) there are likely to be practical reasons for this. While the provision of unrestricted FGC from hydro generation is likely to be feasible in the majority of cases (for existing hydro plant), unrestricted FGC from geothermal or CCGT generation could increase the risk of plant tripping, and thus potentially contribute to higher deviations from the normal band i.e. major frequency events. Although the variations from the provision of unrestricted FGC are likely to be relatively small, older thermal plant in particular may not be able to respond without significant consequences for reliability and maintenance costs. While each individual FGC response may be small in its own right, the cumulative impacts will also accelerate major plant maintenance costs (via accelerating EOH and associated costs) beyond what they would otherwise be. In addition, where thermal plant is operating at maximum levels (for set ambient temperatures) there may be limited scope for increased provision of FGC anyway, and it may be limited to only one direction (i.e. could only back off when load reduces).</p> <p>Also, the characteristics of geothermal plant may not ideally lend themselves to the provision of unrestricted FGC.</p> <p>Given the criticality of this plant in providing capacity to the market, it does not seem reasonable to impose additional obligations beyond what is already effectively provided via reasonable endeavours of the operators of those assets within the normal band for frequency.</p> <p>Contact believes that these issues are key to understanding the current level of provision of FGC, and how this could be expected to change under</p>	The proposal does not change the decisions facing generators - It has always been up to the generator to determine whether or not it considers it more economic to comply or apply for a dispensation, a condition of which has always been to pay any attributable costs.

		the proposal. Contact would be happy to discuss these details with the EC, and suggests the EC seek wider technical advice from providers of FGC.	
	Contact Energy	<p>Contact does not believe that dispensation should be required for generation plant that cannot provide unrestricted FGC.</p> <p>Current providers of FGC do not receive an explicit payment for providing that service. Given that the major drivers of the need for FGC are noisy demand an intermittent generation, it does not seem reasonable to require unrestricted provision of a service (beyond the level that generators are comfortable to provide) by other parties which don't receive a direct benefit from doing so; and who may actually incur material costs if required to do so.</p> <p>The current level of FGC provision is likely to reflect a generator's ability to provide the service without compromising their ability to provide energy/capacity, while accounting for the impacts on maintenance costs and reliability.</p>	See response above. Compliant generators who can meet the additional requirements of the frequency keeping service can obtain payment for it.
Q3 – Do you agree with proposals for speed governor requirements?	Genesis Energy	<p>No.</p> <p>Changing the droop setting on hydro generation units will have little effect as these plants have very low gain set points and are therefore very slow to respond. See response to Q2 above for the effect on thermal assets.</p> <p>Operators of wind assets should have the choice of whether to install governors or seek a dispensation and face an allocation of frequency keeping costs.</p>	All generators, including operators of wind farms, have the choice between providing frequency support themselves (by complying with the AOPOs) or paying a share of frequency keeping costs.
	Meridian Energy	<p>Meridian agrees with the proposed wording amendment.</p> <p>However, Meridian does not agree with the proposal to change the droop setting range upper limit to 6%. Meridian notes that the Commission has not provided any rationale for this change.</p> <p>Meridian is concerned that the Commission does not appear to fully understand permanent speed droop (droop) in its discussion paper. For instance, section 4.2 suggests that “<i>sharpening the response via the droop settings ... would arrest frequency falls faster</i>”. Meridian submits that this is incorrect.</p> <p>Meridian notes that the dynamic response of the governor contributes to</p>	<p>[Comment on rationale for 6% vs 7%]</p> <p>Agree that the response to frequency by generators is affected by more than the permanent speed droop setting of their governors.</p> <p>Agree that link between 6% droop and minimum North Island frequency of 47 Hz is not directly related.</p>

		<p>arresting frequency fall, not the permanent speed droop.</p> <p>Permanent speed droop defines a steady state response in the period prior to secondary frequency control action (ie prior to frequency keeping ancillary service action).</p> <p>Meridian notes that the Executive Summary of this paper states that the paper “contains the results of the review of the first set of obligations; the requirement for generators to support frequency under normal conditions (ie in the absence of events that cause the sudden loss of a significant quantity of generation or load)”.</p> <p>However, discussion in Section 6.6.4 makes a link between 6% droop and the minimum North Island frequency of 47Hz. These values are unrelated as droop is a steady state metric and the minimum frequency requirement is a dynamic metric. Making recommendations based on minimum North Island frequency is therefore inappropriate.</p>	
	MEUG	Agree with the proposal including setting droop between zero and 6 percent (was 7%).	Noted
	Mighty River Power	No – The requirements to provide response to frequency deviation and stable operation are to a large degree mutually exclusive. Modern electronic devices may have the functionality of dual settings but many older mechanical devices do not have this functionality. There should be scope within the rules to allow for fast acting responsive devices as well as slower more stable devices.	The rules provide scope for both fast acting and slower, more stable devices. Rule 5.1.4 provides for the generator and System Operator to agree settings which provide a suitable proportional and stable response to frequency. However, according to the proposal, the slowest proportional response a generator might agree with the System Operator is a droop setting of 6%. A generator can choose a setting greater than this (ie reducing its response) but it would require a dispensation that would come with an allocation of frequency keeping costs. Alternatively, it could invest in newer control technology that would allow it to comply.

	NZWEA	<p>Dispensations must be made available for technologies that are not able to provide a free governor response. A relevant cost allocation might also then be applicable (provided that this is applied in conjunction with an appropriately sophisticated frequency keeping procurement market).</p> <p>NZWEA also understands that the contribution of governors to frequency response can be influenced by other controller settings in addition to the droop setting (such as the 'gain' setting that influences the speed of response). A focus only on droop in the AOPO's may then mean that opportunities to improve frequency response are missed. Broader or more flexible requirements may need to be specified to capture these opportunities.</p>	<p>Dispensations are available but pick up a share of frequency keeping costs.</p> <p>The Commission is aware that there are other settings associated with the speed governor that affect the response of a generating unit to frequency. There is scope for flexibility suggested by the submitter as rule 5.14 provides for appropriate settings (more than just the droop) to be agreed between the System Operator and the generator.</p>
	TrustPower	<p>Yes, for non intermittent generation. TrustPower presently sets its hydro governors with a droop of less than 6% so does not expect the tightening this obligation to have an impact on TrustPower's performance or its ability to comply.</p>	Noted
	Todd Energy	<p>Neutral</p> <p>The EC's proposed re-wording seems largely arbitrary, as is the context of rule 5.1 reducing the upper limit of the droop setting to 6% reduces the expected range of the governor, but 6% is not a strict 'upper limit' as the context of the rule is that the governor "can have droop set" within the range.</p> <p>We would also query whether 0% droop is physically practicable, as this would imply the control system is required to have infinite proportional gain (gain being inversely proportional to droop)?</p>	<p>A droop setting of 0% is referred to as isochronous mode. It is possible on small electrical grids for one larger machine to be operated in Isochronous Speed Control mode while other (usually smaller) generators are operated in Droop Speed Control mode but this operation may or may not be practical in New Zealand.</p>
	Contact Energy	<p>Contact expects that the proposed change to droop settings could be accommodated; however we will require additional time to confirm that it is possible for all plant.</p>	Noted
Q4 - Do you agree with the proposal that initial and all subsequent changes	Genesis Energy	Yes	Noted
	Meridian	Meridian agrees with the proposed wording amendment.	Noted

to the speed governor settings be agreed by the System Operator?	Energy		
	MEUG	Agree	Noted
	Mighty River Power	Yes – While in principle the SO must control frequency quality, limitations of various governor types must be acknowledged and a flexible proactive stance adopted by the SO. Achieving repeatability of settings for mechanical devices sets a number of challenges compared with programming electronic devices where repeatability can be assured. Enforcing the need to test, return to service, obtain permission and then perhaps retest/reset governors will be time consuming and difficult.	Noted
	NZWEA	Given the increasing range of functionality on some modern generator control systems, it might be appropriate to limit the requirement to those “settings” that might have an impact on governor, and therefore system, performance. Perhaps it might also be appropriate to include some reference to the timeliness of the response from the System Operator (subject to their receiving the appropriate information from the Generator)? This is perhaps covered elsewhere in the Rules?	Seems appropriate that settings be limited to those that impact on governor performance. Should EC encourage the SO to publish minimum response times in their business charter? [Discuss with SO?]
	TrustPower	No. Modern digital governors, such as the one developed by TrustPower, can contain many configurable features in addition to speed governing. For example configurable user displays, test routines, diagnostics, data capture etc ... For this reason TrustPower wishes to see the wording limited to only include settings which have the potential to change the performance of the speed governor. While not presently an issue TrustPower has in the past experienced considerable delay in the processing of applications from the System Operator. TrustPower would therefore like to see an obligation on the System Operator to process applications with a reasonable timeframe once, of course, they have received all of the required information.	See above
Todd Energy	No. Modern digital speed control systems have may parameters and settings	See above	

		<p>that have no impact on the power system.</p> <p>Only those settings 'that may have an adverse effect on the integrated operation of the power system' should require prior SO approval.</p> <p>There should be a requirement for the SO to approve any proposed change to relevant settings within a mandatory timeframe, or as otherwise agreed with the asset owner.</p>	
	Contact Energy	Contact believes that the existing wording contained in the rules is clear, and does not require amendment.	Noted
Q5 - Do you agree with the Commission's analysis regarding the "catch-all" rules?	Genesis Energy	Yes	Noted
	Meridian Energy	Meridian agrees with the Commission's analysis.	Noted
	MEUG	Agree	Noted
	Mighty River Power	<p>Yes – refer to question 4 above. In addition we do not consider generation with deadbands adversely affects the ability of the System Operator to plan to comply, and to comply, with its principal performance obligations. Proactive management by SO could improve overall control of frequency management such as better or more demand forecasting/control.</p>	<p>Agree that very small dead bands are unlikely to affect the System Operator's ability to meet the PPOs.</p> <p>[Discuss two alternatives (with and without dead band) and pros and cons of each with the SO]</p>
	NZWEA	No comment	Noted
	TrustPower	<p>TrustPower's experience of the "catch all" clauses contained within Part C of the rules is mixed. While to date the System Operator has tended to interpret the "catch all" clauses in a reasonable and prudent manner, non definitive clauses of this type are often a cause of great concern to equipment vendors when negotiating commercial contracts for the supply of new equipment. This uncertainty has resulted in transactions with very reputable equipment vendors and products unnecessarily breaking down - not because of technical capability but perceived regulatory risk.</p>	[Could canvass generators to assess extent to which this has occurred?]

	Todd Energy	<p>No.</p> <p>Rule 5.1.1.1 is currently too subjective around what may be required of the generator in “supporting” the SO in meeting its PPOs. These are technical requirements so should be objective wherever possible.</p> <p>Rule 5.1.1.1 should be amended to read “does not adversely affect the ability of” the SO in meeting its PPO’s.</p>	Agreed? [Discuss with SO]
	Contact Energy	Contact is not clear as to why changes to these rules were considered, but agrees that no change is required.	Noted
Q6 - Do you have any comments on the proposed rules?	Genesis Energy	Refer cover letter. Genesis Energy believes that the proposed changes to the performance obligations will lead to the cost allocation proposal not correctly targeting causes and will have limited effect on current operating settings. As such, Genesis Energy believes that the proposed rules will not achieve the Commission’s objectives.	<p>Accept that mandating a minimum standard allows for a variation in the level of frequency support from generators. However, the Commission expects that the development of an AGC-based frequency regulation market will reward better performance.</p> <p>Given that frequency must be kept relatively stable and generators can practicably made to do so, the distinction being drawn is one between plant that is deemed to be contributing to frequency stability and plant that is not.</p>
	Meridian Energy	<p>Regarding Rule 2.1, Meridian submits that the Commission should consider the existing wording of “make the maximum possible injection contribution to restore frequency to the normal band.” as this is open to more than one interpretation and can be argued to be contradictory to Rule 5.1.2.</p> <p>Meridian notes that the System Operator is required to assess contributions against ACS data, so there is no need to use the misleading wording “maximum possible injection”.</p> <p>Meridian submits that clearer wording might be “make a positive contribution to restore frequency.”</p>	The wording concerned falls under scope of review of generator obligations during periods of under frequency.

	MEUG	No comments	Noted
	Mighty River Power	The proposed rules appear to discourage investment in non-responsive generation rather than encourage investment in responsive generation. As the Commission notes in its paper, the main cause of frequency fluctuations is from load, with unstable generation adding to variations. Whilst governor dead bands prevent a response to these fluctuations, they do not cause them. By discouraging certain investment decisions rather than encouraging others, a potential outcome is that security of supply is jeopardised as a result of pursuing improvements in frequency quality. As there appears to be no thorough analysis of current or future frequency quality under the current rules, this would clearly be an unwanted outcome of the proposed rule changes.	The clarifications contained in the proposal may clear up misunderstandings and is expected to level the investment environment with respect to generator technology choices. This should improve dynamic efficiency as investors make more appropriate tradeoffs between different capabilities.
	NZWEA	<p>Appendix 2 of the paper identifies that the proposed change achieves the Commission's principal objectives only through its influence on investment decisions. Section 7.3 identifies the main benefit as a reduction in the amount of frequency keeping procured. This would seem to be a very important benefit, consistent with the Commission's objective to put downward pressure on delivered electricity costs. Perhaps if the rules are adopted they should be reviewed to see if the expected cost reduction has actually been achieved? Failure to achieve this outcome might suggest that there are actually other issues that need attention.</p> <p>As discussed in our submission on the cost allocation consultation paper, if it is perceived that the current rules are not being interpreted in the intended manner then it seems sensible to clarify the rules to ensure that the desired outcomes are achieved (subject to those rules actually being appropriate to the capabilities of the generators – there may be good, practical reasons why some generators are constraining their frequency response).</p>	It is possible that the clarifications contained in the proposal may clear up misunderstandings and result in generators sharpening their response to frequency under normal conditions. However, the principle benefit expected is the improvement in dynamic efficiency that stems from a level investment environment with respect to generator technology choices as investors make more appropriate tradeoffs between different capabilities.
	TrustPower	<p>While the objective of these proposed rule changes is to “improve generation investment signals” TrustPower believe there should be an additional, and not necessarily secondary, objective of “optimising frequency management”.</p> <p>The consultation paper is relatively silent on the financial implications associated with unrestricted governor control. TrustPower's expectation is that if unrestricted governor control is increased then primary frequency</p>	The drafting changes only clarifies that unrestricted governor control is required within the normal band. It is already required when frequency is outside the normal band. However, it is possible that this clarification may clear up misunderstandings that result in

		<p>control will improve which implies that fewer instantaneous reserves will be required in the future than at present to arrest an underfrequency event of the same magnitude. This would in turn, assuming an efficient market, result in lower instantaneous reserves costs for New Zealand Inc.</p> <p>TrustPower would have serious concerns if these proposed rule changes did not result in less instantaneous reserves being procured as this would imply that either: 1) insufficient instantaneous reserves are being procured at present, or 2) instantaneous reserves will be unnecessarily over procured in the future, or 3) the proposed changes are immaterial and therefore potentially unjustifiable.</p>	<p>generators sharpening their response to frequency under normal conditions. It is possible that any such changes filter through to the ACS and generator models and impact on the System Operator's reserve modelling.</p>
	Todd Energy	<p>It is our view that industry efforts would be better focussed on implementing the broader market initiatives that will introduce much needed competition and flexibility into the current non-efficient FK arrangements for the benefit of putting downwards pressure on FK procurement costs.</p> <p>We remain dissatisfied with the time being taken to develop these broader initiatives. The rules proposed under this paper are likely just a distraction from the more important FK work stream and are just tinkering around the edges and likely to have minimal effect on overall FK costs.</p>	<p>The Commission is committed to facilitating the development of an AGC-based frequency regulation market. The Commission, the System Operator, and the generators are collectively responsible for the timeframe in which this might be achieved.</p>
	Contact Energy	<p>Contact does not support the proposal, and hence does not support the proposed rule changes.</p>	<p>Noted</p>
<p>Q7 - Do you think there are other reasonably practicable options the Commission should consider?</p>	Genesis Energy	<p>Refer cover letter...[Equivalence section reproduced below]</p> <p>Equivalence arrangements should allow under-performance in some assets to be offset by over-performance in other assets. The mechanism should be able to apply across multiple assets under common ownership, or across assets under separate ownership provided suitable contractual arrangements are in place.</p> <p>In Genesis Energy's case, the equivalence arrangement could be used to allow the company to provide capability across the company's hydro and thermal assets that is better than can be achieved if each asset is assessed independently.</p> <p>Prior to introduction of the Electricity Governance Rules (EGRs), Genesis Energy's hydro plant was tuned to provide increased responsiveness and optimal reserve response while being stable in a large system setting. The</p>	<p>In principle, the submitter could apply to the System Operator with its case for equivalence. However, it would appear to be difficult to calculate the base on which equivalence might be approved.</p> <p>[Discuss Genesis' issues with SO]</p>

		<p>hydro plant maintained acceptable islanded performance by monitoring frequency stability and switching to a small system gain setting if necessary. The arrangements also preserved the ability for Tokaanu to provide black start.</p> <p>The equivalence mechanism, together with a review of how performance obligations are defined, could be used to reinstate similar arrangements and allow increased response in Genesis Energy's hydro plant not only to compensate for dead bands and sliding scale droop in some of its thermal plant but to also allow Genesis Energy to offer considerably more slow and fast reserve response into the market.</p> <p>Genesis Energy expects that other similarly innovative arrangements could be implemented if the system operator made better use of the equivalence mechanism.</p>	
	Meridian Energy	Meridian has not identified any other reasonably practicable options.	Noted
	MEUG	None at this stage	Noted
	Mighty River Power	<ul style="list-style-type: none"> • Clarify existing rules • Allow generation with deadbands • Rules to encourage investment in responsive generation 	Responsive generation avoids being allocated frequency keeping costs and the Commission's project to develop an AGC-based frequency regulation market should both help achieve the submitter's objectives.
	NZWEA	<p>As discussed in 1, above, it appears unlikely that all of the intended outcomes can be achieved without establishing a suitably sophisticated frequency keeping market. As discussed in our submission on the cost allocation paper, NZWEA expects that such a market would help to achieve the objective of driving down the cost of frequency keeping procurement, and so total delivered electricity prices.</p> <p>In not discussing the details of alternative arrangements in other markets where wind generators fall under different rules it has not been possible to determine whether these types of rules would have materially distorted the playing field for generation investors in New Zealand.</p>	<p>The Commission agrees the development of a frequency regulation market is a key priority. However, it is equally important that investment makers are clear what is required so they can make calculate the costs associated with their choices.</p> <p>The Commission considered the option for specifying separate requirements for different generation technologies. However, it preferred instead to create</p>

			a level playing field with respect to generation technologies as it provides investors the right economic signals to make the tradeoffs required.
	TrustPower	Yes, as stated above, we feel that the introduction of a small deadband to minimize unnecessary wear and tear is very practicable and prudent.	[Discuss two alternatives (with and without deadband) and pros and cons of each with the SO]
	Todd Energy	Yes. Defer proposals from this paper and concentrate on fast-tracking the broader FK procurement initiatives. Otherwise our preference is Option B (allowance for dead band / insensitivity) from the paper.	Deferring the proposals would not improve the timeframe for achieving its other initiatives and note the submitter's preference for option B.
	Contact Energy	Contact believes that incentives on parties causing the need for increased response to frequency changes are more appropriate than the proposal.	
Q8 - Do you have any comments on the Commission's assessment of the options?	Genesis Energy	Refer cover letter. The Commission's comparison with other countries does not adequately account for the high proportion of hydro generation in New Zealand that provides sluggish frequency support.	Do not agree that a high proportion of New Zealand's hydro generation is sluggish.
	Meridian Energy	Meridian is not convinced that the proposed changes will provide any improvement to primary frequency control, nor reduce the amount of frequency keeping procurement. Meridian accepts that removing ambiguity in the present wording of the Rules will allow a more consistent application of the Rules.	It is possible that the clarifications contained in the proposal may clear up misunderstandings and result in generators sharpening their response to frequency under normal conditions. However, the principal benefit expected is the improvement in dynamic efficiency that stems from a level investment environment with respect to generator technology choices as investors make more appropriate tradeoffs between different capabilities.
	Mighty River	There appears to be a lack of analysis in regards to: How many participants	See response above

	Power	will be able to comply with the proposed rules around governor settings, and how many will require exemptions. The current quality of frequency and whether or not it is deteriorating to a point where changes are required.	
	MEUG	The list of benefits and costs of the proposal compared to the alternative and the status quo are reasonable and on a non-quantitative basis the proposal is the best option.	Noted
	TrustPower	As per our response to Question 6 above.	Noted
	Todd Energy	As per comments above.	Noted
	Contact Energy	<p>Contact believes that the assessment of the options is not sufficient to support the proposals identified in FK – paper 1.</p> <p>As we have noted above, the introduction of mandatory unrestricted FGC could introduce significant costs on generators, and potentially increase risk around plant reliability. These could lead to increased numbers of material frequency events i.e. when frequency falls outside of the normal band. The EC has also noted that it cannot clearly identify the benefit that it proposes is key to the net value of the total proposal i.e. a “reduction in the amount of frequency keeping procurement necessary to achieve the normal frequency standard, assuming some generators chose to remove dead bands they have applied to their governors”.</p> <p>Given these likely direct and indirect costs, and a lack of clear definition around the net benefits, Contact believes that the options proposed should not be recommended to the Electricity Authority (“EA”) for progression.</p> <p>The EC noted¹ that:</p> <p><i>“A quantitative assessment would involve, amongst other things, making assumptions about the likely percentage net increase or decrease in market efficiency for each option. The error associated with estimating the quantities involved is likely to exceed the margin between the options.”</i></p> <p>Contact believes that such analysis, while difficult, is required to support any regulatory intervention, especially when it imposes additional obligations on generators.</p>	The proposal does not make significant changes to the requirements but merely clarifies them in case of any misunderstandings. The impacts of non-compliance are for generators to trade off with the costs associated with compliance. See
Miscellaneous	Genesis	Genesis Energy considers that improvements to the overall frequency	The Commission intends passing the

comments	Energy	keeping regime are important, but that they should be a lower priority for the regulator than work on implementing the “new matters” set out in clause 45(2) of the Electricity Industry Bill. The new matters alone appear to provide the Commission and the Electricity Authority with sufficient work to occupy the remaining 14-months leading up to the 1 October 2011 backstop date, so it is concerning to see the Commission diverting resources to lower priority work.	findings from this consultation to the Electricity Authority. It will then determine the priority it should give to completing this work.
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