Report and recommendations of the Environmental Protection Authority

Electrical Distribution Transformers Noise Regulation 17 Variation

Western Power

Report 1495

November 2013

Electrical Distribution Transformers
Noise Regulation 17 Variation

Western Power

Report and recommendations of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Report 1495
Regulation 17 Report 24
November 2013

Contents

Page

1. Introduction and Background

Electrical distribution transformers are relatively small transformers – either padmount or pole-mounted units – that are sited in suburban areas to provide power for local areas of typically 100 houses. Although not very noisy, they are quite often non-compliant with the noise regulations on the boundary with the neighbouring residences, due to their proximity to houses. Western Power estimates that there are over 10,000 electrical distribution transformers spread over the metropolitan suburbs, and that up to 4,000 of these units may be non-compliant with the prescribed noise standard. Due to the large number of non-compliant units, it is estimated by Western Power that achieving full compliance for these transformers would cost the Government up to $270 million, which is considered neither a sustainable nor justifiable investment.

Western Power first raised this noise non-compliance problem with the Minister for Environment in 2009, as part of its request for all of its electricity distribution facilities to be excluded from the noise regulations under regulation 3. The regulation 3 approach was not supported by either the Environmental Protection Authority (EPA) or the Noise Regulation Branch of the Department of Environment Regulation (then Department of Environment and Conservation). Instead, the EPA recommended that Western Power explore with the Department of Environment Regulation (DER) the avenue of managing the noise emissions through a 'risk-based' approval under regulation 17 of the *Environmental Protection (Noise) Regulations 1997* (noise regulations).

Investigations carried out by DER have indicated that this noise non-compliance problem should be able to be managed by a noise regulation 17 approval. As a result of this investigation, Western Power applied to the Minister for Environment for a noise regulation 17 approval in relation to noise emissions from its distribution transformers.

2. The Application

Noise regulation 17 provides that *"where a person is of the opinion that he or she cannot reasonably or practicably comply with a standard prescribed under these regulations … that person may apply to the Minister for approval to allow the emission of noise in that case to exceed or vary from the standard."*

On 21 September 2011, Western Power, through the Minster for Energy, applied to the Minister for Environment for an approval under noise regulation 17 in relation to Western Power's existing and future electrical distribution transformers. The approval would allow the noise emissions from the distribution transformers to vary from the noise standard prescribed in the noise regulations.

The basis of the application was that the noise emissions from a large number of distribution transformers operated by Western Power do not comply with the assigned noise levels specified by the noise regulations, due to their proximity to noise sensitive premises. Western Power estimate that, of the 10,000 padmount

transformers and 60,000 pole-mounted distribution transformers within the South West Interconnected System (SWIS) operated by Western Power, noise emissions from over 4,000 padmount transformers and an unknown number of pole-mounted transformers (although significantly fewer than padmount transformers) may not comply with the noise regulations.

Western Power also estimates that the cost for achieving full compliance with the noise regulations will be: $240million for distribution padmount transformers and $27million for pole-mounted transformers. Western Power considers that this would be neither a sustainable nor justifiable investment of public funding, as the community impact of the current noise emissions from distribution transformers is very low.

3. Distribution Transformers and their Noise Emissions

3.1 Distribution padmount and pole-mounted transformers

Distribution transformers provide the final voltage transformation in the electric power distribution system, stepping down the voltage used in the distribution lines to the level used by the customer. If mounted on a utility pole, they are called pole-mount transformers. If the distribution lines are located at ground level or underground, distribution transformers are mounted on concrete pads, thus known as padmount transformers. Because of weight restrictions, transformers for pole mounting are normally smaller units at lower load.

The number of customers that a distribution transformer can serve depends on the transformer's rating. A typical padmount transformer may provide power for a local area of up to 100 houses. According to Western Power, there are currently about 10,000 padmount and 60,000 pole-mounted distribution transformers spread over the metropolitan area.

The majority of padmount transformers spread over the metropolitan area are rated at 500kVA or lower. However, due to the increased housing density and higher energy consumption, larger padmount transformers are being installed more frequently in some suburbs. Though there are exceptions, new transformers currently installed into the SWIS are predominantly limited to 630kVA and 1000kVA.

Distribution transformers are often located in close proximity to the customers, in order to increase the efficiency of electricity transmission. This is also related to the lack of suitable public open space and the pressure to maximise land usage.

3.2 Characteristics of distribution transformer noise

Distribution transformers are relatively small both in size and in sound power output. The sound power level of a transformer depends on its power rating, the type and the year it was produced. Generally speaking, the lower the rating and the newer the transformer is, the quieter its noise emission. As a result of rapid development in noise control technologies, the sound power levels of distribution transformers have been steadily decreasing in the past several decades. For

instance, the sound power level of a 630kVA transformer was set by the 'standard limit' to be 69.5dB(A) in the 1994 Australian Standard AS2376.6-1994; this was reduced to 61.8dB(A) in the 2009 Australian Standard AS/NZS 60076.10:2009. The 2009 Australian Standard also specifies a 'reduced limit', which further reduces the sound power of a 630kVA transformer to 56dB(A) and that of a 1000kVA to 58dB(A). A very recent investigation conducted by Western Power in 2012 indicates that all distribution transformers having been installed within the SWIS since 2009 not only meet the 'reduced limit' specified by AS/NZS 60076.10:2009, but are at least 2dB below the 'reduced limit' on average.

Noise from distribution transformers is tonal, producing a 'hum' at 100Hz and higher harmonics. It has been recognised that this characteristic of tonality cannot be reasonably and practically removed by techniques other than attenuating the overall level of the noise emission, and thus in accordance with noise regulation 9, a 5dB penalty for tonality applies to the transformer noise. This implies that in many cases, for the distribution transformer noise to comply with noise regulations, the level of noise may need to be 30dB(A) or lower at the boundary of the neighbouring noise sensitive premises, in order to meet an L_{A10} assigned level of 35dB(A) after 10pm.

3.3 Required buffer distance for complying with noise regulations

Whether a distribution transformer can comply with the noise regulations depends on the sound power output of the transformer, as well as how much buffer distance the transformer has to the neighbouring property. In general, the lower the sound power output of a transformer, the shorter the buffer distance it requires for its noise to comply with the noise regulations.

Table 1 compares the required buffer distances for transformers meeting the 'reduced' noise limits given in AS2376.6:1994 and those meeting the 'reduced' noise limits specified by AS60076.10:2009. The table clearly demonstrates that the required buffer distances for meeting the noise regulations have been greatly reduced with the new transformers, making compliance with the noise regulations for the new transformers easier than a decade ago.

Table 1. Required buffer distances for transformers meeting the 'reduced limit' given by AS2376.6:1994 and by AS60076.10:2009.

Transformer kVA Rating	Transformer complies with the reduced sound level in AS2376.6:1994		Transformer complies with the reduced sound level in AS60076.10:2009	
	Standard Sound Power Level (dB(A))	Buffer Distance (metres)	Actual Sound Power Level* (dB(A))	Buffer Distance (metres)
630	63.0	17.8	53.0	**5.6**
1000	65.7	24.3	55.0	**7.1**

* *These are likely actual sound power levels that are 3.0dB(A) lower than the 'reduced limits' given by Australian Standard AS60076.10:2009. This scenario is based on the assessment of new transformers made by Western Power and the Urban Development Institute of Australia WA.*

3.5 Practical noise control measures

In the situation where a transformer does not have the required buffer distance, compliance with the noise regulations can still be achieved by implementing noise control measures. The commonly used noise control measures for distribution transformers include:

1. Use of existing development solid walls;
2. Installing acoustic panels or solid boundary walls; and
3. Enclosing the transformer with an acoustic enclosure.

These noise control measures can be effective in achieving noise compliance. For instance, an acoustic fence with a height at least 200mm higher than the transformer can easily achieve a 5dB noise reduction for the area immediately behind the fence. An acoustic enclosure, when properly designed and built, can achieve up to 20dB reduction.

4. Community Impacts

EPA notes that in the case of padmount transformers there are a number of factors which mitigate the noise impacts resulting from non-compliance –

1. the transformers are in many cases located adjacent to parts of houses that may be considered less noise-sensitive than the bedrooms, for example, near garden plots and garages;
2. the non-compliance may extend over a relatively small area, often (in the case of newer, quieter transformers) only a few metres; and
3. the units may only be readily audible when the occupier is nearby, for example at night when in the backyard and close enough to the unit to hear it over the background noise.

In the case of pole-mount transformers, these are located on the power pole which is usually some 8m from the house, and may only cause problems when a second-storey bedroom faces the street.

These factors may explain why Western Power only receives very few noise complaints relating to distribution transformers (in the order of two or three per year), while the number of non-compliant distribution transformers is relatively large. Notwithstanding the above, the EPA notes that Western Power has procedures in place for addressing the noise complaints that it does receive.

EPA considers that, while the impacts associated with distribution transformers can generally be considered minimal, there will be cases where a unit is located close to the sensitive parts of a dwelling, and the noise level is such as to result in genuine noise problems.

5. EPA Assessment

5.1 DER investigations

DER Noise Regulation Branch studied the noise emissions from padmount distribution transformers, conducting site visits and noise measurements in four typical suburbs between November 2011 and May 2012. These four suburbs: Booragoon, South Perth, Tapping and Southern River, represent typical residential areas ranging from old/established to new/developing suburbs. DER's investigation has indicated that levels of transformer noise higher than the assigned noise level are constrained within a small area around the transformers (i.e. several metres). However, due to the short buffer distances between the transformers and the closest residences, this small area often extends inside the boundary of the neighbouring residence, resulting in a non-compliant situation.

The numbers of non-compliant padmount transformers, as estimated by Western Power and assessed by DER Noise Regulation Branch, are compared in Table 2. It can be seen in Table 2 that DER's site visits/measurements have indicated that the actual noise non-compliance problem with padmount transformers may not be as large as estimated by Western Power. This may be because Western Power's estimation did not take into consideration the actual assigned noise level of the area and the existing structures that may reduce noise transmission, such as fences or barriers. However, DER's study agrees with Western Power's finding that there is likely to be a large number of distribution transformers whose noise emissions may not comply with the assigned noise levels, due to the limited buffer distances between the distribution transformers and residences and the tonality of the noise (which attracts a 5dB penalty).

Table 2. Comparison of the numbers of non-compliant padmount transformers estimated by Western Power and assessed by DER.

Suburb	Total Number of Padmount Transformers	Western Power's estimation	DER's Assessment
Winthrop	22	11	4
South Perth	69	10	7
Southern River	31	6	4
Tapping	36	19	13

DER's investigation has also indicated that most non-compliance occurs only at night-time (from 22:00 to 7:00 Monday to Saturday and to 9:00 Sunday and public holidays) when the assigned noise levels are the lowest, and in the outdoor areas such as the front yard and back yard. DER's site visits found that quite a large number of padmounts located near the dwelling are actually close to an area that is less sensitive to noise, such as the car port or garage. This observation supports the view that, although the number of noise non-compliant padmount transformers is large, the actual noise impact on the community is relatively small.

DER would also agree that, while the number of non-compliant transformers may be less than estimated by Western Power – and the costs of achieving compliance may thus be lower than the estimated $270million – achieving compliance in all cases is unlikely to prove justifiable and practicable.

Due to the fact that the new transformers are much quieter than their predecessors, DER would take the view that all new distribution transformers to be installed should be located and designed to comply with the noise regulations, if practicable. Recognising that full compliance will still not be practicable in many cases where the transformer is located close to a residential boundary, DER has noted that the 'noise-affected area' around the transformer can be further reduced to a very small area by good site selection and fence design. This may be achieved by developing a transformer siting guideline for developers and installers.

In December 2011, the EPA provided advice to Western Power that it should work with the Urban Development Institute of Australia (UDIA) and DER to develop best practice guidelines in relation to the siting of padmount transformers to avoid a future legacy of non-compliance and potential noise complaints.

Under the guidance of the EPA, by working with DER Noise Regulation Branch and the UDIA, Western Power has recently developed a distribution transformer siting guideline – Work Instruction: Noise Compliance Requirements for Distribution Transformers. This siting guideline takes a distance-based approach to translate the sound power level of the transformer, influencing factors and the presence of fences into a couple of easy to read tables. DER considers that it is a workable guideline and can ensure that the risk of noise impacts from new transformers should be effectively minimised.

5.2 EPA assessment

The EPA notes the results of the DER investigations, and considers that the grant of a noise regulation 17 approval would be an appropriate response in this case. A noise regulation 17 approval would take the actual impact of noise from distribution transformers into account and require Western Power to take action on those distribution transformers whose noise materially affects the amenity of the neighbouring residences.

The EPA therefore proposes a 'risk-based' approval based on the following concepts –

1. The approval should make allowance for existing padmount and pole-mount transformers that impact only on the less-sensitive parts of the receiving premises;

2. Western Power should have in place clear procedures to deal with noise complaints where the noise emissions are materially affecting the receiver;

3. New transformers being installed should ideally comply with the noise regulations. The transformers must meet the reduced sound power level limit specified by AS/NZS 60076.10-2009, and their installations must follow the siting guideline for transformers.

6. Outline of Noise Regulation 17 Approval

The EPA considers that, should an approval be granted, the approval should be structured as a 'risk-based' approval, containing the following features:

6.1 The assigned noise level is applied at locations at 2 m from the opening to a habitable room

The assigned noise levels for noise sensitive premises given by Regulation 7 of the noise regulations apply to any location within 15m of a building directly associated with a noise sensitive use, which basically covers almost all of the area within the boundary of a residence in the metropolitan area, including front and back yards. The EPA notes that most of the noise non-compliance problems with distribution transformers occur only at night, when the most stringent assigned noise levels apply. The EPA would recommend that the location for compliance with the night-time assigned noise levels given by Regulation 7 be reduced from 'within 15m of a building directly associated with a noise sensitive use' to locations at 2 metres from, and directly in front of, the windows or external doors of the habitable rooms of such a building. This reflects the fact that the night-time protection is intended primarily for living and sleeping activities, and ensures that the indoor amenity of the residences is not compromised.

6.2 The Approved L_{A10} noise limits

The noise regulations specify noise limits in the form of $L_{A\ 10}$ and $L_{A\ 1}$ assigned levels, that is, levels not to be exceeded for more than 10% and 1% of a representative assessment period; and $L_{A\ max}$ assigned levels that are not to be exceeded at any time (See Appendix A). The assigned levels as given in Table 1 of the regulations do not need to be changed for this approval. However, due to the fact that the noise from distribution transformers is extremely stable, only the $L_{A\ 10}$ level is required for this approval.

6.3 Areas less sensitive to noise are excluded from a 'building'

As this approval would aim to protect the night-time indoor amenity of the habitable rooms, building areas not directly associated with a noise sensitive use, such as a carport, garage, laundry, bathroom or toilet should be excluded from the definition of a 'building' in the approval.

6.4 Noise limits for new transformers

To ensure best practice, all new transformers to be installed should be required to meet the reduced sound power level limit specified by AS/NZS 60076.10-2009.

6.5 Procedure for noise-affecting sites

Western Power should be required to set up a system to register all distribution transformers that are identified as being likely to have actual noise impact on the neighbouring residences (through noise complaints), and to implement measures

within a reasonable time to reduce noise emissions/impacts. These transformer sites would be designated as 'noise-affecting sites'.

6.7 Development of noise management plan

Western Power would be required to develop and implement a noise management plan for distribution transformers generally. The plan should contain noise management measures including:

a. a procedure to ensure that any new distribution transformers to be installed comply with the reduced sound power level specified by Australian Standard AS/NZS 60076.10:2009;
b. a distribution transformer siting and installation guideline for developers, to ensure that any new distribution transformers are installed in accordance with the guidelines;
c. a procedure for provision of information to the community about noise emissions from Western Power's distribution transformers;
d. a procedure to be adopted by Western Power in responding to complaints about noise emissions;
e. a procedure to be adopted by Western Power to register the noise-affecting sites; and
f. a procedure to be adopted by Western Power to implement noise control measures on the registered noise-affecting sites.

6.8 Reporting requirement

Western Power would be required to report annually to the Department of Environment Regulation. The report should include –

a. evidence of compliance with the Approval;
b. summary of the register of distribution transformer sites in respect of which Western Power has received advice that the site is reasonably likely to be a noise-affecting site;
c. progress of implementation of the noise control measures on the identified noise-affecting sites; and
d. any other progress with the implementation of the noise management plan.

The purpose of this requirement would be to ensure best practice at all times.

7. Conclusions and Recommendations

The EPA concludes that –

1. Due to the limited buffer distances between the distribution transformers and residences, a large number of distribution transformers are not complying with the assigned noise levels at the closest residences. It is not practicable or justifiable to request Western Power to achieve full noise compliance for all these transformers.

2. The majority of the noise non-compliance occurs at night and in the areas less sensitive to noise, such as front and back yards of the residences, or at a carport, garage, laundry, bathroom or toilet of the dwelling. As a result, the

actual noise impact on the community from the noise non-compliant transformers is limited to isolated cases where a habitable room is close to a transformer.

3. The noise emission from distribution transformers can be regulated through a risk-based system set up to focus on those transformer units whose noise emissions have actual impact on the amenity of the neighbouring residents, and to avoid future noise problems through appropriate siting and installation of new transformers.

The EPA considers that the granting of a noise regulation 17 approval would be an appropriate response in this case, in that Western Power can focus its efforts and resources on those distribution transformers whose noise emissions have actual impacts on the community.

Recommendations

The EPA recommends that a variation to the prescribed standard in the noise regulations be granted in accordance with the attached drafting instructions (See Appendix B and Appendix C).

Appendix A

Noise Level Standards

Assigned levels in regulations

Table 1 - Assigned Levels derived from Table 1 of Regulation 8 of the *Environmental Protection (Noise) Regulations 1997*

Type of premises receiving noise	Time of day	Assigned level, dB		
		$L_{A\ 10\ (slow)}$	$L_{A\ 1\ (slow)}$	$L_{A\ max\ (slow)}$
Noise sensitive premises, at locations within 15 metres of a building directly associated with a noise sensitive use.	0700 to 1900 hours Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays.	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises, at locations further than 15 metres from a building directly associated with a noise sensitive use.	All hours	60	75	80
Commercial Premises	All hours	60	75	80
Industrial and utility premises	All hours	65	80	90

"$L_{A\ max}$ assigned level" means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded at any time;

"$L_{A\ 1}$ assigned level" means an assigned which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 1% of the representative assessment period;

"$L_{A\ 10}$ assigned level" means an assigned which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 10% of the representative assessment period; and

"influencing factor" means the influencing factor determined under Schedule 3 of the regulations.

Appendix B

Drafting Instructions for a Noise Regulation 17 Approval

Approval should be granted to Western Power to allow the level of noise emitted from a padmount or pole-mount distribution transformer to vary from the prescribed standard in Regulation 7, when received at noise sensitive premises ('the Approval').

The Approval would be made to be valid for 10 years, and if Western Power applies for a new approval one year before its expiry date, the Approval would continue to apply until the Minister makes a decision on the new Approval (similar to the provision in recent regulation 17 approvals).

Regulation 7 should apply to the noise emission as follows –

1. Subregulation (1)(a) specifies that the noise emission must not exceed the assigned level, and must not significantly contribute to an exceedance of the assigned level. Subregulation (2) specifies that the noise is 'significantly contributing to' an exceedance if level of the emission exceeds a level which is 5dB below the assigned level. The Approval should apply both of these provisions to the noise emission;

2. Regulation 7(1)(b) deals with noise characteristics of tonality, impulsiveness and modulation. The noise emission, because of the nature of distribution transformers, will possess tonality which cannot practicably be removed, and therefore will need to be assessed under r.9. Thus the provisions of r.7(1)(b) will need to continue to apply to the noise emission; and

3. Subregulation (3) allows the level of the emission to be determined by measurement at a reference position, followed by a calculation of the level at the point of reception. This clause should continue to operate under the Approval.

Regulation 8 specifies the assigned levels in terms of the locations and times of day at which they apply, and the levels themselves. The Approval will affect the locations where compliance is to be achieved – with some locations being exempted under the Approval – but will not affect the assigned levels themselves. This is discussed in detail below.

Commercial and industrial premises that receive noise have relatively high assigned levels, and only the noisiest of the older transformers would exceed these levels. These exceedences are likely to be a rare occurrence, and if a noise complaint arose, it is to be expected that Western Power would take measures to achieve compliance. Therefore the Approval does not need to exempt the noise emissions when received at these premises.

The part of a noise sensitive premises that receives noise and is more than 15m from the 'building that is directly associated with a noise sensitive use', also has a

relatively high assigned level. Again, exceedences are likely to be very rare, and compliance should be achievable if an issue arose, and hence the Approval does not need to exempt the noise emissions when received at this part of a noise sensitive premises.

The most stringent assigned levels apply to the part of a noise sensitive premises that receives noise and is *less than* 15m from the 'building that is directly associated with a noise sensitive use'. In this regard the noise issues with transformers generally relate to the impact on residential buildings during the night period when background noise is lowest and people are trying to sleep. In this case there is no real need to protect all of the outdoor area within 15m of the building; therefore the approval should specify that the assigned levels for the area *greater than* 15m should apply *within* 15m of the building, i.e. at any point outside of the building. The exception to this is that it is necessary to protect the most sensitive parts of a residential building, and in this regard the Approval should specify an outdoor 'compliance zone' at locations 2m directly outside the 'habitable rooms' of the building; this is discussed further below.

A suitable definition of a habitable room on residential premises may be based on the definition in State Planning Policy 3.1:

> ***Habitable room***
>
> *A room used for normal domestic activities that includes:*
>
> - *a bedroom, living room, lounge room, music room, sitting room, television room, kitchen, dining room, sewing room, study, playroom, sunroom, gymnasium, fully* ***enclosed*** *swimming pool or* ***patio****; but excludes*
> - *a bathroom, laundry, water closet, food storage pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes drying room,* ***verandah*** *and* ***unenclosed*** *swimming pool or patio and other spaces of a specialised nature occupied neither frequently nor for extended periods.*

Schedule 1 Part C of the regulations identifies the various types of noise sensitive premises that are to be protected. The main premises to be protected are those in Item 1 of Schedule 1 Part C: 'Premises occupied solely or mainly for residential or accommodation purposes'. In focusing the Approval onto 'habitable rooms' in residential buildings, it is recognised that there will be some buildings on premises within the meaning of Schedule C that do not have 'habitable rooms', e.g. schools, churches. In this case, under the Approval the assigned noise levels for the part of a noise sensitive premises that is more than 15m from the 'building that is directly associated with a noise sensitive use', would apply to the transformer noise. In other words the transformer would need to meet an L_{A10} noise level of 60dB(A) at any point outside of the building, including at the boundary, at any time of the day. This application of the Approval would provide for compliance to be practicably achievable at the boundary in these cases, while at the same time it is unlikely that there would be any resulting problems with noise received in the nearby buildings.

Subregulation 8(1) defines a variety of 'buildings' that are to be protected on noise sensitive premises, including caravans, camps and park homes in established caravan parks and camping grounds. While it is unlikely that caravans and the like would be located close to a transformer, it is proposed that they be treated in the Approval in the same way as normal residential dwellings. In other words, the definition of a 'building in r.8(1) could remain under the Approval.

The policy position on which the Approval is to be based is that the 'habitable rooms' in 'buildings' that are 'directly associated with a noise sensitive use' on 'noise sensitive premises' that are 'occupied solely or mainly for residential or accommodation purposes' should be protected to the standard provided for currently in r.8.

The Approval should apply a variation to the assigned levels for those spaces inside a residential building that are not noise-sensitive, i.e. that are not habitable rooms. While r.19(2) allows noise measurements to be taken in any type of space inside a building, it is likely that transformer noise that affected only a garage (for example) would have no real impact on the dwelling. Thus it is proposed that the assigned levels specified in r.8(2) for the part of a noise sensitive premises that receives noise and is *more than* 15m from the 'building that is directly associated with a noise sensitive use' should apply if noise from a transformer is assessed inside the building in a space that is not a habitable room. Conversely, the assigned levels for the part of a noise sensitive premises that receives noise and is *less than* 15m from the 'building that is directly associated with a noise sensitive use' should apply if noise from a transformer is assessed inside the building in a space that is classed as a 'habitable room'.

In summary, the Approval should provide a relaxation of the assigned levels in the following spaces on noise sensitive premises –

1. Outdoors in parts of noise sensitive premises that are *less than* 15m from a building that is occupied solely or mainly for residential or accommodation purposes (except for the 'compliance zone'); and
2. Indoors in spaces that are not habitable rooms in a building that is directly associated with a noise sensitive use on noise sensitive premises that that are occupied solely or mainly for residential or accommodation purposes;

The extent of the relaxation provided by the Approval is that the assigned levels specified in r.8(2) for the part of a noise sensitive premises that receives noise and is *more than* 15m from the 'building that is directly associated with a noise sensitive use' should apply to the noise emission.

The assigned levels for commercial premises and industrial and utility premises in the Table in subregulation 8(2) will not need to change under the Approval; these assigned noise levels will still apply. Similarly, the assigned noise levels for noise sensitive premises are not proposed to be altered, as it is the locations – rather than the levels – that will be affected by the Approval. However not all of the assigned levels specified in the Table will be necessary. As the noise emission is essentially constant, only the $L_{A\,10}$ level is relevant to the assessment of a noise emission of this type. Further, as the noise emission is the same

during the day or the night, it will be the 'night' level that is critical when the noise is received at a habitable room, i.e. '2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays'. Hence the assigned noise levels for noise sensitive premises in the Table in subregulation 8(2) may be simplified to two levels – one for the 'compliance zone' at 2m from a window of the habitable room and inside the habitable room [L_{A10} = 35dB + influencing factor)], and one for any other location on the premises [L_{A10} = 60dB(A)].

These 'approved levels' could apply at all hours of the day – while this would make the approved level of '35dB + influencing factor' more stringent than the current regulations for times of the day other than night time, this places no hardship on Western Power, as the transformer noise does not vary with the time of day.

A 'compliance zone' is mentioned above, in order that the initial thrust of the approval be placed upon the noise level received just outside of the habitable room rather than indoors (the indoor noise level will almost always be assessed anyway in response to a complaint that is being investigated). The outdoor 'compliance zone' approach allows for an initial compliance assessment to be made, by calculation if appropriate, prior to an indoor assessment.

The compliance zone could be defined to be any point in a plane outdoors and 2.0m from and parallel to the window or door of a habitable room. When the level of a noise emission from a transformer is determined in a compliance zone, the level must not exceed the assigned level in Table 1 of the regulations for the part of the noise sensitive premises that is *less than* 15m from a 'building that is directly associated with a noise sensitive use'.

It is relevant to mention the role of Part 3 of the regulations here. Noise levels are generally measured outdoors, but can/must be measured indoors under certain circumstances [r.19)]. Under the Approval the noise levels would be measured either outdoors in the 'compliance zone' or indoors under r.19(2). If the 'building' is a caravan, camp or park home the measurement is taken outdoors [r.19(3)].

Regulation 20 deals with the location of the microphone, and subregulations (2) to (4) deal with sound reflections that may affect outdoor measurements. Generally the measurement should be made at least 3m from a reflecting surface (other than the ground), or as far as practicable from a reflecting surface. Note that the above description of the 'compliance zone' places it at 2m from the window or door of the habitable room; while there is some possibility of sound reflections from the door or window at this distance, the effect is likely to be of low significance. Recognising however that the 2m compliance zone is within the 3m distance specified in r.20(3), and in order the avoid any confusion, consideration could be given to varying '3 metres' in r.20(3) to '2 metres'. [In suggesting this approach it is noted that r.17 speaks of varying the 'prescribed standard' and it may be that r.20 is not regarded as part of the prescribed standard – in this case the Approval may still operate satisfactorily with r.20 in force.]

Indoor measurements under the Approval would be taken normally using r.19 and r.20(4).

Under the current wording of r.17(12) the effect of a breach of a condition of approval is that the approval would cease to have effect. With this in mind, it is requested that in this Approval the requirement to comply with the assigned level at a ‘compliance zone’ or indoors be made a part of the ‘approval clause’ itself, rather than being set as a ‘condition’ of approval (this approach has been taken successfully in recent regulation 17 approvals).

In light of the somewhat complex nature of the above, a lay draft is presented in Appendix C for consideration. The draft draws on the wording of recent regulation 17 approvals.

APPENDIX C

PRELIMINARY DRAFT APPROVAL

Approval of the Minister under the *Environmental Protection (Noise) Regulations 1997* regulation 17(7).

1. Citation

This approval is the *Environmental Protection (Western Power Distribution Transformers Noise Emissions) Approval 2013.*

2. Terms used

In this approval –

AS/NZS 60076.10:2009 means Australian Standard AS/NZS 60076.10:2009 Power Transformers – Part 10: Determination of sound levels;

building has the same meaning as in regulation 8(1);

compliance zone means any point in a plane outdoors and 2.0m from and parallel to the window or door of a habitable room;

Director means the Director of the Environmental Regulation Division of the Department of Environment Regulation;

distribution transformer means a padmount or pole-mounted transformer owned by Western Power and any associated integral enclosure;

habitable room has the same meaning as in State Planning Policy 3.1;

influencing factor has the same meaning as in the regulations;

$L_{A\ Slow}$ has the same meaning as in the regulations;

$L_{A\ 10}$ ***approved level*** means a level determined under the Table in clause 3 which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 10% of the representative assessment period;

noise-affecting site means a distribution transformer site where the level of noise emitted from the distribution transformer exceeds the approved noise level specified in the Table;

regulation means a regulation of the Environmental Protection (Noise) Regulations 1997;

representative assessment period has the same meaning as in the regulations;

start day means the day on which notice of this approval is published in the *Gazette*;

Western Power means Electricity Networks Corporation ABN 18540492861, trading as 'Western Power'.

3. Approval

1. Approval is granted to Western Power to allow the level of noise emitted from a distribution transformer to vary from the standard prescribed under regulation 7(1)(a) for noise sensitive premises if the level of noise emitted from the transformer, when received at a location set out in column 1 of the Table, does not exceed the L_{A10} approved level set out in column 2 of the Table at any time of the day.

Table

Premises receiving noise	**Locations**	**$L_{A\ 10}$ approved level (dB)**
Noise sensitive premises that are occupied solely or mainly for residential or accommodation purposes	Any locations within the compliance zone or within a habitable room of a building directly associated with a noise sensitive use.	35 + influencing factor
	Any locations other than locations within the compliance zone or within a habitable room of a building directly associated with a noise sensitive use.	60
Noise sensitive premises that are not occupied solely or mainly for residential or accommodation purposes	Any locations within the boundary of the premises.	60

2. When determining the level of the noise emissions from a distribution transformer –

   a. regulation 20(3) is varied to:

      Outdoor noise measurements should be made with the measuring microphone located at least 2 metres from any substantial sound reflecting surface (other than the ground plane);

      and

   b. regulation 20(4) does not apply to the noise emission.

4. Duration of approval

1. The approval has effect for ten years from the start day or a longer period that applies under subclause (2).

2. If Western Power applies for a further approval under regulation 17 in relation to noise emissions from the distribution transformers within the first nine years in which this approval has effect, this approval continues to operate until the Minister grants, or refuses to grant, the further approval.

5. Conditions of approval

It is a condition of the grant of the approval that the provisions in clauses 6 to 9 are complied with.

6. Sound power level of the transformers

The sound power level of a distribution transformer, when determined by reference to AS/NZS 60076.10-2009, shall comply with the reduced sound power level limit of the Standard if it is installed on or after the start day.

7. Procedure for noise-affecting sites

Western Power shall –

1. maintain a register of distribution transformer sites in respect of which Western Power has received advice under subclause (2) that the site is reasonably likely to be a noise-affecting site;
2. place a distribution transformer site on the register as soon as practicable after–
    a. a complaint is received from the owner or occupier of a noise-sensitive premises through Western Power's complaint system; or
    b. a response is received by Western Power from an owner or occupier of noise sensitive premises to a community survey conducted in accordance with the noise management plan required by Clause 8,

    that identifies noise emissions from a distribution transformer;

1. conduct an investigation into noise emissions as soon as practicable after a distribution transformer site is placed on the register to determine –
    a. whether this approval applies to the noise emission; and
    b. if the approval applies, whether the site is a noise-affecting site;
2. where the investigation determines that the distribution transformer site is a noise-affecting site, implement one of the following within a reasonable time –
    a. measures to reduce noise emissions from the distribution transformer to the extent that the site is no longer a noise-affecting site; or
    b. alternative measures to the satisfaction of the owner or occupier who made the complaint;

3. where an investigation determines that –
    a. the approval does not apply to the noise emissions from a transformer site; or
    b. the site is not a noise-affecting site; or
    c. the owner or occupier has indicated in writing satisfaction with the alternative measures implemented under subclause (4)(b),
    d. remove the site from the register; and
4. make the register available to the Director on request.

8. Noise management plan

1. Western Power is to submit to the Director within 3 months of the start day a noise management plan.
2. The noise management plan is to include details of the following –
    a. procedures for Western Power to procure distribution transformers that comply with the reduced sound power level detailed in Australian Standard AS/NZS 60076.10:2009;
    b. guidelines for developers regarding the siting and installation of distribution transformers and the provision of advice to landowners;
    c. procedures to be adopted by Western Power in conducting community surveys or consultations which may result in owners or occupiers of noise-sensitive premises raising issues of noise from distribution transformers;
    d. procedures to be adopted by Western Power in responding to complaints about noise emissions from distribution transformers;
    e. investigation procedures in respect of distribution transformer sites that are on the register of noise-affecting sites;
    f. description of and procedures for implementing remedial actions in respect of noise-affecting sites;
    g. procedures for resolution of any disputes; and
    h. any other matter that the Director may require.
3. At any time after receiving a noise management plan the Director may, by notice in writing, require Western Power to provide a revised noise management plan including details of any matters specified in the notice.
4. A revised noise management plan required under subclause (3) is to be provided within 14 days or by such other time as the Director specifies in the notice.

9. Annual Reports

1. Western Power is to prepare a written report —
   a. for the year beginning on the start day; and
   b. for each year that begins on the anniversary of that day.
2. The report for a year is to provide –
   a. a summary of the actions taken in relation to the register required under Clause 7; and
   b. a summary of progress with implementation of the noise management plan required under Clause 8.
3. Western Power is to give the report for a year to the Director within one month after the end of the year, or by such other time as the Director approves in writing.
4. On the request of the Director, Western Power is to give the Director any translation or other information necessary to enable the report to be understood by members of the public.