

29 September 2009

Energy Safety
Ministry of Economic Development
PO Box 1473
Wellington

by email: vanessa.horne@med.govt.nz

SUBMISSION ON EXPOSURE DRAFT – ELECTRICITY (SAFETY) REGULATIONS

- 1 Orion New Zealand Limited (**Orion**) welcomes the opportunity to comment on the exposure draft of the Electricity (Safety) Regulations 2009 (the **ESRs**).

About Orion

- 2 Orion is an electricity operator for the purpose of the Electricity Act 1992. We are the electricity network provider for Christchurch and central Canterbury. Our network includes more than 14,000 kilometres of overhead lines and underground cables which deliver electricity to more than 190,000 home and businesses. Our network is slightly larger than Transpower's nationwide network of transmission lines. Orion's shareholders are the Christchurch City and Selwyn District councils.

Structure of our submission

- 3 General issues arising from the ESRs are detailed below. Further comments are provided on a clause-by-clause basis in the attached table.

General comments

- 4 In general Orion supports the direction of the ESRs, however we are concerned that some aspects of the proposals are unworkable and create unnecessary complexity, confusion and duplication of existing requirements for our industry.

- 5 As a general comment, we believe that specifying detailed, prescriptive safety requirements in relation to **works** in the ESRs is unnecessary and creates unwarranted complexity, as public safety issues relating to works will be identified and managed through audited safety management systems when the ESRs come into force.
- 6 We acknowledge that there is a need to outline high level safety requirements for those works that are not covered by safety management systems, however we submit that works that fall into this category should be treated separately in the ESRs. The proposed clauses 44 – 52 should be extended to include all necessary public safety requirements for works that are not already managed through audited safety management systems.
- 7 We have had an opportunity to review the Electricity Engineers' Association's submission on the ESRs and we generally support and endorse that submission.
- 8 Thank you for the opportunity to make this submission. If you have any questions, please contact Shane Watson at DDI 03 363 9624 or email shane.watson@oriongroup.co.nz.

Yours sincerely



Shane Watson
Engineering Manager

Regulation	Issue	Comment
<p>Clause 4</p>	<p>Definition of “electrically safe” is inconsistent with Electricity Act 1992.</p>	<p>“Electrically safe” is defined in clause 4 as follows:</p> <p><i>Electrically safe, in relation to works, installations, fittings, appliances, and associated equipment, means that there is no significant risk of injury or death to any person, or of damage to any property, as a result of the use of, or passage of electricity through, the works, installations, fittings, appliances, or associated equipment; and electrically unsafe has a corresponding meaning.</i></p> <p>We note that this definition is much wider and all-encompassing than the safety benchmark that must be met by electricity generators and distributors via safety management systems as prescribed by section 61A of the Electricity Act 1992 (the EA).</p> <p>Section 61A states that electricity generators and distributors must implement and maintain a safety management system that:</p> <p><i>...requires all practicable steps be taken to prevent the electricity supply system from presenting a significant risk of –</i></p> <p><i>(a) serious harm to any member of the public; or</i></p> <p><i>(b) significant damage to property owned by a person other than the electricity generator or electricity distributor.</i></p> <p>Given that the ESRs are promulgated under the EA, we suggest that the definition of “electrically safe” should be aligned with the intention of section 61A, rather than creating a broader safety benchmark. We are particularly concerned that “injury” and “damage to any property” are not defined or qualified in the proposed definition, and that this has the potential to create confusion and frivolous/vexatious claims.</p> <p>We therefore recommend that the definition of “electrically safe” be amended as follows:</p> <p><i>Electrically safe, in relation to works, installations, fittings, appliances, and associated</i></p>

		<p><i>equipment, means that there is no significant risk of serious injury or death to any person, or of significant damage to any property, as a result of the use of, or passage of electricity through, the works, installations, fittings, appliances, or associated equipment; and electrically unsafe has a corresponding meaning.</i></p>
Clause 6	Strict liability offences are unwarranted.	<p>We are concerned that the majority of grade A and grade B offences created under the ESRs are strict liability offences with only limited means of defence. Given the size of the potential fines (up to \$50,000 for a company for each grade A offence) and the uncertainty around how the ESRs interact with other safety requirements placed on the industry, we consider that imposing strict liability is unnecessarily harsh.</p>
Subclause 13(1)	Minimising risk of contact with live conductive parts. Delete reference to “works”.	<p>As a general comment, we believe that specifying detailed, prescriptive safety requirements in relation to works in the ESRs is unnecessary and creates unwarranted complexity, as safety issues relating to works will be identified and managed through audited safety management systems.</p> <p>Subclause 13(1) imposes obligations on persons who have “<i>control of any works, installations, fittings, appliances or associated equipment</i>” to minimise the risk of contact between exposed conductive parts and people or animals. This subclause should be explicitly included in the exemptions listed in ESR 43.</p>
Clause 14	High voltage works and installations. Delete clause or include in coverage of ESR 43.	<p>For the reasons mentioned above in relation to subclause 13(1), we believe that clause 14 should be deleted as it relates solely to high voltage works and installations. Safety requirements in relation to these assets will already exist within audited safety management systems, and should not be further prescribed in the ESRs.</p> <p>If this clause is retained, it should be explicitly included in the exemptions listed in ESR 43, as it will be covered by safety management systems’ risk assessment</p>

		<p>processes. We note that only competent persons are allowed to access high voltage sites, i.e. those who are competent for the task and regularly trained in the appropriate first aid techniques. Warning signs external to any building would be more effective in protecting the public.</p>
<p>Clause 15</p>	<p>Obligation to notify Secretary of danger. Confusion about intent of this clause.</p>	<p>We are uncertain about the intention and objective of this section, and are therefore confused about what it means.</p> <p>Is it intended that any person who has the ability/authorisation to carry out prescribed electrical work must notify the Secretary and the property owner/occupier whenever a danger exists? In theory, this would mean that Orion would have to notify each time anything happens on its network that presents a danger? For example, every time a car hits a pole or a tree falls on a line?</p> <p>Or is it intended to apply only in situations where there is an ongoing danger that will not be resolved as quickly as possible? For example, where an electrical contractor notices an electrical hazard in a customer's house that the customer will not allow to be fixed?</p> <p>We recommend that the objective and wording of this clause should be clarified. If the clause is intended to only apply to hazards that cannot be quickly resolved, then we suggest that the word "ongoing" be inserted in subclauses (1) and (2) as follows:</p> <p><i>(1) Any person who carries out prescribed electrical work (including a person acting under an exemption) and has reasonable grounds to believe that any works, installation, fitting, or appliance presents ongoing immediate danger to life or property must, as soon as practicable, advise both the following people of the danger:</i></p> <p><i>(a) the owner or occupier of the property where the danger exists:</i></p> <p><i>(b) the Secretary.</i></p> <p><i>(2) A person commits a grade A offence if the person has reasonable grounds to</i></p>

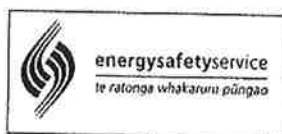
		<p><i>believe that any works, installation, fitting, or appliance presents an ongoing immediate danger to life or property and the person fails to comply with sub clause (1).</i></p>
<p>Clause 16</p>	<p>When works, installations, fittings and appliances are deemed to be electrically unsafe. Unworkable and unlimited.</p>	<p>Clause 16(1) requires actions (a) and (b) and (c) to be carried out, whereas the existing ER 94(2) lists actions (a), (b) and (c) as options, any of which can be used to achieve the objective. In the case of HV works and installations the requirements of subclause 16(1) are impracticable in that (a) cannot be ensured in all circumstances, and it is more usual to satisfy (b) and/or (c).</p> <p>Also, the proposed subclause 16(1) (unlike ER 94(2), which refers to means of compliance only, and includes “all practicable steps”) requires measures (a), (b) and (c) to be taken regardless of the costs involved in taking them. We recommend that the “all practicable steps” requirement should be reinstated, or that clause 16 (1)(a) be modified to include:</p> <p style="text-align: center;"><i>...current standards, or in the case of HV works and installations, provide no significant risk of serious injury or death to any person from exceeding the IEC shock currents standard; or</i></p> <p>Subclause 16(1)(b) requires automatic disconnection of power supply when a fault occurs, otherwise the works will be deemed “electrically unsafe”.</p> <p>Orion has received a dispensation (see attached) from the Secretary to operate an alternative earth fault protection system which does not disconnect the power supply when a fault occurs. This system deals with an earth fault on a three phase system and very rapidly reduces any earth potential rise to safe levels without loss of power. Known as resonant earthing with residual current compensation, it modifies the voltage to close to zero at the point of fault on HV systems.</p> <p>We have invested a considerable amount (\$2m) in this resonant earthing system,</p>

		<p>based on the dispensation to the current regulation.</p> <p>We suggest that clause 16(1)(b) should be extended to reflect the use of resonant earthing systems as follows:</p> <p><i>...occurrence of a fault, or in the case of an earth fault on an HV system, earth fault current must be limited such that there is no significant risk of serious injury or death to any person from “step”, “touch” or transferred earth potential rise.</i></p>
Clause 17	Electrically unsafe works and installations. This clause is too prescriptive as the issues it seeks to address are already covered by existing requirements.	We consider that this clause should be deleted as it is too prescriptive and the issues it seeks to address are already covered by existing requirements. As mentioned earlier in this submission, safety issues in relation to works will be covered by audited safety management systems. Safety issues in relation to installations are comprehensively covered in AS/NZS 3000. We suggest that this clause adds unnecessary complexity and duplication, and could create confusion when considered with existing safety standards and requirements. If the clause is not to be deleted, we suggest the reference to installations be removed and the remaining clause be subject to ESR 43.
Subclause 26(1)	Requirements relating to safety of electricity supplied – purports to “preserve the safety of electricity”.	Subclause 26(1) purports to “preserve the safety of electricity” by not changing the characteristics of the supply or increasing the prospective fault currents beyond reasonable levels. In that electricity is “electrical energy”, it does not make sense to protect its safety. What is intended is to avoid damage to any works, installation, fitting or appliance to which electricity is supplied from any supply system so that persons and property are safeguarded. Therefore, we suggest that subclause 26(1) be amended to read “ <i>In order to ensure that the supply of electricity is safe...</i> ”.
Clause 27(2)	Harmonics – we recommend that a standard be added in	The referred standards do not directly address the issue of how to fairly allocate the limits of harmonics associated with an individual connection to the distribution

	<p>relation to interference.</p>	<p>network. A current internationally accepted standard (mandated in Victoria, Australia) is IEEE 519.</p> <p>We therefore recommend that a further relevant international standard be added as follows:</p> <p style="text-align: center;"><i>27(2)(e) IEEE 519-1992.</i></p>
<p>Subclause 30(2)</p>	<p>Testing/connection. Testing work before connection.</p>	<p>Subclause 30(2) requires that any person connecting works must see signed documentation stating the tests carried out on the completed work, and the results of such tests, before connection or reconnection may take place.</p> <p>In our industry most onsite works are carried out by dedicated crews, and the disconnection and reconnection of the works is always under the control of the person in operational control, typically located in a control room or equivalent, but almost always not at the work location.</p> <p>We note that subclause 30(1) is written in performance terms and enables asset owners to establish systems that meet the requirement.</p> <p>Since procedures to meet these requirements will be covered by safety management systems, we believe this section should either be deleted or explicitly included in the exemptions listed in ESR 43.</p>
<p>Subclause 46(2)</p>	<p>Reword subclause.</p>	<p>Subclause 46(2) states that an earthing system that complies with the ECP 41 is deemed to comply with the control of step, touch, and transferred voltages to prevent danger to any person. We note that reference to “ECP 41” is incorrect and should be changed to “ECP 35”.</p> <p>We do not consider that ECP 35 provides criteria that give the appropriate safety outcomes required by the EA and regulations. ECP 35 has been effectively replaced by the EEA “Guide to Power System Earthing Practice”, which uses a much more</p>

		comprehensive risk-based management approach to safe outcomes. We therefore recommend that clause 46(2) be removed.
Subclause 49(2)	High voltage conductors of overhead lines.	<p>The subclause, as it is, is too prescriptive and cuts across the dispensation already granted to Orion to apply resonant earthing with residual current compensation. We note that five other New Zealand lines companies are using, or are intending to use, this technology.</p> <p>We recommend that subclause 49(2) should be changed to read:</p> <p style="padding-left: 40px;"><i>...short circuit and earth fault protective fittings must either operate to disconnect supply from the current or other fittings that they protect</i></p> <p style="padding-left: 40px;"><i>or</i></p> <p style="padding-left: 40px;"><i>earth fault current must be limited such that there is no significant risk of serious injury or death to any person from step, touch, or transferred earth potential rise.</i></p> <p>This change would allow newer earth fault protection technology to be applied. Earth fault protection can operate very rapidly and improve safety outcomes without “disconnecting supply”.</p> <p>We note that existing HV fuses will in many cases rely on the upstream earth leakage protection of the circuit breakers or main feeder circuit breaker sensitive earth fault (SEF) protection for adequate performance.</p>
Clause 53	Safety of installations – metering enclosures.	We recommend that an additional subclause be added to expressly state that it covers metering enclosures. Where an appropriate enclosure is provided for the purposes of revenue metering, separate from the main switchboard and attached or part of the building/ dwelling, the enclosure and electrical equipment is deemed to be a switchboard as defined in AS/NZS 3000.

Subclause 100(2)(a)	Work stringing additional conductors between poles.	<p>The existing ER 31(1) is worded to state that either the existing conductors are isolated and earthed, or the additional conductors are earthed and associated equipment is used. In the terms used in subclause 100(2), this would be equivalent to 'a' or 'b + c'. The proposed wording of subclause 100(2) would require existing conductors to be isolated in all circumstances for the purpose of adding new conductors. This would add significant cost to a job without any benefit.</p> <p>We note that whether the existing conductors need to be isolated will be an employer's decision based on health and safety requirements, and is therefore not an issue for the ESRs to address. It is clearly an issue of worker safety rather than public safety.</p> <p>We also note that this clause is only relevant where works are not covered by safety management systems, and therefore if it is retained, it should be moved to the part of the ESRs that relates to works not covered by audited safety management systems (clauses 44 – 52).</p>
Clause 106	Retrospective application of ESRs.	<p>We agree with the EEA's comments on this clause.</p> <p>For the avoidance of confusion, we recommend that clause 106 should specifically state that the regulations are not retrospective.</p>



File:
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Application for "Chief Executive's Exemption Requirements" of the Electricity Regulations 1997

Application is hereby made, pursuant to Regulation 103, for an exemption from requirements of the Electricity Regulations 1997. The prescribed fee of \$400.00 must accompany the application. Cheques are made out to the Ministry of Economic Development and should be marked "not negotiable".

Applicants Name: **Orion New Zealand Ltd.**
Applicants Address: **218 Manchester Street, P. O. Box 13896, Christchurch**
NZ Company No: **404935**
(where applicable)
Telephone: **03-3639898** Facsimile: **03-3639899**

Description of the works, electrical installation, fitting, electrical appliance, associated equipment, person or thing for which the exemption is sought:

Note that the provision of Regulation 103 only apply to regulations 28 to 36, 46 or any regulations in parts 4 and 5.)

The earthing system of the supply to a portion of Orion's rural 11 kV distribution system (overhead lines and underground cable network)

Location of the specific work, electrical installation, fitting, electrical appliance, associated equipment for exemption (where applicable):

The earthing connection arrangements for the 11 kV network supplied from Darfield District Substation, corner of Clintons and McLaughlin's Roads, Central Canterbury

Period for which the exemption is sought: Regulation(s) from which an exemption is sought:

5 Years from expected date of Commissioning (February 2007) 62(2) and 62(5)

Description of the reason for the exemption being sought: (continue on separate sheet if necessary)

Orion wishes to install resonant earthing (Peterson Coil) with residual earth current compensation at its Darfield District Substation 33/11 kV transformer, which supplies approximately 1800 rural customers though approximately 220 km of mainly overhead 11 kV line including Darfield Township.

Exemption is requested from the requirements of 62(2) "Short circuit and earth fault protective fittings must operate to disconnect supply from the circuit or other fittings that they protect" and 62(5) "High voltage conductors of overhead electric lines must have earth fault protection fittings that interrupt fault currents to earth in 5 seconds or less".

These regulations are based on the solidly earth system commonly employed in New Zealand. The resonant earthed system with residual earth fault compensation neutralises any earth fault current but does not disconnect supply, i.e. it achieves the safety objective in a different manner.


This system also reduces earth potential rise to very low levels thus providing additional public safety benefits.

Description of the alternative means by which any danger or potential danger to the safety of any person or property will be controlled: (continue on separate sheet if necessary)

Orion will install resonant earthing (Peterson Coil) with residual earth current compensation in the neutral earth connection of the Darfield District Substation 33/11 kV transformer. The resonant earthing system will initially provide limitation of earth fault current to approximately 2 to 5 Amps. On the occurrence of an earth fault, after a timeout of approximately 0.25 seconds the residual earth current compensation will then reduce the voltage on the faulted conductor practically to zero and the earth fault current at the fault location to zero.

1. The resonant earthing and residual earth current compensation control system will be connected to the Orion SCADA system to provide continuous monitoring for the detection of earth faults.
2. Fault location will be commenced as soon as is practicable after the occurrence of a permanent earth fault.

3. Existing earth fault protection will remain in place as backup protection in the event of failure of the resonant earthing and residual earth fault compensation system.
4. The reduction of voltage on the faulted conductor and the earth fault current to zero at the fault location will thus control "the danger or potential danger to the safety of any person or property" by "limiting the supply of electricity within works and installations so that shock currents and their duration cannot exceed the IEC shock currents standard" (Regulation 87,3(b)).

Signature:  GM- Network Development Date 17/03/06 .

Forward to:
Manager, Operations
Energy Safety Service
PO Box 1473, Wellington, New Zealand

439311 04/01 CEER



energysafetyservice

te ratonga whakaruru pūngao

File No: 1/4/2

27 April 2006

Mr T L Scott
General Manager Network Development
Orion New Zealand Ltd
PO Box 13896
CHRISTCHURCH

Level 7, 33 Bowen Street
PO Box 1473, Wellington, New Zealand
Phone: 64 (4) 472-0030 Fax: 64 (4) 460-1365

Dear Sir

EXEMPTION FROM REQUIREMENTS OF ELECTRICITY REGULATIONS 1997

I refer to your letter of 20 March 2006 requesting an exemption from the requirements of the Electricity Regulations 1997 and acknowledge your receipt of your cheque for the sum of \$400.00 forwarded with this application.

Under the delegated authority of the Secretary, I approve your application for an exemption to the Secretary's requirements pursuant to Regulation 103 as follows:

Applicant's Name:

T L Scott, General Manager Network Development

Company:

Orion New Zealand Limited

Company Address:

218 Manchester Street, Christchurch

Description of Works:

11kV distribution network earthing system

Location of Works:

Orion's 11kV rural network in the Central Canterbury area and including Darfield District Substation

Period of Exemption:

Valid to 31 March 2016

Regulations to Which Exemption Applies:

Regulations 62(2) and 62(5)

Description of Exemption:

To install and evaluate resonant earthing systems (Peterson Coil) with residual earth current compensation in the neutral earth connection of the rural zone substation 33/11kV transformers.

This being a departure from the requirements of regulation 62(2) which required that short circuit and earth fault protective must operate to disconnect supply from the circuit or other fittings that they protect. In addition there is also departure from the requirements of 62(5) which required that high voltage conductors of overhead electric lines must have earth fault protection fittings that interrupt fault currents to earth in 5 seconds or less.

Reason for Exemption:

Regulations 62(2) and 62(5) are applicable to solidly earthed systems, whereas the resonant earthed system with residual earth fault compensation, neutralises any earth fault current but does not disconnect supply. The resonant earthed system reduces the earth potential rise to very low levels thus providing an additional safety benefit to the public such as incidents involving downed conductors.

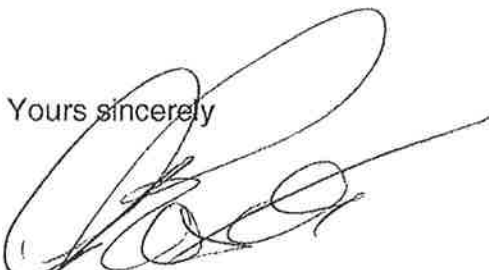
Means by Which Safety is Addressed:

By the installation of the resonant earth (Peterson Coil) in the transformer neutral earth connection, will initially limit the earth fault current to within 2 to 5 Amps. On the occurrence of an earth fault after a timeout of approximately 0.25 seconds the residual earth current compensation will then reduce the voltage on the faulted conductor to zero and the earth fault current at the fault location to zero.

The resonant earthing and residual earth current compensation control system will be connected to the Orion SCADA system and provide for continuous monitoring for the detection of faults.

Fault location will be commenced as soon as practicable after the occurrence of an earth fault and the existing earth fault protection will remain in place as backup to the resonant earthing and residual earth fault compensation.

Yours sincerely



G Boxall
Operations Manager
Energy Safety Service

IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems

Sponsor
**Transmission and Distribution Committee
of the
IEEE Power Engineering Society**

and

**Static Power Converter Committee
of the
IEEE Industry Applications Society**

Approved June 18, 1992
IEEE Standards Board

Approved January 4, 1993
American National Standards Institute

Abstract: This guide applies to all types of static power converters used in industrial and commercial power systems. The problems involved in the harmonic control and reactive compensation of such converters are addressed, and an application guide is provided. Limits of disturbances to the ac power distribution system that affect other equipment and communications are recommended. This guide is not intended to cover the effect of radio frequency interference.

Keywords: harmonic control, harmonics, reactive power compensation

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