KHSK

Economic Consultants

Report to

Department of Communications, Climate Action and Environment

International Practice in the Approach to and Levels of Compensation of Property Owners in Proximity to High-Voltage Transmission Lines

Final Report

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Table of Contents

Executive Summary

1. This report has been prepared by KHSK Economic Consultants in response to a request from the Department of Communications, Climate Action and Environment to undertake a study of how compensation is provided to property owners in the vicinity of new transmission infrastructure in a range of countries.
2. The study was undertaken against the background of the proposed development of the North-South interconnector between the transmission networks of Ireland and Northern Ireland, but it is not undertaken to provide recommendations in relation to how compensation on this project should be provided.
3. There is a large literature on this topic, but it is mostly confined to identifying the reasons why compensation should be provided, rather than the how and how much questions that are the main concerns of this report. Two conclusions are important. The first is that there is no scientific basis for a claim that transmission lines cause health problems. The second is that there is limited evidence from numerous analyses of sales prices that transmission lines depress the value of the land over which they pass.
4. This second finding is important as it greatly weakens the argument that there are environmental or lasting perceived negatives associated with the construction of new infrastructure although these issues may appear important before and for a time after the infrastructure is constructed.
5. In relation to the payment of compensation, the main finding of this report is that there is considerable variation in the approaches that are used by TSOs to compensate land owners and in the levels of compensation that are paid. Indeed, it would not be meaningful to try to summarise the information given the extent of the differences.
6. Payments for direct impacts on property are often assessed against a published scale and the basis for this compensation is not contentious. However, arbitration is often required to arrive at an actual agreed payment. There are often difficulties with accessing comprehensive information across countries as TSOs tend to be very guarded in relation to the outcomes of arbitration processes or payments that are made for impacts such as injurious affection.
7. One important point that emerges is that provisions in the legal framework in each country, particularly in relation to private property rights and the formal rights of electricity operators, are the key determinants of the approaches to compensation

that are seen. These vary hugely. Approaches have been designed in response to these provisions rather than against objective strategic criteria.

8. Some types of compensation are provided by all TSOs. These include payments for damages to land or crops and the usual practice is to try to restore damage before offering 100% compensation for losses. A similar approach is taken with respect to loss of crops, but there are a lot of differences in practices regarding how to do this.
9. For the most part, TSOs prefer to obtain easements than to purchase property with some exceptions. Most TSOs attempt to get agreements in place, but some move directly to compulsory acquisition of rights. Many TSOs build in premia to incentivise early agreement, but some are prohibited from doing so.
10. The concept of national interest is important in many countries and where a project is defined as such the TSO often has considerable powers to act. Where this is the case, and where there are unlikely to be additional delays or costs associated with the compulsory approach, TSOs are most likely to follow this route.
11. It is very rare to specifically compensate for issues such as visual intrusion, noise or health as the potential for these impacts is usually not recognised in law. It is more common to compensate for loss of value in a property on the assumption that these impacts will be captured into the value.
12. TSOs usually only pay compensation for any impact on valuations within a specified area that coincides with a technically defined protection corridor. This usually coincides with the easement area and excludes claims by third parties.
13. There is huge variation in relation to how to compensate for loss of land but the use of valuers or agreement with national farmer representative organisations are common approaches. Many countries also have detailed laws to guide valuations.
14. Compensation is usually paid as a lump sum irrespective of its basis. The exception is a minority of cases where there are recurring annual payments to reflect loss of earning potential, overhang or leases.
15. It is difficult to be definitive in relation to the prevalence of compensation for injurious affection and many countries would appear to specifically exclude such payment. Where there is such compensation there is considerable secrecy regarding how it is determined and under what headings.
16. Some TSOs have developed community benefit (gain sharing) schemes but the practice is still not widespread. Most of these schemes have little or no legislative basis and are often viewed as a way to address local opposition.

1. Introduction

1.1 Context and Background

This report has been prepared by KHSK Economic Consultants in response to a request from the Department of Communications, Climate Action and Environment to undertake a study of *International Practice in the Approach to and Levels of Compensation of Property Owners in Proximity to High-Voltage Transmission Lines* with specific reference to European experience.

The terms of reference for the study noted the context provided by the proposed North-South interconnector between the transmission networks of Ireland and Northern Ireland. The planning consent process for this new infrastructure has concluded but there are ongoing issues being raised in relation to how it might affect the prices of land and property in proximity to the new lines. Against this background, it is proposed that the research and subsequent report would provide an information base on the provision of compensation to land and property owners in a range of countries.

As will be seen below, compensation for the construction of new transmission lines is closely connected with legislation in relation to the acquisition of rights over private properties and, sometimes, the acquisition of the property itself. This is a common feature of compensation practices in every country. However, the World Bank has concluded that "

> 'although the compulsory acquisition power is deeply rooted in virtually all legal systems, the establishment of efficient and fair legal and institutional frameworks for exercising this power remains unfinished business in many countries around the world. … The task of better defining the principles and processes that govern compulsory acquisition powers is one that is very much alive and at the heart of current land policy debates'[1]

Partly as a result, in as far as the consultants can ascertain, there is no generally accepted international set of criteria that could provide reliable guidance for good electricity industry practice in this regard and practices are based on the legal framework which varies considerably from country to country.

[1] Lindsay, J. M. (2012) *Compulsory Acquisition of Land and Compensation in Infrastructure Projects*. World Bank PPP Insights, Vol. 1 (3)

An important result is that the practices that are employed by transmission system operators (TSOs) when dealing with property owners, the ways in which compensation is considered and the amounts that are paid have all been shaped and determined by detailed clauses within national property laws and differ considerably across countries, even within the EU. This report does not seek to examine these legal structures, except in passing reference, but examines instead the practices that are followed and the outcomes that are produced.

A number of common features are found in terms of the basis for paying compensation. One of these is that while there is fairly widespread agreement – with exceptions – regarding the issues that might lead to compensation and many countries have developed metrics or formula based on these to calculate the compensation to be paid, it is also quite common for these practices to contain options for arbitration between TSOs and property owners where it is proving difficult to find an agreeable outcome. An important implication for this report is that the outcomes of these arbitration procedures do not appear to be made publicly available except in rare cases. Therefore, while it is often possible to identify the practices that are followed and the inputs to the discussions, it is often not possible to be definitive in relation to the outcomes that are produced.

1.2 The North-South Interconnector

The proposed North-South interconnector provides the context for this review. This cross-border infrastructure has been identified as a vital link in the All-Ireland electricity network and, having been designated as a Project of Common Interest under EU 'Guidelines for Trans-European Energy Infrastructure', it is the first such designated project to be considered for planning approval in Ireland[2].

When completed, the part of the interconnector in Ireland would comprise a new single circuit overhead transmission line of just over 100km in length and will involve the construction of 299 support structures, ranging in height from 26 metres to 51 metres over ground level, with associated conductors, insulators and other apparatus along with other works on existing infrastructure. The support towers will be placed about 340

[2] The EU regulation for trans-European energy infrastructure (EU No 347/2013) is aimed at modernising and expanding electricity infrastructure and increasing the interconnection of networks across national borders.

metres apart with an area of approximately 900m^2 required around each tower to complete the necessary works.

Tower foundations will range from 4 to 81m^2 depending on the type of tower and temporary access routes, up to 4m wide, will be required for the construction of the towers and other infrastructure. In some cases, it is likely that access will also require that temporary tracks are put in place. The construction is expected to take place over a period of three years. Current land uses along the route are almost wholly agricultural with some drumlin landscape and some occasional stretches of forestry. Consequently, it is foreseen that the infrastructure will require access and long term usage of agricultural land currently in private ownership.

Planning for this infrastructure has been completed, notwithstanding legal challenges, in both the Republic and in Northern Ireland. However, this process is not completed at this time and there are additional legal challenges ongoing. It is known that there have been extensive external consultations between Eirgrid and landowners, residents and other community groups along the route. These issues are relevant in that they provide the background to the study, but they are not the concern of this report and no further comment is included. Furthermore, nothing in this report should be construed as a comment on planning or legal procedures connected with the proposed infrastructure, or on any consultations that have been undertaken between the TSO and other stakeholders.

1.3 Methodology and Report Structure

The research for this report primarily involved information gathering and the presentation of findings. There are three main sources for the information on which this report is based. These are:

- A literature review of academic publications, online sources and other materials.
- A survey of TSOs in European countries and in Australia and New Zealand.
- A consultation process undertaken within Ireland and a selection of other EU countries.

The TSO survey forms the information basis for much of Chapters 5, 6, 7 and 8. The survey was conducted online and a copy of the questionnaire that was used is included as an appendix below. As well as directly eliciting information, this questionnaire also requested that links to additional sources of information be provided. This proved to be a useful request as a number of TSOs have undertaken work to codify their own practices

and practices in neighbouring countries and, while some of these have been placed on the internet, they would have proven very hard to track down without direct links.

The survey questionnaire was sent to named contacts in TSOs in 30 European countries[3]. A total of 16 fully completed responses were received, including from all the larger European countries, and partial information was obtained on 6 other countries[4]. To elicit this response, the consultants arranged for an email to be circulated by ENTSO-E to its members by way of introducing the consultants[5]. This was sent in mid-October 2017 and was followed up by an email from the consultants and a copy of the questionnaire a week later. An email reminder with another copy of the questionnaire was sent in mid-November and a further reminder was sent at the end of November 2017. The consultants also engaged in correspondence with a number of the contacts to offer assurances regarding confidentiality, to prompt responses and to answer additional questions in relation to the survey. Many TSOs also requested that a copy of the report be made available to them when it is completed indicating that there is considerable interest in this topic, but there is a lack of comprehensive, reliable, cross country, comparative information.

Report Structure

The report is structured as follows. Chapter 2 reviews, mostly academic, studies that have been published on the possible impacts of transmission lines. A number of reasons have been examined as a basis for the payment of compensation. Some of these are broadly agreed, but the review, while brief, suggests that the basis for some is not without controversy. Irrespective of what this research might find, it can be argued that if there is even perceived to be an impact then this will be reflected in property prices. The literature is examined to identify the strength and nature of such relationships.

[3] The countries survey included 24 of the 28 members of the EU plus Bosnia, Iceland, Macedonia, Serbia, Norway and Switzerland. Ireland was not included in the survey as direct consultations with Eirgrid were undertaken. Malta does not have high voltage overhead transmission lines over private property and so it was not included. Contacts in Luxembourg and Romania were not identified by ENTSO-E. A version of the survey was also sent to TSOs in non-European countries.

[4] As is always the case with such surveys, the consultants could not check the accuracy of the information that was provided except in a small number of cases where there were publications that included similar facts. However, we are not aware of any reason to doubt the accuracy of the responses. With this in mind, the consultants have accepted that the information is accurate, and the report is based on a summary and interpretation of the information provided.

[5] ENTSO-E was established in 2009 by the EU's Third Legislative Package for the Internal Energy Market and represents 43 TSOs from 36 European countries.

Chapter 3 summaries the results of published comparative research on practices and the payment of compensation. There have been only a few attempts to collect and publish cross-country comparative information on this topic and the scope is considerably narrower than this report.

Chapter 4 provides an overview of experience and practices in Ireland. This is included as background information to enable comparisons to be drawn between practices in Ireland and the information that is obtained on other countries. It also provides additional context for the conclusions that are drawn.

Chapter 5 reviews practices in Britain and Northern Ireland. This clearly has direct relevance for the North-South Interconnector. The information has been collected from a range of sources including published material, the survey and direct consultations with TSOs operating in the UK.

Chapters 6 and 7 provide information on practices in other European countries. The main data source is the survey, email contacts with the TSOs and such additional online information as could be sourced. Chapter 6 covers larger EU countries while Chapter 7 reviews smaller EU countries and other countries in Europe.

Chapter 8 provides information on practices in New Zealand, Australia and in selected US states and Canadian provinces. The information in this chapter is illustrated by reference to practices and outcomes in relation to specific recent and ongoing major transmission infrastructure projects in these countries.

Finally, Chapter 9 summarises findings on the more common practices and areas of agreement in this sphere. However, these are not recommendations as this report is an information source to inform decisions, not to direct them.

2. Impacts of Transmission Lines

2.1 Direct Impacts on Property

There is general agreement in relation to certain impacts of transmission lines but serious disagreements in relation to certain other claimed impacts. This is seen in both studies on the possible impacts of new lines and in the issues for which compensation is paid. For the most part, there is general agreement that compensation will be paid in respect of impacts such as obtaining a right of way, damage to crops, damage to land, or restrictions on current or future use. This may also include full acquisition of the property.

As will be seen in later chapters of this report, there is fairly widespread agreement among most countries on when compensation might be paid – and for which it can be possible to follow pre-determined methodologies to identify the appropriate level of compensation – but there are issues of sharp disagreement – and consequently a lack of clear, easily summarised methodologies. Where there is a direct impact on property, the case for compensation is seldom contentious, although the precise value may be open to negotiation. Compensation may be paid either through a one-off or a recurring payment for direct losses, or for the acquisition of a right – such as a wayleave or easement – to site structures on or over a property, or through compulsory acquisition of all or part of an affected property. Of course, there are areas for arbitration, but fundamental agreement on the principle of compensating property holders does allow for the use of simple rules or formulae. These are sometimes made publicly available, although actual practices and outcomes, which can involve arbitration, are not always so easily available, if at all. However, arbitration mechanisms are widely developed.

Despite this fundamental agreement, there can be difficulties in terms of agreeing the levels of compensation and what exactly is the basis for any compensation that is, or should be, payable. One common area where disagreement can arise is where the current use of the land or property is perceived to be not its highest value use, and where it is envisaged that a higher value use could arise in the foreseeable future, but that this could be prohibited by proximate power lines. This is akin to injurious affection. The most common instances of this is where agricultural lands are close to urban areas and may be rezoned in the future. A similar situation can arise where new power infrastructure might be perceived to undermine the broad visual appeal of a location and thereby undermine its potential for development as a tourism or amenity centre.

This is not a problem with full acquisition since there would be a logical fallacy if the payment is set according to the full current market value of the property as set by an independent arbitrator – as is usually the case – and it was also maintained that this does not reflect maximum use value. It is of course possible that a particular property may obtain a new use value in the future, but to argue that the probability of this happening is not reflected in the current market value of the property would be to argue that an individual, who is likely a party the transaction with a vested interest, has greater insight or is more capable of objective analysis than the market.

However, this argument may be more valid in respect of cases where a transmission line only affects part of a property. In that case, the valuation is likely to reflect the current use value of that part only and not reflect the fact that this could prohibit a higher full use value for the property. Therefore, where there is a permanent structure, the payment should seek to reflect the market value of a property, not the current use value of a small part of it.

A second related area of contention arises from the argument that transmission lines do not just affect the value of properties in their immediate vicinity, but also affect the values of properties outside the immediate corridor of the line. This idea has been expressed to the consultants along the following lines:

> 'Assume a situation where there are two identical properties except that a new power line is to be erected near one, although it will not cross the property. Given a choice between buying that property or the identical property that is not near the new transmission line it is reasonable to expect that a prospective buyer would choose the latter'[6].

On face value, this argument appears difficult to dismiss, but it requires that at least one of two pieces of proof are required. The first is to show that there are real reasons to think that these properties will be devalued in some way and that the perception is not only based on a fear of change that will soon disappear once the infrastructure is in place. This requires that it can be shown that there would be a real impact arising from the proximate construction of a new transmission line. The second requirement is to show that the sale prices of properties are supressed when they are near transmission lines or when new lines are put in place nearby and that this finding can be applied to any property being examined.

[6] Taken from private correspondence with consultants

The view of the consultants is that if either of these requirements are fulfilled than the case for compensation is strengthened as there is either actual harm caused or there is a perception created that harm is caused that persists, and is sufficiently real, to be reflected in prices. Furthermore, it can be argued that if the second can be shown the first can be inferred, even if it cannot be objectively proven. However, the reverse is also true. If it cannot be shown that there is a persistent and sustained impact on property prices when new transmission infrastructure is constructed, it cannot be argued that there is a real detrimental impact from transmission lines or even that any perception of a detrimental impact will persist beyond the short term. To do so would be to argue that an existing owner perceives the negatives, but that a buyer does not.

For the issues where there are disagreements, the questions to be answered therefore appear quite straightforward. First, do transmission lines cause detrimental effects on people who live in their vicinity other than the direct effects on immediately adjacent property owners? Second, is there evidence that any impacts are reflected in property prices i.e. are current and future negatives capitalised into lower property prices?

2.2 Health and Environmental Impacts

The most commonly expressed issue in relation to the potential impacts of transmission lines revolves around perceptions of their impact on the health of people living in the vicinity[7]. This is an important issue since it is of relevance to a far wider cohort than property owners in direct proximity to the lines and can give rise to emotional responses. However, since the physical characteristics of transmission lines and their impacts on health are characteristics that can be studied objectively it should be possible to come to definitive conclusions in this regard. The issue has been widely studied and indeed this is the case.

It is not difficult to see where concerns regarding the possible impacts of transmission lines on health may have arisen. It is known that electricity transmission lines operate at high voltage and the strength of electromagnetic fields (EMFs) directly beneath the

[7] Transmission lines are sometimes opposed on the basis that detrimental health impacts cannot be compensated as it would be akin to placing a value on a specified life. It follows that the prospect of any health impact is a reason to refuse permission to construct infrastructure even if compensation is available. The consultants reject any such argument since property owners, if fully compensated for any fall in values, would have the option to move elsewhere to ensure that there would be no adverse effects on their health. This is stated without any implication for the proposed North South Interconnector.

lines may reach up to 5µT[8]. EMFs are a form of radiation and it is a simple association to link radiation with adverse health effects stretching to cancers and cardiovascular problems.

The issue of a link between transmission lines and adverse health effects has been examined by the World Health Organisation (WHO)[9]. They concluded that

> there are no substantive health issues related to ELF electric fields at levels generally encountered by members of the public.

The National Radiological Protection Board and Health Protection Agency in the UK, has provided advice in terms of the safe levels of exposure[10]. Based on commissioned research and a review of available published research they concluded that

> There is no clear evidence of a carcinogenic effect of ELF EMFs in adults and no plausible biological explanation of the association that can be obtained from experiments with animals or from cellular and molecular studies. … Studies of occupational exposure to ELF EMFs do not provide strong evidence of associations with neurodegenerative diseases. … Studies of suicide and depressive illness have given inconsistent results in relation to ELF EMF exposure, and evidence for a link with cardiovascular disease is weak. … NRPB concludes that the results of epidemiological studies, taken individually or as collectively reviewed by expert groups, cannot currently be used as a basis for restrictions on exposure to EMFs. (NRPB, page 38)

The research concluded that

> The overall evidence for adverse effects of EMFs on health at levels of exposure normally experienced by the general public is weak. The least weak evidence is for the exposure of children to power frequency magnetic fields and childhood leukaemia. (page 146)

This reference to an association between exposure to EMFs and childhood leukaemia has received quite a lot of attention, but it is easy to draw incorrect conclusions.

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[8]Bond, S. S. Simms, and P. Dent (2013) *Towers Turbines and Transmission Lines: Impacts on Property Value*. Chichester: Wiley-Blackwell. 5µT is 5 microtesla or 50 milligauss.

[9] World Health Organisation (2007) Fact Sheet No. 322: Electromagnetic Fields and Public Health – Exposure to Extremely Low Frequency Fields.

[10] NRPB (2004) *Review of the Scientific Evidence for Limiting Exposure to Electromagnetic Fields (0-300 GHz)*. Documents of the NRPG, Vol. 15(3)

The first evidence of a link was published in 1979[11] and follow-up studies have confirmed a weak association between exposure to strong EMFs and the incidence of childhood leukaemia[12]. These studies found that exposure to EMFs greater than 0.3 – 0.4 µT were associated with a doubling of the risk of leukaemia. This level of exposure would arise at a distance of about 60 metres from a 500kV line. One UK study also found an elevated risk at greater distances in excess of 200 metres[13]. This study found that children who lived within 200 metres of a high voltage line had a relative risk of leukaemia of 1.69 while those living between 200 and 600 metres away had a relative risk of 1.23 when compared to children who lived greater than 600 metres from a line. However, the researchers were unable to explain why this might be the case and concluded that

> There is an association between childhood leukaemia and proximity of home address at birth to high voltage power lines, and the apparent risk extends to a greater distance than would have been expected from previous studies. About 4% of children in England and Wales live within 600 m of high voltage lines at birth. If the association is causal, about 1% of childhood leukaemia in England and Wales would be attributable to these lines, though this estimate has considerable statistical uncertainty. There is no accepted biological mechanism to explain the epidemiological results; indeed, the relation may be due to chance or confounding.

This conclusion indicates the level of uncertainty with regards to the findings of these studies and the authors are very careful to warn against drawing simple conclusions of cause and effect pointing out that no such linkage might exist and cannot be assumed in the absence of a causal explanation. The NRPB has reached a similar conclusion and stated that the association found between transmission lines and childhood leukaemia '*is an observation for which there is no sound scientific explanation*'. It is an association, there is no known causal relationship. It is possible that the results that have been found may be due to bias in the selection of control children and chance variations resulting from small numbers of individuals being included in studies. As a result, the NRPB concluded that

> Any judgements developed on the assumption that the association [*between exposure to EMFs from any source and an increased incidence of childhood leukaemia*] is causal would be subject to a very high level of uncertainty. (NRPB, page 133)

[11] Wertheimer, N. and E. Leeper (1979) 'Electrical Wiring Configurations and Childhood Cancer. American Journal of Epidemiology, Vol 109, pp. 273-284.

[12] Copes, R. and P. Barn (2008) 'Is living near power lines bad for our health?'. British Columbia Medical Journal, Vol. 50 (9) pp. 494-95.

[13] Draper, G., T. Vincent, M. Kroll and J. Swanson (2005) Childhood Cancer in Relation to Distance from High Voltage Power Lines in England and Wales: a Case-Control Study. British Medical Journal, Vol. 330

The issue has also been examined in Ireland. A review of EMF research undertaken by the Department of Communications, Marine and Natural Resources (DCMNR) reached similar conclusions and found that

> No adverse health effects have been established [*for EMFs at strengths*] below the limits suggested by international guidelines[14].

In other words, while it is accepted that power lines produce EMFs, the impact of these, and other EMFs to which the population is exposed on a regular or occasional basis, on health is within acceptable levels. Based on this and on a review of international evidence the Office of the Chief Scientific Adviser stated that

> 'It is simply not possible for the level of energies associated with power lines to cause cancer[15].

This report went on to state that claims in this regard are '*scientifically unconvincing*' and led to the conclusion that the results of research that indicted associations had been weakened by more recent research. More recently, a team of researchers from the Netherlands examined EMFs in an Irish context[16]. In line with other studies, the report concluded that

> 'the evidence for the various long-term health effects of ELF or RF fields at strengths below the limits in the European recommendation is either limited, inadequate or absent' (page 9).

The research also included a comparative analysis of practices in five European countries and Ireland in relation to EMFs. This identified a number of differences with some countries having translated EU recommendations into national legislation while others apply different limits. There were also differences in how EMFs are monitored and the involvement of private citizens in decision making in this area. In the case of Ireland, it found that the restrictions and reference levels '*support a high level of health protection*' (page 67).

This level of increase in childhood leukaemia found in the Draper et. al. study would mean that about 5 cases of childhood leukaemia each year may be associated with living close to power lines in the UK. At the time of the research, about 200 children were

[14] Department of Communications, Marine and Natural Resources (2007) *Health Effects of Electromagnetic Fields*

[15] O'Sullivan, D. (2011) A Review of Recent Investigations into the Possible Health Effects of Exposure to Electromagnetic Fields (EMF) from Power Lines. Report published by the Office of the Chief Scientific Adviser

[16] RIVM (2016) *Electromagnetic Fields in the Irish Context*. Report to the Department of Environment, Community and Local Government. The report is available at www.dccae.gov.ie/en-ie/environment/publications/Pages/Electromagnatic-Fields-Publications.aspx

being killed in road accidents each year in the UK. As a result, researchers have tended to conclude that rather than applying a precautionary principle approach in decision-making or trying to ensure that all transmission lines are distant from homes, given the level of uncertainty, the correct approach is to accept that:

> Based on the available evidence, one can achieve much greater risk of reduction or health benefits if resources are directed to other larger, better established risks[17].

The lack of scientific evidence for a link between EMF and adverse human health effects led the European Commission to decide not to apply the precautionary principle in its EMF Guidelines on the basis that

> there are no clear scientific indications that the possible effects on human health may be potentially dangerous[18].

The evidence therefore is that there is no proof of any adverse effects from EMFs on human health. Furthermore, there are important issues to be considered before a conclusion regarding the impact of a transmission line on health can be drawn. The strength of the EMF from transmission lines decreases with distance such that it would fall to 0.1µT, just 2% of the level directly underneath the line, at 50 to 100 metres away from the line. As well as distance, trees and buildings also reduce this strength so that the strength of EMFs inside a house will be only a fraction of outside.

There is a further important issue: EMFs are not only created by transmission lines. All electrical equipment including household items such as televisions, computers and mobile phones produce EMFs. Consequently, the strength of EMFs emanating from a power transmission line that is normally experienced by a person living in the vicinity of the line will be significantly lower than the strength of EMFs experienced as a result of them being surrounded by common household appliances. In addition, out of doors, EMFs are also emitted by distribution lines and people are generally much closer to these, and for much longer periods of time, than they are to high voltage transmission lines. As a result of these factors, a World Health Organisation review concluded that the level of exposure to electric fields of people living in the vicinity of high voltage

[17] Copes, R. and P. Barn (2008) 'Is living near power lines bad for our health?'. British Columbia Medical Journal, Vol. 50 (9) pp. 494-95.

[18] European Commission Implementation report on the Council Recommendation limiting the public exposure to electromagnetic fields (0 Hz to 300 GHz). The report is available at http://ec.europa.eu/health/archive/ph_determinants/environment/emf/implement_rep_en.pdf

transmission lines actually differs very little from the average exposure of that is experienced among the general population[19].

The WHO has collaborated with the International Commission on Non-Ionising Radiation Protection (ICNIRP) to establish guidelines to limit public exposure to non-ionising radiation. A EU Directive published in 1999 meant that all EU countries agreed to adopt these guidelines and use them in their planning processes. New Zealand and the US also base their planning on these guidelines. In this respect, the consultants note from the planning report on the North South Interconnector the statement that

> Based on the weight of research in the field, the HSE is satisfied that as long as the development complies at all times with the international exposure limit guidelines as established by the INCIRP, there will be adequate protection for the public from any electromagnetic field sources (ABP, 2017, page 50)[20].

This indicates that the ENCIRP Guidelines were indeed applied to guide decisions during the planning process for the proposed interconnector.

Consequently, there are two distinct weaknesses in the argument that new transmission infrastructure will likely have detrimental health effects: no causal link between EMFs and health deterioration have been found and the vast majority of the EMFs that would be experienced by people who live in the vicinity of power lines would arise from household appliances to which they are exposed all the time with new transmission infrastructure having no more than a small marginal impact.

Along with the fact that there is no observational evidence to support a link between the construction of transmission infrastructure and health impacts, there are theoretic reasons to expect that electromagnetic fields associated with power infrastructure will pose no threat to health.

For a start, the EMFs from power lines and appliances are of extremely low frequency and low energy[21]. Energy from higher-frequency fields is absorbed more readily by biological material, but low frequency EMF does not have enough energy to heat body tissues.

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[19] World Health Organisation (updated 2016) *Extremely Low Frequency Fields*. Environmental Health Criteria Monograph No.238. http://www.who.int/peh-emf/publications/elf_ehc/en/

[20] An Bord Pleanála (2017) *Inspectors Report VA0017*

[21] Transmission lines have a low frequency of 60Hz while television transmitters have higher frequencies in the 55 to 890 MHz range. Microwaves have even higher frequencies of 1,000 MHz and above. Ionizing radiation, such as X-rays and gamma rays, have frequencies above 10^{15} Hz. See *APCo 765 KV Transmission Line: Environmental Impact Statement*, Volume 4, page 8. This report prepared by U.S. Forest Service, the National Park Service and US Army Corps of Engineers and published 1996 is widely cited.

Second, because of this low frequency, the fields produced by these sources are non-ionizing. They are therefore quite different from ionizing radiation such as X-rays and gamma rays. Consequently, EMFs from transmission lines cannot cause ionization.

Third, all cells in the body maintain large natural electric fields across their outer membranes. These naturally occurring fields are at least 100 times more intense than those that can be induced by exposure to common power-frequency fields. When an external agent perturbs the cell, other processes can compensate so that there is no overall disturbance to the organism. Strong fields cause harmful effects but electric field intensity exposure such as would be experienced at 50 to 100 metres from a transmission line is not harmful.

The WHO estimates that in the region of 25,000 articles have been published over the past 30 years to examine the biological effects and medical applications of non-ionizing radiation[22]. Consequently, scientific knowledge in this area is now more extensive than for most hazards. The WHO reviewed this literature and concluded that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields. Despite these facts it is still commonly claimed that there are gaps in the knowledge and that more research needs to be done. Furthermore, safety and health concerns are given high importance in planning requirements and objective criteria have been developed to minimise any possible impact. Bond et. al (2013) go as far as to state that:

> Planning policy in relation to the siting of electricity distribution equipment and the subsequent development of this type of land are dependent upon two factors: health and safety legislation and, since HVOTLs produce electric and magnetic fields (EMFs), safe EMF exposure levels[23].

As a result, provided these criteria are applied during the planning process and adhered to thereafter, there would appear to be no scientific reason to use health concerns as a basis for compensation.

Of course, EMFs are not the only health issue that can arise with power lines and, while they have garnered most attention, direct contact with lines, while very rare, is a much greater risk. However, this risk is contained in the sense that it will only be associated with specific instances such as during construction, if problems arise during maintenance

[22] See http://www.who.int/peh-emf/about/WhatisEMF/en/index1.html

[23] Bond, S. S. Simms, and P. Dent (2013) *Towers Turbines and Transmission Lines: Impacts on Property Value*. Chichester: Wiley-Blackwell. HVOTLs stands for high voltage overhead transmission lines.

or if lines fall to the ground. This means that these risks do not arise during normal operations and so times of heightened risk are clearly indicated and can usually be managed. Furthermore, except in the rare cases when a member of the public might approach a fallen line the risks are restricted to specific personnel only, namely, employees of the TSO. However, in terms of the impact on human health and life, these risks are far more important than those posed by EMFs[24].

Environmental Factors

A range of possible impacts of transmission lines have been identified, mostly arising from the fact that overhead lines have a visible physical existence. This list of concerns can include, but is not necessarily limited to:

- Aesthetic and visual impact;
- Noise emissions;
- Possible interference with air transport;
- Potential impact on birds;
- Negative impacts on woodlands, wet lands and areas of conservation;
- Impact on areas of cultural and heritage importance; and
- Interference with TV and Radio reception.

These impacts are qualitatively different from direct impacts on property in a number of respects. Importantly, they will be felt similarly by people in the area, either as visitors or residents, whether or not they own property. Consequently, compensation based on whether a transmission line directly impacts on a property by crossing it or by limiting its use will not address these impacts. Furthermore, it is much more difficult to identify areas or people who fall within an exclusion zone to which any compensation should be paid.

Two approaches are used to get around these problems. First, the planning process contains many considerations that result in obligations on a developer to minimise the impact. These usually include limitations on the types of infrastructure, their positioning, requirements to minimise noise and other types of intrusion and even route alterations. However, the conceptual basis for this is not to compensate for the impact but to minimise the impact to the extent that a 'public good' argument becomes decisive. In other words, that the negative impact is minimised to the extent that the benefits of constructing the infrastructure exceed the costs imposed. This is not an unusual

[24] Centre for Health, Environment & Justice (2015) *Power Lines*. Fact Pack – PUB 041

argument to make and is fully in line with economic decision-making as expressed in the Kaldor-Hicks criterion[25].

The second approach is that TSOs have been moving to develop mechanisms to compensate those affected without assigning direct impacts or requiring property ownership. These community benefit or benefit sharing approaches recognise that there can be impacts on local residents but do not require that a direct causal impact is measured or even identified. In this, they can be considered to be a type of no-blame compensation. Rather, compensation is paid based on the recognition that the benefits that arise do so mostly to communities at either end of the transmission line, while the costs are imposed on those who live along the route of the line. They are then often described as gain-sharing mechanisms, rather than compensation for damages.

A second difference is that only some of these features of transmission lines can be measured. Their impact can be assessed objectively, and criteria or guidelines developed to minimise the impact. However, it cannot be concluded, just because there may be no objective way to measure an impact directly, that the impact is any less 'real'. Unless it is argued that the impact is somehow experienced only by those living in the area in advance of the construction of new infrastructure, then it can be concluded that any adverse impact, no matter how subjective or perceptual, will be reflected in property values that will be lower in the vicinity of transmission lines when compared with prices in a before and after analysis, or compared to the value of similar properties more distant from the lines. Thus, analysis of property values is a useful proxy for assessing the impact of transmission lines where no direct objective measurement is possible.

It is neither possible nor necessary for this report to comment in detail on this list as, for the most part, they are issues that were dealt with in the planning process. That process seeks to minimise the impact and allow the project to proceed in the public interest or avoid any impact by refusing permission. For example, noise, can arise from wind

[25] The Kaldor-Hicks criterion is an important and widely employed decision-making tool that address impasses that arises with the use of earlier decision criteria based on Pareto optimality and utilitarian ideas. It is widely used, if seldom stated, in the recommendations of cost benefit analysis studies. In summary, the Kaldor-Hicks criterion states that a proposed development should proceed if the benefits to society from proceeding exceed the costs to society by some predetermined margin such that the winners from the development could compensate the losers and still favour the proposal, even though there is no requirement for the compensation to be made. This basically means that the good of society is favoured over the good of any individual or group within society. It is then up to society to decide to what extent the losers should be compensated. The use of this concept is often seen in the approaches adopted in many countries, as described below, when transmission projects receive approval having been deemed to be in the public interest.

blowing through the structures – aeolian noise – or from small minor leakages – corona discharge – which can cause a noise under certain conditions. Usually, the noise emissions are relatively minor compared to background noise and may not be distinguishable except over very short distances. Consequently, it is usually fairly straightforward for a TSO to comply with requirements to keep noise emissions within 'reasonable' levels, as defined by the planning authority. Other impacts such as the impact on nature or on heritage areas can be similarly addressed through planning and the use of abatement interventions.

However, compensation, while it is a somewhat secondary consideration for the most part in relation to these factors, may have a role to play. This will particularly be the case when dealing with highly subjective issues such as the visual impact or any impact on the character of an area.

2.3 Impact on Property Values and Prices

If transmission lines impose a burden on people in their vicinity, even if this cannot be measured precisely or if it is purely subjective or perceptual, then this negative impact – often described as stigma – should be seen in property values. If this is the case, then an argument can be made that this loss of value should be included in the compensation that is paid. Because of this, there have been numerous studies of the impact of transmission lines on property values. However, resolving the issue satisfactorily has proven to be much more difficult than might at first be expected with results depending on the analytical models that are used and external factors such as market trends and location[26].

A number of reviews of the literature have been published. Jackson and Pitts reviewed studies of the impact of transmission lines on property values spanning from 1964 to 2009[27]. Only studies that analysed empirical data were included but the review covered both appraisal research – which is less formal, survey based and looks at the expectations of estate agents – and more formal statistical analysis of actual sales. The former type of studies generally expressed concerns and expectations of impacts. However, the review found that while there were some differences in the details, the formal studies

[26] Pitts, J. and T. Jackson (2007) 'Power Lines and Property Values Revisited'. *The Appraisal Journal*, Fall, pp.323-25

[27] Jackson, T. and J. Pitts (2010) 'The Effects of Electric Transmission Lines on Property Values: A Literature Review'. Journal of Real Estate Literature, Vol. 18 (2) pp.239-260.

of actual sales generally indicated that sales prices were either not impacted by the presence of transmission lines or that there was a small impact in the range of 2% to 9%. They note that appraisal studies are based on what might happen while the results of sales price studies reflect what markets participants actually do. Most such studies found no impact. Those that did find an impact found that this dissipated quickly with distance from the lines and disappeared altogether over time.

A review of literature prepared by Headwater Economics also found that peer review studies based on actual property sales generally do not find any impact on property prices arising from proximity to transmission lines when compared with similar properties further from the lines[28]. However, the report noted that some case studies and appraisal reports that found large impacts. This is conflicting evidence, but a common finding was that, in the case of rural property, the impact was greatest if the line curtailed the use value of the property.

A report prepared by Applied Economic Research also reviewed the literature on the impact of high voltage transmission lines on property values[29]. It found that most studies found that there was no impact or a modest impact of less than 10% that occurs in the short run and dissipates over time. The review also found that where an impact was found it occurred only in close proximity the lines and diminished quickly beyond 50 feet with no impact over 200 feet. The review did note however that there have been some outlier results that found either larger impacts or unexpected positive impacts. The report also examined if different analytical approaches could explain the variation or the common failure to find impacts that might be more in line with expectations that there would be a large impact. However, they concluded that the consistency of the findings in different settings using different techniques would not support this explanation. They also concluded that:

> Simply put, the research suggests that the presence of an HVTL is not a primary consideration for all (or possibly most) buyers. (Applied Economic Research report, page 3)

[28] *Transmission Lines & Property Value Impacts: A Summary of Published Research on Property Value Impacts from High Voltage Transmission Lines*. Report prepared for MSTI Review Project by Headwater Economics.

[29] *The Effect of High Voltage Transmission Lines on Real Estate Values: A Review of the Appraisal Literature*. Report prepared by Applied Economic Research, May 2011

A more recent review by Anderson et. al. covered the literature since 2010 and also included studies from Europe and New Zealand[30]. They found that although new techniques and new data sources had become available in recent years, along with developments such as the growth of renewable generation, closer examination of the potential socioeconomic impacts of lines and increasing opposition to new developments, the conclusions of the more recent studies were consistent with the earlier studies. In summary:

> Survey based research finds adverse perceptions and general dislike for HVOTLs, but sales data reveals little or no diminution in prices. Stated preferences by market participants in this case generally do not translate into noticeable price effects as revealed by market data. (Anderson et. al., page 192).

Put simply, the fears and negative expectations that are often expressed about HVOTLS are not reflected in lower property values.

Chalmers and Voorvaart reviewed 16 major studies and found that about half of them found no relationship between power lines and property values[31]. Of those that did find effects, the negative impacts tended to be small and unusually in the range of 3-6% and only noticeable for properties within 100 metres of the lines. These impacts would tend to be swamped by market price movement due to other variables. Furthermore, these effects were only noticeable with new lines and tended to disappear after a few years of their existence.

In addition to viewing the existing literature, this research also examined the impact of the construction of a high voltage transmission line on steel structures on property values in New England. It found no statistically reliable evidence of an impact on property prices as a result of proximity to the lines or as a result of the carrying towers being visible from a property. This applied to both lower and higher valued properties and across a range of market types. However, it did find a small negative relationship between the existence of an encumbrance on the property due to a right way for the transmission network operator, although this was not consistently significant.

Hamilton and Schwann examined the impact of high voltage lines on the prices of nearby detached houses. They found that there was an impact on values but only within a very narrow band and only where a carrying tower was directly visible from the house.

[30] Anderson, O., J. Williamson and A. Wohl (2017) 'The Effect of High-Voltage Overhead Transmission Lines on Property Value: A Revie of the Literature Since 2010'. *The Appraisal Journal*, Summer, pp.179-193

[31] Chalmers, J. and F. Voorvaart (2009) 'High Voltage Transmission Lines: Proximity, Visibility and Encumbrance Effects' *The Appraisal Journal* (Summer).

Otherwise there was no impact. They concluded that any impact was limited to properties close to the lines and arose due to visual impact only for a range of property types and settlement patterns[32].

Proximity and visibility were also found to be a deciding factor in a study by Han and Elliott. They found that the prices paid for houses within a 50 metre zone of transmission lines were up to 15% lower than those 200 metres from the lines. However, they found that for houses close to the lines there was no impact on capital appreciation over the long term such that once the initial fall had occurred the house appreciated in line with other houses in the area.

A commissioned report by Corr and Insight Consulting examined the relationship between proximity to transmission lines and property prices in Ireland[33]. They reported on a range of international literature on experience abroad – the results found were broadly similar to the results in this current review – as well as reporting on a survey of estate agents in Ireland and the outcome of a statistical analysis on sales data from Ireland.

The survey of estate agents indicated that the construction of new transmission lines could be expected to impact the value of nearby houses in a similar fashion to other types of infrastructure such as railway lines and motorways. This equated to a fall of 18% for houses within 50 metres of a transmission line with the impact being much higher if pylons were visible but just 3% for lines carried on poles. A broad range of estimates was found, and the impact was expected to decrease over time. For agricultural land, the survey response indicated expectations of reduced value of 6% for 400kV lines with little or no impact expected for commercial properties. It is not unusual to find such expectations in appraisal studies, although these results are higher than is generally seen internationally.

However, as with studies in other areas, the analysis of actual sales data provided a very different result. The analysis found no statistically significant impact on property values arising as a result of proximity to power lines for either houses of farmland, irrespective of the types of power structures included in the data. While this outcome is out of line

[32] Hamilton, S. and Schwann, G. (1995) 'Do High Voltage Lines Affect Property Value?' Land Economics, Vol. 71 (4) pp. 436-444,

[33] *An Investigation into the Potential relationship between Property Values and High Voltage Overhead Transmission Lines in Ireland*. Report prepared for EirGrid plc by Corr Commercial and Land Ltd. And Insight Statistical Consulting, February 2016

with the expectations identified in the survey, it is broadly in line with the international literature reviewed above.

Bond and Hopkins (2015) found a broadly similar divergence between expectations and actual outcomes. They undertook parallel studies of residents' perceptions of the impact of transmission lines on property values and analysis of actual property sales and compared the conclusions[34]. As with a number of studies, if a pylon is close to a house and visible then there is an effect, but they found no impact from having a transmission line close to the house provided the pylon is not visible. Despite this evidence, people living close to the lines, and even some living more further afield, believed that the lines had a negative effect on the value of their properties. They concluded that the negative perceptions of residents towards transmission lines are often not reflected in the values of properties. In other words, these perceptions were not shared by newcomers i.e. house buyers, to the area.

Thomas and Welke undertook a study of the impact of new towers on property prices and then on the impact when the towers were subsequently removed[35]. They note that the results they found were broadly in line with other authors in that:

- The impact of lines and pylons is seen only for houses within 100 metres;
- The greatest impacts are seen for houses directly bordering the line's route and these impacts tend to drive results overall;
- Encumbrances on properties affects values;
- Any impact on price is short term and disappears over time; and
- Changes in other characteristics of an area, such as amenities, schools and jobs have a much greater impact on prices that power lines.

Farmland and Commercial Properties

The report by Corr and Insight referenced above noted that research on rural properties in the US and Canada found that proximity to transmission lines had no impact on the value of farmland properties. This is generally true for studies based on statistical analysis of sales data but, as Kielisch (2009) points out, considerable impacts are found

[34] Bond. S. and J. Hopkins (2015) 'The Impact of Transmission Lines on Residential Property Values: Results of a Case Study in a Suburb of Wellington, NZ.' *Pacific Rim Property Journal*, Vol. 6 (2) pp52-60

[35] Thomas, C. and G. Welke (2017) 'The Effect of HVTLs on Property Values: An Event Study'. *International Real Estate Review*, Vol. 20(2), pp. 167-187

by many researchers who use appraisal technique approaches or case studies[36]. In these types of studies, it is not unusual to find impacts of 20 to 30% for farmland properties when high voltage transmission lines cross the property. Kielisch offers explanations for these impacts but these rely on perceptions, such as health impacts or 'stray voltage', for which there is little or no scientific basis. However, he does not consider this to be problematic as he contends, with some justification, that

> The value of the property is based on the perception of the buyer. Understanding that perception drives value is the foundation in analysing the effect that electric transmission lines have on property value. (page 1).

It would be easy to dismiss this as artificial when the basis for the perception is false, leading to the conclusion that as the valuation is based on misinformation or lack of information, the solution lies in providing better information. However, this might not be so straightforward. Kielisch points out that even when the false basis for the perceptions is made clear, the perception of damage has been enough to lead to the award of damages in court. Having reviewed a number of cases where farmers in the US claimed damage to animals from stray voltage. He concludes that:

> Though it's difficult to prove a significant presence of stray voltage, and even more difficult to prove a direct correlation between stray voltage and poor health, courts have awarded farmers sizable judgements to compensate them for damaging stray voltage from nearby power lines. (Kielisch, page 9)

However, this still does not explain why econometric studies of sales prices do not find an impact on values unless it is accepted that only people who know the area both before and after a transmission line is constructed can form a convincing perception of damage. The more likely explanation is that these effects can only be found when a case by case methodology is adopted, as is done by researchers using appraisal and case study approaches. The problem with this, however, is that, almost by definition, it is difficult to draw general conclusions from such methodologies as the results depend on the specific cases. In contrast, methodologies using statistical analysis of sales prices are designed to provide general conclusions, but do not treat data on the case by case basis that may be required to identify impacts, even when hedonic approaches are used.

[36] Kielisch, K. (2009) *Valuation Guidelines for Properties with Electric Transmission Lines*. Report Prepared for Appraisal Group One

Studies on the impact of lines on commercial property have been less common but such as are available have found no effects[37]. Indeed, it may be the case that there are some benefits as location close to lines may be the result of planning decisions to locate industrial premises close to other services that are required such as transport linkages. Properly planned lines in urban areas where commercial premises tend to be concentrated are also often accompanied by open spaces that can be beneficial.

Conclusion

While this study cannot hope to review all the literature in this area, a good cross section has been examined and the results of these studies are very mixed. Furthermore, the results may depend on the methodology that is adopted and the specification of the model that are constructed to examine these impacts such that analysing the same data with a different specification might give a different result. In as far as the results can be summarised, statistical analysis studies mostly indicate that transmission lines have a negligible or small impact on property values. Where an impact is found, it usually requires that the property is very close to the lines and/or that a carrying tower or pylon is close and visible. In the case of new infrastructure, the results suggest a negative impact over a somewhat wider range, but that this tends to be short term only and dissipates within a couple of years. However, despite this, studies based on expectations of the impact – as distinct from analysis of actual sales – consistently show highly negative expectations and reports of case studies also find similar results.

Overall, these results mean that there is no more than weak support for the argument that there are objective negative impacts of transmission lines that go beyond their direct impact on immediately adjacent property and lands, or that existing perceptions of such impacts will persist and will be shared by people who were not familiar with the area before a transmission line is constructed. This also weakens the case that there is a burden placed on the communities through which a line may pass that goes beyond the impact of the line on property immediately along its route. However, the research and the results also indicate that this information is unlikely to change perceptions.

[37] Jackson, T., J. Pitts and S. Norwood (2012) The Effects of High Voltage Electric Transmission Lines on Commercial and Industrial Properties. Paper presented to American Real Estate Society Annual Meeting.

3. Published Reviews of Compensation in Europe

3.1 Some Background Issues

While there is a voluminous literature on the medical, physical and environmental impacts of transmission lines, and a large – if disparate and inconsistent – literature on the possible impact of lines on property values, the available literature on the compensation of property owners, the practices that are used, and the values that are identified, is very sparse. Academic studies are notable for their absence while commissioned studies, if any have been undertaken, have not been published. Some country specific studies on practices and compensation have been made publicly available and these are reviewed in the country analysis in later chapters of this report.

The reason for this lack of published studies is not difficult to see. Operators are concerned about confidentiality. They do not always wish to publicise to competitors how they address issues and they do not generally wish to publicise the levels of compensation they actually pay because they fear that occasional high outliers would come to be seen as the starting point for future negotiations on compensation. These are understandable concerns. However, operators are also faced with the requirement that in order to gain acceptance for new infrastructure they must publicise their acceptance that there are genuine concerns, that they recognise that actual damages and impacts will occur, and that they are prepared to compensate for these damages.

This difficulty is illustrated by the following extract from a response from a TSO following a request from the consultants for information on how they calculate compensation amounts and the issues for which compensation is paid[38].

> *There seems to be two potential elements, the first being wayleave payments and the second injurious affection compensation.*
>
> *Wayleave payments are very much in the public domain and freely available and I don't believe we would have any difficulty sharing this information as part of this exercise.*

[38] The identity of the respondent is deleted to maintain confidentiality. Severance and injurious affection arise where an authority obtains a compulsory purchase order for part of a property, or a right over part of the property, if the acquisition adversely affects the value of the part that is retained by the original property owner. Severance refers to any loss in value of the retained part as a direct result of the holding being divided. Injurious affection arises if there is a loss in the value of the retained part as a result of something that occurs on the part of the holding that has been acquired.

> *Injurious Affection is much more contentious and for competition reasons we should not provide any information relating to our policy, practice and settlements. The policy we have established for such is unique to* [redacted] *and by its nature will be quite different to other TSO/DSO's. We certainly do not discuss such with any other network operator in* [redacted]*. I would be very uncomfortable stating our policy in a future paper which could potentially be used to either compare the network operators or used against* [redacted] *by claiming agents.*

The distinction that is drawn in this extract runs through much of the information available on practices in this area: payments for direct impacts on property are often assessed against a published scale and the basis for this compensation is not contentious. However, arbitration is often required to arrive at an actual agreed payment. Payments for other claimed impacts are much more contentious, are usually not assessable in a formulaic manner and are not made public. This inhibits research.

This lack of published material is particularly the case for comparative studies of practices across countries. The consultants are aware of only three such studies. The first was undertaken by Eurelectric and adopted a case study approach of how different countries were addressing difficulties being encountered is overcoming opposition to transmission infrastructure[39]. The report is based on submissions by informed groups and organisation in each country. However, no information on practices in Ireland was included in the report.

The second report by ENTSO-E and was based on a survey of a wide range of TSOs across Europe[40]. The survey questionnaire provided a basic template for the development of the survey that was undertaken for this report to inform the country analysis in later chapters. However, all the results in the ENTSO-E study were anonymised before being published and it was not possible to identify the extent to which there are differences across Europe in terms of practices and outcomes.

The third is a study undertaken by the Renewables Grid Initiative from which some results were published[41].

[39] Eurelectric – Union of the Electricity Industry (2003) *Public Acceptance for New Transmission Overhead Lines and Substations*.
[40] ENTSE-E (2013) *Survey of Compensation Strategies for Transmission Infrastructure Development (lines, cables and sub-stations).*
[41] Renewables Grid Initiative (2015) *Compensation: Policy and Practice across Europe*. Compensation Briefing Document

3.2 Eurelectric Networks Committee Report

Eurelectric is the representative organisation of the electricity industry in Europe and was formed in 1999 by the merger of two earlier organisations. It aims to promote the development of the industry and also to represent it in public affairs dealings with the institutions of the EU. With the emergence of privatisation and liberalised electricity markets in Europe, Eurelectric was concerned about problems that were being encountered by TSOs as a result of growing public opposition to new infrastructure across Europe. It took the approach that new inclusive planning that involved all stakeholders was required along with a more sophisticated approach to planning by the promoters of new infrastructure projects.

As part of this approach, Eurelectric aimed to identify the practices that were being employed, identify innovations and ultimately set out a best practice policy for TSOs when approaching planning. The report codifies the practices for a number of countries but often at a rather high level without much detail on actual practices. However, it is useful to review these as they give an indication of how the legislative background in different countries has determined practices. As such, this is one of the very few reports available that covers in part the basis for the assessment of compensation and the reasons for payments.

The work began by looking at the legal basis for accessing properties as a way to identify the basis for land impact compensation. While legislation can change over time, these issues are quite fundamental to ways in which the issue is addressed in practice and the consultants have not seen fundamental differences between this information (unless noted) and the country specific results that are contained in later chapters of this report. Specifically, the research identified if a right of way was sought and across what areas. Table 3.1 summarises their findings.

This table shows that there is a legal basis for obtaining rights of way in most countries and system operators make use of this. Most have identified corridors over which they will seek to acquire these rights and, while it is not set out in this table, the later discussion below indicates that the process usually involves seeking agreement and then proceeding to enforce access if this fails. Where the rights are not identified in law, TSOs will buy the property if required for use. In terms of best practice policy, the work concluded that for overhead lines:

> The route of the line should preferably be as straight as possible, consistent with the minimum visual and environmental impact. (Eurelectric, page 12).

Table 3.1: Legal Basis for Encumbrances on Land and Rights Sought by TSOs

Austria	A right of way is obtained for a corridor of 2x30 metres for 110kV to 380 kV lines.
Belgium	There is no basis in Belgium legislation for obtaining a right of way. No such process is foreseen in Belgium law.
Cyprus	Right of way is obtained for a corridor of 32 metres for lines from 66 to 220kV.
Czech Republic	A right of way corridor of 20 is obtained for 110 up to 400kV lines.
Denmark	There is a basis in Danish law for obtaining a right of way, but a corridor is not specified in law or by the TSO.
England	Similar to Denmark. (This has since been updated).
Finland	There is a legal basis for obtaining a right of way, but the corridor is not specified.
France	There is a legal basis for obtaining a right of way, but the corridor is not specified.
Germany	When dealing with 110kV up to 380kV lines a specific corridor is identified that relates to that line and to the landowner concerned.
Italy	Right of way over a corridor of up to 50 metres for lines in the range 130 to 380kV can be obtained.
Luxembourg	A corridor of up to 60 metres for lines in the range 65 to 220kV is usually sought.
Netherlands	No specific rights or practices were specified.
Norway	The legal basis to obtain a right of way exists but a corridor was not specified.
Poland	Right of way over a corridor of 2x33.2 metres for lines in the range 110 to 400kV can be obtained.
Portugal	The legal basis to obtain a right of way exists but a corridor was not specified.
Slovenia	A right of way over a corridor of 50 metres for lines in the range 110 to 400kV can be obtained.
Spain	The legal basis to obtain a right of way exists but a corridor was not specified.
Switzerland	The legal basis to obtain a right of way exists but a corridor was not specified.

Source: Eurelectric (2003)

As well as examining the procedures that are followed by TSOs in attempting to obtain permission for the construction of new transmission infrastructure, the research also identified that compensation is usually paid under two distinct headings: compensation

for impact on the land and compensation for visual or health (EMF) impacts. As such, it is in keeping with the approach to examining the basis for compensation that was used in the previous chapter of this report.

Table 3.2 summarises their findings with specific reference to the reasons why compensation is paid to landowners. In a small number of cases it is not possible to distinguish between these headings on the basis of the results published.

Table 3.2: Basis of Compensation for Landowners in European Countries

Austria	Compensation is paid for direct impact on land and restrictions on use, but no compensation is paid for health or visual impacts.
Belgium	If required for structures, the land will be bought, but no compensation is paid for health or visual impacts.
Cyprus	Compensation is paid for direct impact on land and restrictions on use, but no compensation is paid for health or visual impacts.
Czech Republic	
Denmark	Compensation is paid if a new 400kV line passes within 50 metres of a farmhouse or if a 150kV line passes nearer than 35 metres.
England	All these countries reported that compensation is paid for direct impact on land and restrictions on use, but no compensation is paid for health or visual impacts.
Finland	
France	
Germany	
Italy	Compensation is paid if it is shown that residents suffer would permanent disadvantage
Luxembourg	All these countries reported broadly similar practices in that compensation is paid for direct impact on land and restrictions on use, but no compensation is paid for health or visual impacts.
Netherlands	
Norway	
Poland	
Portugal	
Slovenia	
Spain	
Switzerland	

Source: Eurelectric (2003)

There is a very obvious conclusion from this table. Compensation for the use of land or for the impact of constructing new infrastructure on land and its use is a well-established procedure in European countries with some provisions in all the countries included in the research. However, the opposite is the case for visual or health impacts with no country specifically noting that compensation is paid for these reasons and most specifically ruling out payments under these headings.

This outcome would appear to be pretty much in line with the results of literature review above. Operators pay for land acquisition, damage and restrictions where impacts are obvious, but do not pay compensation for health effects – where the causal linkages are weak and unproven – and generally do not pay for visual impacts or other effects that would be expected to impact on the value of the property, recalling that the evidence is very mixed in this regard.

3.3 ENTSO-E Survey of TSOs

ENTSO-E stands for the European Network of Transmission System Operators and represents 43 TSOs from 36 European countries. It was established in 2009 by the EU's Third Legislative Package for the Internal Energy Market. This legislation was introduced to further liberalise the gas and electricity markets in the EU. Among its aims are ensuring the secure and reliable operation of the increasingly complex European energy network, promoting cross-border and regional network development and aiding the creation of the Internal Electricity Market in Europe.

Examining the practices of TSOs in relation to the compensation of property owners that may be affected by electricity infrastructure is relevant under all these headings. However, ENTSO-E observed from such evidence as was available that practices differed considerably between operators and particularly between different countries. Such differences could inhibit the development of cross border systems. As a first step to address this issue, ENTSO-E undertook a survey of its members' strategies and practices in relation to the compensation of property owners when transmission infrastructure is placed on their land. The survey confirmed that considerable differences existed at that time. However, all the results and comments that were obtained were published anonymously without identifying which country engaged in any practice.

The research involved an extensive questionnaire covering many forms of transmission infrastructure including overhead and underground cables, pylons, stations and access rights[42]. However, only results in respect of overhead transmission lines are considered here. The survey also obtained information on the transmission voltages for which infrastructure had been built in each country in recent years. This shows that a wide

[42] A total of 42 TSOs were include in the survey and 28 responses were received. Therefore, all the results and commentary refer to these 28 TSOs only.

range of transmission voltages are used but 110kV, 220kV and 400kV are the most common being used by 14, 22 and 17 TSO's respectively.

Respondents were asked to indicate how the legal right to construct new towers for transmission lines on private property was obtained. In response, 19 of the 28 TSOs indicated that they acquired easements over the property with 13 obtaining wayleave by agreement or by compulsion[43]. Expropriation (compulsory acquisition) was used by 15 TSOs while 10 used purchase by agreement. Only 6 TSOs used leases or other means[44]. Easement is therefore the preferred option and compulsory acquisition is generally only rarely used as a last resort when agreement cannot be reached. It is not available in a minority of countries. Expropriation is also used upfront in some cases to obtain easements.

Most TSOs (16 of 28) reported that the width of land over which a right is obtained to construct a tower is defined in advance. Table 3.3 shows details on what widths are used for which voltages for a selection of the TSOs that were surveyed. While most TSOs work with pre-defined requirements depending on the size of the tower and the voltage, the range of variation in the practices followed by different TSOs is indicated by this table.

Table 3.3: Land Area for Rights Acquired by TSOs to Construct Towers

TSO	Voltage	Width of Land - Single (SC) or Double Circuit (DC)
1	400kV	40 metres SC, 50 metres DC
2	150kV, lattice steel 400kV, lattice steel 150kV, steel masts	From 8x8 up to 12x12 metres depending on study From 10x10 to 15x15 metres depending on study From 1x1 up to 2.5x2.5 metres
3	There is no uniform rule, but the width is normally 60-80 metres	
4	110kV 220kV & 380kV	50 metres 60 metres
5	Depends on the tower basement area	
6	220kV	2x25 metres depending on the span and height of line
7	110kV to 330kV	50 to 80 metres
8	Dimensions vary from case to case. The required width is not pre-defined.	
9	Depends on the height of the tower.	
10	220kv to 380kV	5x5 to 8x8 metres

Source: ENTSO-E (2013)

[43] An easement was defined as a right to allow construction and maintenance of infrastructure and to impose restrictions on the use to which the land could be put. A wayleave was defined as similar but without the restrictions.

[44] Note that this means that TSOs each use a range of means but this was not explored in the report.

In the case of 26 of the 28 TSOs who responded to the survey, landowners were entitled under law to compensation when electricity infrastructure was placed on their land. How compensation should be calculated varied with formulae such as a fraction of the market price, application to a court appointed arbitrator and legislative rules all being used in different places. While the acquisition of a right appears to lead to an automatic right to compensation in most cases there are exceptions. In some places, it is necessary to prove an actual loss before compensation is payable.

Only 11 of the 28 respondents operate in countries that have formal agreements between TSOs and organisations representing property owners. However, almost all these agreements relate to farmland only, not including forestry.

Headings under Which Compensation is Paid

There was considerable variation in terms of what this compensation should include and most legislation does not appear to specifically identify what issues need to be addressed. In most cases, however, it included damage to the land and to crops and compensation for land under the towers. Some specifically ruled out compensation for devaluation of the land, but many noted that compensation is payable in this respect if there are restrictions placed on the land. A number also identified compensation for any disadvantage placed on a land owner or for the inconvenience of towers. Table 3.4 summarises the responses (each value is out of 28 total response).

Table 3.4: Headings under which Compensation is Paid

	Number of TSOs
Crop loss	23
Damage to land or property	22
Loss of forestry	22
Area under a tower	17
Loss of development potential	14
Area under conductors	14
Devaluation of land under conductors	11
Payment per tower	8
Change of crops	7
Devaluation of land under tower	7
Devaluation of farm unit	5
Annual loss payment	4
Payment per metre of conductor	4
Other	2

Source: ENTSO-E (2013)

This table shows that by far the most common reason given for compensation is direct damage to lands or crops. In addition, most TSOs make payments for the land that is lost because of structures and restrictions on future use. After this a range of factors were identified, but only a small minority allow for payments due to a perceived, or actual, devaluation of the property as a result of the infrastructure being present.

Information was also collected on the rates of payments and how payments were made. The details of payments depend on what is being compensated and it is necessary to restrict this summary to the most common payments. Again, these show considerable variation.

After direct payments for loss and damage, the most common payments are for areas of land under towers and lines. The following provides an indication of the ways in which compensation is assessed under these headings. For areas under towers:

- A one off payment is made according to the land value;
- An area equating to the foundation of the tower is bought at a price of €10 per m^2;
- A one off payment is made for loss of income and inconvenience based on the size of the tower;
- A single payment is made to buy the land under the tower based on a court's valuation;
- A one off payment of 9 to €26 per m^2 is made;
- A single payment based on the size of the tower's basement area;
- A payment of 2.5 times the tower's basement area at market value;
- Payment is based on dimensions of the tower and negotiations with the owner with a single payment before construction;
- Payment based on agreement with the owner or a court estimate if no agreement is found;
- An area of disturbance is calculated for each tower type. The average is 3,500 m^2. Payment is made at between €2,071 and €5,917 per hectare.
- Compensation is set by legislation with expert opinion used in each case to make a single payment.

For areas under lines:

- A one off payment is made according to the land's market value;
- Compensation paid at €0.40 per m^2;
- A one off payment of an amount decided by the courts for a corridor of 20 to 25 metres on either side of the line;
- One off payment of €0.50 to €1.90 for a 60 metre corridor for 220kV and 380kV lines;
- Compensation of overhang of lines at €0.50 per m^2;
- A 50 metre corridor compensated at 30% of the market value of the land;

- Calculated between ½ - ⅔ of basic price (€2,071 to €5,917 pr. Ha). ½ for land over 300m.a.s.l and ⅔ for areas lower than 300m.a.s.l.
- Based on conductor blow out and paid at 20% of land value

While this list shows that there are considerable differences in terms of the practices that are used and the rates at which land is valued, there are a number of common features. The most notable is that TSOs generally prefer one off payments. No response indicated regular or recurring payment. Land under towers is compensated at market value sometimes using a court valuation while land under lines is compensated at a percentage of the market value.

Some TSOs prefer to pay compensation of a set amount per tower rather than valuing the land. Table 3.5 provides the information that was obtained by ENTSO-E on these payments. As with other aspects of this research, these data indicate the wide disparity that exists in terms of practices and payments made.

Table 3.5: Compensation Payments per Tower

Tower Type and Voltage	Rate of Payment per Tower
400kV suspension tower	€6,404
400kV suspension/angle tower	€8,005
400kV dead end tower	€9,606
200kV tower	€2,000
275/400kV towers	€7,373
110kV tower	€22,000
110kV wooden pole set	€11,000

Source: ENTSO-E (2013)

A considerable number of TSOs also indicated that compensation is payable for loss of development potential. However, this generally happens only if there is clear evidence that prior planning approval is in place or is imminent and would be negated by the transmission line. In other words, it is not based on speculative suggestions that planning might be possible or that zoning might be changed in the future. In this respect, TSOs made the comments along the following lines[45]:

- Compensation is only paid in residential and commercial areas and only if the right to erect structures already exists. It can be up to 100% of the fair market value.
- Compensation depends on study by an expert.

[45] Note that these comments have been edited to improve readability without changing the meaning.

- Compensation is on paid in exception cases if the corridor of the new line is already included in a local spatial plan for houses. The level is determined by a court appraiser.
- Compensation can be paid but requires documentation in the planning process of the municipality and only for a horizon of 8 years.
- Areas that have development potential near city plan areas, are compensation based on their raw land value determined according to market price.
- Compensation is payable if the land is located in a construction zone but cannot be developed as a result of the transmission infrastructure. The compensation is calculated as the difference between the value of normal construction terrain to agriculture land.
- Compensation is payable with the amount calculated as the difference between the market value of the land before and after the building of the new line.

These appears to be more consistency for payments for loss of crops or damage to crops during construction. The TSOs generally reported that expert opinion was generally used, and one off payments were made following agreement with the landowners.

For damage to land, TSOs usually attempt to restore the land to its previous condition and many have agreements with farmer representatives for any payments. Expert opinion might be consulted. In some cases, damage is assumed to be implicitly included in payments for access.

A few TSOs make annual payments but these are a small minority. These appear to be based on agreements with farmer organisations and figures of around €250 per tower per year were noted.

Most TSOs do not take into consideration if a farmer co-operated when assessing compensation. However, one-third of TSOs do take this into consideration. This often took the form of a higher rate or an additional payment for early agreement.

Only 6 of the 28 TSOs make payments for devaluation to property that does not have lines or tower directly on the property. This is usually as a result of legislation or Government rules. This is usually restricted to houses that fall within a narrow band of a line often assessed at 20 metres. Different approaches are used to assess this compensation and practices range from offers to buy to compensation calculated according to legally defined formulae. However, 10 of the 28 respondents indicated that they operated a community gain programme. However, most TSOs did not see that these schemes achieved much in terms of social acceptance of new infrastructure to any appreciable extent.

3.4 Renewables Grid Initiative

The Renewables Grid Initiative (RGI) is a collaboration launched in 2009 between a number of environmental NGOs and TSOs to promote more environmentally sensitive grid development. It has undertaken research and published reports on best practice in its areas of interest. Among its research projects it has examined the development of community benefit schemes as a way to promote good environmental practice and improve public acceptance of transmission infrastructure. This work also looked at compensation practices more broadly and resulted in a discussion paper that included some findings on the practices that are followed[46].

The RGI approach envisaged that compensation for the impact of transmission infrastructure is generally paid, or made, under three broad headings: compensation to landowners, mitigation measures and compensation to communities. The former is central to this report and, as is further detailed below, payments to landowners are often designed to meet legislative requirements to provide compensation for actual or perceived losses. Differences in practice often reflect underlying differences in the legislative framework and provisions of different countries. Mitigation measures, such as habitat construction and design innovations, are also often driven by legislative requirements implemented through the planning process, environmental impact assessments and EU Directives[47]. In contrast, community benefit schemes have tended to have developed because of the need for TSOs to find ways to promote the acceptance of development proposals and often lack any legislative structure.

The discussion paper noted that compensation for landowners is usually provided as a result of one of three processes:

- Rights over land are granted with permits and the level of compensation is determined by law;
- The rights are granted by permits and compensation payable is negotiated by the TSO and the landowner;
- Private agreements are negotiated on rights and compensation levels.

If there is a problem with finding agreement there is usually recourse to a court or other legal mechanism to find a resolution.

[46] Renewables Grid Initiative (2015) *Compensation: Policy and Practice across Europe*. Compensation Briefing Document

[47] Three Directives were considered to be particularly relevant: EIA Directive (85/337/EEC), Natura 2000 (Habitat Directive 92/43/EC) and SEA Directive 2001/42EC, Annex I.

In many cases, the amount of compensation offered is calculated according to a set formula which is often treated as confidential. RGI undertook a survey of its member TSOs to identify practices on how landowners are compensated and provided some results. However, only a very small range of countries were included in the discussion paper reflecting the difficulties that are often encountered in accessing this sort of information. The paper noted that

> Most TSOs keep their set formulas for calculating compensation as confidential. This means that it is not easy to assess the particulars of landowner compensation or present fully instructive case studies. (RGI, 2015, p. 4).

The research found that in Germany, the parameters for calculating compensation are set by the Electricity Network Charges Ordinance. Clear rules exist in relation to the methodology to be used when calculating payments to landowners. When this is done, and an offer is identified, it is followed by negotiations with a landowner or with a farmer representative organisation on behalf of its members. If agreement is found the result is a private law contract. If no agreement is found a legal expropriation process is used that may typically result in compensation at a lower rate.

The process in Spain is regulated by the Act of Obligatory 1954, the Regulatory Act 1957, and the Refunded Land Act 2008. Expropriation is the only process that is legally regulated. The process is administered though provincial government departments, with the final decision going to the provincial Tribunals of Expropriation. However, there is no legal constraint on TSOs attempting to reach individual agreements with landowners and paying them such compensation as is required to gain the necessary rights to access lands and construct infrastructure. Municipalities are compensated in a similar way to private landowners for impacts on public properties they own.

Compensation in the UK is provided under the Land Compensation Act 1973. An easement agreement is sought between the landowner and the TSO once a Development Consent Order has been obtained from the Planning Inspectorate. Payments are calculated according to internal payment schedules with some level of negotiation possible. If agreement is not reached, the land, or rights over the land, can be expropriated with a lower rate of compensation legally required under the Planning and Compulsory Purchase Act 2004.

The governing law in Ireland is provided by the Electricity (Supply) Act, 1927 as amended and the Acquisition of Land (Assessment of Compensation) Act, 1919. Wayleave notices are served on all landowners and occupiers prior to construction. Landowners are

entitled to be paid compensation and if the amount cannot be agreed landowners can refer the issue to statutory arbitration under the provisions of the 1919 Act.

The RGI research also found that there were a number of deficiencies in the sort of legislation that governed this area. TSOs are concerned about compensation inflation but the legal provisions were not designed to control the impetus to inflation that often emerges in negotiations, particularly where landowner or farmer organisations were involved to negotiate on behalf of members. Legal requirements also generally only concerned landowners where structures were placed on their properties. This is a source of difficulties in designing compensation for areas where the lines passed over land, but there was no entitlement to compensation or, more commonly, among local residents close to the lines but whose properties were not crossed by the lines. The confidential aspects of underlying mechanisms were also a source of distrust between communities and TSOs.

Instances of community gain schemes are discussed further in this report in the chapters on practices in specific countries. However, while RGI is generally supportive of these projects, the research identified a number of deficiencies in the manner in which they have developed. It noted that:

- The lack of a legislative base means that they can be viewed as a 'slippery slope' towards ever greater entitlements.
- The programs were often poorly designed, targeted or advertised
- They were often limited in vision and failed to identify further benefits for the community that could be drawn from the measure at little or no additional costs.
- The programs did not always achieve acceptance as the idea is often seen as bribery by TSOs.
- There was concern that communities that suffer an 'indirect' impact may not 'deserve' compensation.
- Sceptical communities can miss out on the opportunity to get something beneficial from compensation because they perceive it as giving-in to a project.

4. Overview of Practice in Ireland

4.1 Legislative Background

Although ownership of electricity assets in Ireland and the responsibility for developing new infrastructure lies with EBS Networks, Eirgrid has responsibility for the operation and development of the electricity transmission system in its role as the national TSO. Its right to place transmission infrastructure on private lands arises from §53 of the Electricity (Supply) Act 1927[48]. A 1985 Supreme Court judgement in the case of *ESB v Gormley* found that the right of the ESB – which was then the sole agency with responsibility for the supply of electricity in Ireland – to acquire an easement over land to construct lines, pylons and masts, which had previously existed without the requirement to provide compensation, was unconstitutional as it amounted to a 'burdensome right over land'. This section was amended by the Electricity (Supply) (Amendment) Act 1985 which provides the legal basis for the payment of compensation to landowners. Up to that point a landowner had no statutory right to compensation for the placement of electricity infrastructure on their property. The Act also included the right to refer disputed compensation claims to arbitration by a formally appointed officer of the courts with reference to the 1919 Act. Since then, a landowner is entitled to claim compensation for losses and damage when a line is placed over their land.

The roles and responsibilities of Eirgrid are set out in legislation and detailed in a document known as the Infrastructure Agreement. This indicates that Eirgrid is responsible for engaging with landowners to obtain the necessary agreements on access and compensation when this is required. The right to enter private lands is obtained by the service of a Wayleave Notice under the 1927 Act. The service of a wayleave notice is a statutory notice of intent to construct electricity infrastructure and the TSO has the right to enter and commence works 7 days after it is served. The 1927 Act itself doesn't specify exactly what rights are thereby obtained by the TSO. However, based on common practice, the rights appear similar to what is acquired in easements in a range of countries as discussed later in this report.

[48] This report is primarily concerned with practices outside Ireland, but the information in this chapter is included to provide additional background and completeness. It may also be useful for comparisons with practices elsewhere. However, nothing in this report should be interpreted as a judgement or opinion on the law, practices in relation to compensation or the amounts that are provided. Neither should anything here be interpreted as a recommendation on these issues.

4.2 Approach to Compensation and Values

It is generally considered that a claimant is entitled to full compensation. This may include compensation for the value of any property acquired, based on its open market value, any severance or injurious affection arising as a result of any reduction in the value of retained property and for disturbance, which may include loss of profits in the case of farming or other business. However, the extent to which a landowner should be compensated for the perception of a health risk under injurious affection to retained lands arising from the location of infrastructure pylons close to a property is not clear.

A point worth noting is that a claim for compensation is submitted under the Acquisition of Land (Assessment of Compensation) Act 1919, which provides the law on compulsory purchase of property. This Act does not indicate what compensation might be payable and provides only a limited framework for the calculation of such compensation. Consequently, Ireland lacks a clear legislative statement on the scope of the power of compulsory purchase or on the measure of compensation for land compulsorily acquired. The law is spread across over 100 different pieces of legislation with the two most important having been passed in 1845 and 1919.

Over time, the law of compulsory purchase has been expanded on an *ad hoc* basis with judicial interpretation being important[49]. The general principle that determines the level of payment under compulsory purchase is that the original property owner should be in the same position afterwards as before the purchase, in as far as monetary payments can achieve this. This is to be achieved through full compensation for losses or disturbance. Any property acquired should be valued at market value and the principle of equivalence should be maintained so that the property owner is in the same financial position after the purchase. This likely means that the compensation should cover not just the value of the land but also any fall in the value of a retained area of the property that occurs as a result of the purchase. As well as acquisition, the right to compensation for damage is undisputed and extends to crops on lands or where explicit restrictions are imposed. However, ESB Networks/Eirgrid has not formally accepted that there may exist a right to compensation for devaluation of the lands or properties near to where transmission infrastructure is constructed.

[49] Galligan, E. and M. McGrath (2014) 'Impact of pylons on landowners will have to be assessed in cash terms'. *Irish Times*, March 17th

The practice followed is that the TSO first collects information on all landowners along a proposed route and contacts them in relation to its intentions. This contact is the first step in getting access and deciding on compensation and also provide some feedback that can influence the final route. Initial access is for a walkover survey of the land. A wayleave is sought thereafter, and an easement agreement if it is considered necessary to place restrictions on activity near the lines.

A range of schemes has emerged in Ireland through which compensation for the impact of the construction of transmission lines is provided to landowners. These include the ESB/IFA Code of Practice from 1985, Flexibility of Access payments first introduced in 2009, and Community and Proximity Payments which have been developed over the past 5 years or so. Many of these emerged from a series of agreements over the years, mostly between ESB Networks and farmer representative organisations, primarily the Irish Farmers Association (IFA). As is seen later in this report, negotiations and agreements between TSO and farmer organisations take place in many countries to identify compensation payments. However, any payments that are made under these schemes in Ireland are considered to be *ex-gratia* payments that are provided to people who accord with certain conditions. They are non-statutory payments, even though Irish law has identified a statutory right to compensation for the siting of electricity infrastructure on private property[50].

The 1985 Code of Practice is central to the process for the payment of compensation. A landowner is entitled to opt out of the code and its attendant agreements, but the TSO must adhere to the agreement if the farmer wishes to do so. However, landowners seldom choose to do so as it is perceived that this would leave them reliant on the statutory entitlement to compensation and there this would be significantly lower. Furthermore, the Code removes any requirement for the landowner to prove negligence on the part of the TSO should acclaim for damages arise.

Along with the process of engagement to be followed, a number of areas for compensation were agreed under the 1985 Code of Practice agreement. These include payments for land that is damaged and crops that are lost during construction, Annual Mast Interference payments, compensation for loss of development if this is shown, and compensation for time lost by the landowner as a result of the infrastructure being

[50] Eirgrid maintains that a landowner can choose to receive either statutory payments or payments under the 1985 Code of Practice agreement, but not both. Consultations undertaken in preparing this report suggest that this is disputed and that all payments provided under these schemes are non-statutory and are provided as an alternative to statutory compensation. Payments made under the Access Flexibility of Access are not disputed to be *ex gratia*.

constructed. The TSO will try to reach agreement with landowners in relation to the value of compensation under these headings. However, if this is not possible the matter will be referred to arbitration. These payments are made after construction is complete.

Under the agreement, all damages are to be made good within 1 month or full compensation for restoration is payable. Compensation is also paid for the landowner's lost time.

Mast interference payments are made annually in respect of the impact of existing infrastructure. These payments depend on the structure in question without reference to the value/quality of the land or the crops that are grown on the land. The current payment rates under the Code of Practice are shown in Table 4.1[51].

Table 4.1: Current Mast Interference Payment Rates

Mast dimensions	€ per annum
Double wood poles <2.7 metres wide	15.87
Double wood poles over 2.7 metres wide	37.70
Steel towers up to 3 meters width	33.19
Steel towers, 3.0 to 3.8 metres wide	36.75
Steel towers, 3.8 to 4.6 metres wide	47.66
Steel towers, 4.6 to 6.1 metres wide	63.47
Steel towers, 6.1 to 7.6 metres wide	74.47
Steel towers, 7.6 to 9.1 metres wide	92.31
Steel towers, 9.1 to 10.7 metres wide	114.16
Steel towers, 10.7 to 12.2 metres wide	152.53
Steel towers, 12.2 to 13.7 metres wide	168.16
Steel towers, 13.7 to 15.2 metres wide	207.21
Steel towers, 15.2 to 16.8 metres wide	227.07
Steel towers, over 16.8 metres wide	263.55

Source: ESB Networks.ie

The Code of Practice also covers loss of development rights for the land. This commences when the landowner is first advised that a line is likely to be built on their land. At that point, the TSO provides the owner with an opportunity to state whether this would conflict with existing planned uses for the land including existing or future

[51] As published at https://www.esbnetworks.ie/existing-connection/farming-landowners/mast-interference-payments

planned forestry, or if it is planned to use land for housing or other commercial development. If a conflict is identified, the Code provides that if a viable development is prevented by the planned works the owner will be fully compensated for the loss of that development. In order to prove there is a viable loss it is generally necessary to show existing statutory approval such as planning permission or approval for forestation is required. Compensation for the loss will extend to the capital loss, recurrent losses such as forest premiums and reasonable expenditure incurred in the planning of the development and the pursuit of the claim. This claim need not be made before the line is constructed and can be made at any time.

Both the TSO and farmer representative had identified issues in relation to the Code. To address these, the flexibility payment arrangement was introduced in 2009 in respect of 110kV and 220kV lines for landowners who cooperate with the construction of new infrastructure. These payments are made in three stages: on access to the land, during construction and on completion of the full line. The payments are made solely in recognition of the fact that facilitating construction is disruptive for farmers. All other headings of compensation are made under the Code. Table 4.2 shows the value of these payments.

Table 4.2: Current Staged Flexibility Payments for 110kV and 220kV Lines (€)

Stage	Timing of payment	Per tower	Per poleset	Line only
1	At time of contractor access	10,000	5,000	2,500
2	On completion of a straight	7,000	3,500	
3	On completion of the line	5,000	2,500	
Total		22,000	11,000	2,500

Source: Eirgrid

In addition, a sum of €5,500 is paid for stays on polesets. These flexibility payments are made if there is a voluntary agreement for access. If access is not granted the payments are not made. Payments are also made under similar conditions where there is an upgrade to existing infrastructure with rates currently set at €12,100 for masts and €6,050 per poleset.

Negotiations have been held, but there is currently no equivalent agreement on flexibility of access payments for 400kV lines such as are proposed for the North South Interconnector.

Easements are sometimes sought, most often in forestry areas. An agreement on restrictions on tree planting in forestry areas was also reached in 1992. This identifies a

corridor around lines that must be kept clear and depends in part on the tree species that is planted in the area. The corridor for 110kV lines is set at twice the maximum height of trees in the area of the lines plus 9 metres, for 220kV it is twice the maximum height plus 16 metres, and for 400kV it is twice the maximum height plus 22 metres. A height of 26 metres is usually assumed as the height for commercial forestry at felling time in Ireland so the corridor for a 400kV lines would be close to 80 metres. However, each case is assessed in relation to local circumstances.

This amounts to an easement on forestry land and compensation is paid. The forestry agreement specified that where land had been recently purchased for forestry, the compensation would be equal to 75% of the purchase price of the area included in the easement. If the land was already in the farmer's ownership, but was to be planted as forestry, a similar payment would be made based on recent market prices for similar land. Lost forestry premia are also payable as part of the compensation for the easement. Landowners can refer the payments offered to arbitration.

Easements are occasionally sought in other circumstances. The compensation payable is calculated on a case by case basis. Once the easement is agreed and the compensation is paid, the right to statutory compensation has been exercised.

The issue of landowners making claims for statutory compensation is problematic. The issue in question is the impact of the infrastructure on the value of the land. In effect, this is a claim for injurious affection. The claim is taken under the 1919 Act and is referred to Arbitration, but the process has proven to be adversarial and extremely costly. Eirgrid has provided information to the consultants of a case where the award from the arbitration was less than 20% of what was claimed, but the costs that were subsequently claimed for the process where over three times the award. According to Eirgrid, there have been a number of similar cases.

4.3 Community Benefit

Eirgrid developed a community benefit scheme following the publication of a policy statement in 2012[52]. This statement set out the view that it is appropriate that

[52] Department of Communications, Energy and Natural Resources (2012) *Government Policy Statement on the Strategic Importance of Transmission and Other Energy Infrastructure*.

community gain considerations should be incorporated into the planning of major infrastructure projects.

There are two elements to the Eirgrid scheme. The first, known as Community Payment, is a one-off payment that is provided when a new transmission line is completed. The amount paid is based on the length and voltage of the new line with the rate of payment to communities in the vicinity of the line set at €15,000 per kilometre for 110kV lines, €30,000 per km for 220kV lines, and €40,000 per km for a 400kV line. New substations are valued according to 1 km of line. These payments are administered by the TSO working with local community groups and local authorities. The funds can be used for a variety of projects that are agreed in advance. The area within which community payments can be provided has not been defined as a set distance from the line. Additional details can be found in material provided by Eirgrid[53].

The first completed scheme was in relation to a 110kV transmission line between Mullingar, Co. Westmeath and Killaskillen in Co. Meath. Following an agreement between Eirgrid, local authorities in the area and representatives of community groups, the area was defined as lying within 2.5 to 3 km of the new line. The amounts provided ranged from €1,000 up to €45,000 with many in the region of €5,000 to €7,500[54].

The second element of the scheme is known as Proximity Payment. The rate of payment in the case of 400kV lines is €30,000 for residences at 50m, reducing on a sliding scale to €5,000 at 200m. Details are shown in Table 4.3.

Table 4.3: Schedule for Calculation of Proximity Payments (distance of line from house)

	Up to50 m.	50 - 100 m.	100 - 150 m.	150 - 200 m.
110kV	€10,000	€7,333	€4,667	€2,000
220kV	€20,000	€14,500	€9,000	€3,500
400kV	€30,000	€21,667	€13,333	€5,000

Source: Eirgrid (2017) *Landowner Compensation and Approach to Community Gain*

This compensation is provided as a one-off payment and is paid to owners of occupied residential properties or sites with full planning permission located within 200 metres

53 Eirgrid (Undated) '*Community Fund and Proximity Payments: Direct benefits to local areas when we develop the grid*'. An example of proximity payments can be found in Eirgrid (undated) '*Mullingar-Kinnegad 110kV Project: Proximity Payments – what they are and how to apply*'

54 A full list of the projects that were funded and the amounts that were provided can be found at http://www.eirgridgroup.com/newsroom/community-fund-award/

from the centre of new 400kV, 220kV and 110kV lines and rural sub-stations. The TSO seeks to locate new lines at least 50m from homes but, if this is not possible, offers are made to property owners on a case by case basis.

These payments are made on the basis of 'loss of amenity' but they are very similar to payments in other countries, as discussed below, under two headings – loss of property value and payments to third parties. One difference is that in other countries the payments are generally provided explicitly for loss of value as assessed by a valuer or another appraisal expert. The implicit assumption is that any loss of amenity, or other perceived losses, will be reflected in reduced market values of a property. The discussion in Chapter 2 above suggests that such appraisals will generally indicate losses, although analysis of the market evidence finds that this is seldom the case. However, there is sensitivity in Ireland around describing the payments as compensation for loss of property values as the TSO has not definitively accepted that transmission lines cause a loss in the value of property over which lines cross – outside of a directly affected corridor – much less that there are negative impacts on the value of properties owned by others who are not party to an easement or a wayleave agreement in relation to their properties.

5. Britain and Northern Ireland

5.1 England and Wales

Britain's electricity transmission network is owned and maintained by three regional transmission operators. The three TSOs are National Grid Electricity Transmission plc (NGET) with responsibility for England and Wales, Scottish Power (SP) Transmission Limited for Southern Scotland, and Scottish Hydro Electric Transmission plc for Northern Scotland and the Scottish Islands. NGET is also responsible for ensuring the stable and secure operation of the transmission system as a whole.

National Grid foresees a major program of investment in the grid over the next decade as new generation comes on stream. The Planning Act 2008 requires that National Grid will need to obtain a Development Consent Order from the Planning Inspectorate to progress new construction.

This construction will involve considerable interaction with private property owners. The TSO employs a range of procedures to obtain access to property for construction. These include agreed purchases, compulsory acquisition for structures, and easements for areas under lines. The processes followed are defined by the Planning Act 2008 and the Planning and Compulsory Purchase Act 2004. The 2008 Act also places a duty on the TSO to consult and engage with communities and to identify all stakeholders at an early stage of planning. This is particularly the case for works that will impact on a residential or amenity area. A first necessary step is to obtain contact information on all landowners along a preferred route for new lines. The TSO will try to obtain this voluntarily, but it has legal powers under the Act to obtain the information by compulsion if necessary.

Early consultation tends to be most effective in terms of mitigating impact as it is most likely to influence the design of a project. The first necessary agreements relate to surveying that must be performed on private lands. Again, agreement is sought but the TSO can also enforce its rights to enter property for this purpose under both the Electricity Act 1989 and the Planning Act 2008. National Grid has a statutory right to undertake these surveys and compensation is offered only in recognition of any damage that may be caused, not for the right of this access.

Once the final route is identified, National Grid seeks an agreement with landowners and land users whose land will be directly affected by the new infrastructure. If there is a

mortgage on the land, consent to the agreement is required from the mortgage provider. This agreement provides a right of entry for construction once planning approval for the development is obtained and also allows for minor changes in alignment within a specified corridor. It is not an easement, but it provides for an easement to be acquired over the land where the assets are built, once construction is completed. This process of making an agreement can begin before a Development Consent Order has been obtained for constructing the infrastructure. If professional fees are incurred by landowners during this time they will be compensated.

If the agreement cannot be concluded voluntarily and the planning consent is in place in the form of a Development Consent Order, National Grid has the power to acquire the access and construction rights as a result of holding this Order. This process is undertaken under the Compulsory Purchase Act 1965 and the Acquisition of Land Act 1981. The same compensation is then payable as if the rights were acquired voluntarily, but no premium will be payable. Interestingly, even if a voluntary agreement is completed in respect of a particular parcel of land, the TSO still applies for compulsory powers to acquire the rights covered in the agreements in order to reduce any risk that might arise due to deficiencies in the voluntary agreement.

Landowners are legally entitled to compensation as defined by Sections 3 and 4 of the Electricity Act 1989. This includes compensation for damage that arises as a result of the TSO exercising the rights it has acquired and for injurious affection, which is considered on an individual basis. Compensation may also be payable for the devaluation of property or loss of development potential and is assessed by a qualified surveyor on a case by case basis with values based on the available market evidence. The rights acquired under an easement are compensated by means of a single payment at the time of the acquisition. Damage that occurs as a result of the TSO exercising its rights is compensated by additional one-off payments when the damage is assessed.

Levels of compensation payments, excluding payments for injurious affection – which are assessed on a case by case basis – are published by National Grid[55]. While payments for injurious affection are not published, the TSO acknowledges that a basis exists for such compensation.

Compensation for surveys after the initial walkover assessment are compensated at £250 per land holding in each crop cycle. If night visits are required these are

[55] National Grid (2017) '*Payments schedule for new electricity transmission assets*'. https://www.nationalgrid.com/uk/about-grid/our-networks-and-assets/land-planning-and-development

compensated at £250 per holding for up to 6 such visits. If boreholes are required, they are compensated at £350 for up to 6 boreholes in close proximity plus £125 per borehole elsewhere on the holding. Trial pits are compensated at £350 per pit. Water monitoring equipment is compensated at £100 for the first gauge plus £50 for each additional gauge per year. If there is any additional damage to the land as a result of this surveying activity it will be paid on production of evidence of losses.

Easement agreement payments are set at £6,000 per tower. If there is no tower placed on a land holding, but the line crosses the land, this overhang is compensated at a rate of £500 for a span up to 49 metres, £750 for a span of 50 to 99 metres and £1,000 if the span is greater than 100 metres. These are one-off payments that are paid in in three stages. When the agreement to grant the easement is initially signed, 50% of the compensation that is agreed for the easement is paid over. This is followed by a further 25% when construction begins on the holding and the final 25% when the easement is completed following construction. If access to an easement corridor is required over a third party's land holding that is not included in the easement corridor, a compensation of £1,000 is payable to the third party per tower that needs to be accessed for construction or future maintenance.

Premiums are offered to incentivise early signing of the agreement. If it is signed within 12 weeks of the initial notification from the TSO that is wishes to acquire an easement agreement, a premium of £500 per tower is payable to an owner plus £1,500 to the occupier of the land. These are aggregated for owner-occupiers. A premium of £500 is also paid to owners and to occupiers for overhang and also to third party owners and occupiers if access is required through their land. If the agreement is signed in weeks 13 to 18 following notification the premiums payable are 50% of these amounts. Beyond 18 weeks no incentive premiums are paid.

If the TSO needs to purchase lands the costs are negotiated on a case by case basis according to market prices. Compulsory rights apply and can be used by the TSO.

Professional fees are also compensated. There is a fixed level of £150 for land agency services involved in completion of the initial information data sheet. Fees accruing for survey work are fixed at £250 while additional fees that may arise during the negotiation of the easement agreement are payable according to a current scale[56]. These fees are fixed fees payable to professional service providers, but the funds are paid via the landowner or occupier who engages the services. The level of compensation varies

[56] These fees are detailed in the National Grid publication entitled *Payment of Surveyors Fees*.

according to the amount of compensation that is payable to the landowner or occupier. A fixed fee of £500 is also payable for agreeing injurious affection claims and fixed fees are set for compensation for structures and overhand payments. All these payments are one-off payments.

Annual payments are also made for structures that are placed on the land and for overhang. The level of payment depends on the use of the land and on the type and placement of structures. Table 5.1 provides details of the current payments schedule.

Table 5.1: National Grid Annual Payments for Structures (up to 31st March 2018)

	Owner's Payment	Occupier's Payment		
		Arable	Grassland	Hedgerow
Single pole	£7.61	£23.14	£2.30	£0.70
Single pole and stay	£9.47	£31.07	£5.05	£2.45
A or H (double) pole	£9.68	£26.41	£3.27	£1.57
Stay or strut	£1.86	£9.80	£2.75	£1.75
Additional stay	£1.86	£4.84	£1.37	£0.86
Lines only (tower lines)	£2.17	~	~	~
Lines only (pole lines)	£1.53	~	~	~
TOWERS:				
less than 2.6m x 2.6m (T1)	£24.41	£47.61	£8.69	~
2.6m x 2.6m - 3.8m x 3.8m (T2)	£28.19	£52.48	£10.52	~
3.8m x 3.8m - 4.6m x 4.6m (T3)	£32.97	£55.72	£11.74	~
4.6m x 4.6m - 5.3m x 5.3m (T4)	£44.12	£58.56	£12.81	~
5.3m x 5.3m - 6.9m x 6.9m (T5)	£48.06	£65.05	£15.25	~
6.9m x 6.9m - 7.6m x 7.6m (T6)	£51.94	£67.89	£16.31	~
7.6m x 7.6m - 9.1m x 9.1m (T7)	£63.92	£73.97	£18.60	~
9.1m x 9.1m - 10.7m x 10.7m (T8)	£77.64	£80.46	£21.04	~
10.7m x 10.7m - 12.2m x 12.2m (T9)	£97.63	£86.68	£23.33	~
12.2m x 12.2m - 13.7m x 13.7m (T10)	£110.32	£93.13	£25.62	~
13.7m x 13.7m - 15.2m x 15.2m (T11)	£131.82	£99.57	£28.14	~
15.2m x 15.2m - 16.8m x 16.8m (T12)	£143.11	£106.44	£31.03	~
16.8m x 16.8m (T13)	£163.26	£112.88	£32.64	~

Source: National Grid

These payments are subject to revision on a regular basis and are provided for the time the structures remain on the land.

The National Grid Community Grant Programme

Without a legislative requirement to provide community compensation, National Grid's Community Grant Programme aims to provide funds to projects run by not-for-profit community organisations and charities in areas where the TSO's operations and activities impact on residents. The projects can provide a range of social, economic and environmental benefits. The funding is also provided to impacted schools through sponsorship of VEX Robotics. Grants are awarded up to £20,000 (€22,500). The nature of projects is broad but the types of projects that are targeted include:

- Initiatives that support isolated community members
- Initiatives that support community safety including the elderly and people with special needs
- Education projects, especially the development of STEM skills
- Activities that promote or support health and wellbeing
- Initiatives that support economic regeneration
- Work placement or retraining schemes
- Capacity building for community, charity or voluntary groups
- renewable energy or conservation projects and
- Environmental awareness projects

Individuals and certain groups and activities are excluded, including religious organisations, political parties, medical research, ongoing running costs and any work that is the responsibility of statutory organisations.

Applications are accepted all year round and from any relevant area. All grants need to be used within 12 months. However, a recipient can apply again in a subsequent year, but the fund does not usually fund a specific project more than once.

5.2 Scotland

The electricity transmission system in Scotland is split into two regions with two licensed operators. Scottish Power Transmission, part of SP Energy Networks, covers the south of Scotland while Scottish Hydro, part of Scottish and Southern Electricity Networks, is responsible in the north of Scotland. The latter is particularly concerned with the transmission of electricity generated from onshore windfarms and hydro power stations to customers further south in Scotland, England and Wales.

The acquisition of rights process is undertaken under the Electricity Act 1989 and the Planning Act 2008 as in England and Wales. Rights are obtained following award of a

Deed of Easement/Servitude. These will contain a Wayleave Agreement which will require a one off payment to landowners/occupiers and annual payments for as long as the right is obtained i.e. in perpetuity or as long as the assets remain on the land. The required agreements will be negotiated, but if this is not possible the compulsory process under the Electricity Act 1989 is used. This is a last resort as it can take 9 to 18 months to secure. Land for substations is normally purchased, but is may be leased on occasions. While similar overall, an additional required compared to other parts of the UK is that an 'Irritancy Protection Agreement' may also be required in Scotland.

The common legislative framework under which electricity transmission infrastructure is developed in Scotland means that the entitlements to compensation are similar to other parts of the UK. Compensation takes the form of single payments for easements and damages and annual payments for land used by infrastructure. As is shown in Table 5.2, allowing for the different dimensions adopted and the different classification of land, annual payments appear broadly similar to those in the National Grid area[57].

Table 5.1: Annual SP Transmission Payments for Structures (£, 2013)

Tower base dimensions	Arable land	Enclosed pasture	Hill land
Rent paid to owners			
4.57 sq. metres (15 sq. feet)	25.51	25.51	23.78
7.62 sq. metres (25 sq. feet)	42.92	42.92	41.31
10.67 sq. metres (35 sq. feet)	61.49	61.49	60.90
13.72 sq. metres (45 sq. feet)	92.81	92.81	90.49
Over 13.72 sq. m. (> 45 sq. feet)	139.21	139.21	136.89
Compensation to land occupiers/tenants			
3.05 sq. metres (10 sq. feet)	33.83	8.66	1.10
3.81 sq. metres (12'6" square)	36.46	9.65	1.10
4.57 sq. metres (15 sq. feet)	38.76	10.52	1.10
5.49 sq. metres (18 sq. feet)	43.69	12.37	1.25
7.32 sq. metres (24 sq. feet)	48.62	14.23	1.25
9.14 sq. metres (30 sq. feet)	53.55	16.09	1.35
12.19 sq. metres (40 sq. feet)	65.36	19.80	1.50
15.24 sq. metres (50 sq. feet)	79.36	23.50	1.60

Source: Scottish Power Transmission

[57] These payments relate to 2013 but were the most recent provided to the consultants. Allowance for review for inflation in the interim would make most of the payments similar to those in the National Grid table for 2018.

SP Transmission also compensates landowners or occupiers for lost time, if documentation is provided, in relation to works undertaken on the land at £40 per hour[58]. Compensation that will be paid to landowners in respect of professional fees on a fixed fee basis, if claimed within 12 months of being incurred. This fixed fee is based on the level of compensation on a sliding scale up to £5,000 compensation and are calculated at 2.1% of the level of compensation thereafter.

This common legislative framework with the rest of the UK also means that the right to compensation in Scotland is largely restricted to landowners directly affected or impacted by the easement corridor and there is no legal right to community compensation outside of this.

5.3 Northern Ireland

SONI, the Systems Operator for Northern Ireland, is the TSO in Northern Ireland. It is a subsidiary of Eirgrid but, as it operates in a different jurisdiction, the way in which landowner payments have developed bears little resemblance to the approach used on the rest of the island.

From the review of practices in Ireland above, Eirgrid has a statutory right to place electricity infrastructure on private lands and generally sought to gain access through wayleaves. Compensation was largely based on statutory entitlement and agreements with the IFA. However, there is no equivalent statutory right to place electricity infrastructure on lands in Northern Ireland. Access rights are mostly obtained by SONI entering into a wayleave agreement with a property owner.

This can be problematic. For a start, a landowner may refuse to enter into a wayleave agreement. Then, even if it is put in place, it can be severed by the landowner provided 12 months' notice is given. As a result, wayleave agreements provide SONI with only limited security of tenure in respect of the infrastructure is may construct and may need to maintain. If either of these circumstances arise, SONI may apply to the Department for the Economy for a "necessary wayleave", in effect a compulsory wayleave.

[58] SP Energy Networks (Undated) *Fee Scale*

An easement agreement that incorporated a right of way, such as is used by National Grid, would address the security of tenure issue. Easements are occasionally acquired for overhead lines by SONI, but usually only where there is forestry or building activity nearby on the land. Compensation for easements is assessed on a case by case basis with the assessments being carried out by an independent professional Land Agent or Agronomist. Compensation includes a payment for the land within the easement area. This is typically a percentage of the market value of the land as assessed by the agent. The payment will also include compensation for injurious affection arising from any assessed fall in the value of the retained land as a result of the proposed development.

Compensation is payable for structures that are placed on private land. These are payable by NIE Networks and comprises a standard wayleave rent per structure. For pylon structures this is typically of the order of £100 - £200 per tower per year.

Landowners are also entitled to statutory compensation for any damages to lands or buildings arising from the construction and any crop loss or disturbance. This is a statutory requirement arising from the construction and is paid in the case of both the wayleave and easement agreements.

6. Larger European Countries

6.1 France

Réseau de Transport d'Electricité (RTE) was created in 2000 as a managerially independent entity within Electricité de France. It functions as the French transmission grid manager with responsibility to develop and maintain the high voltage network. In line with French legislative requirements, RTE's approach when seeking permission and a legal right to construct infrastructure on private property is to obtain easement and agreed right of access. However, if agreement is not reached with a property owner, RTE will seek compulsory easement for the installation of towers, pylons, poles and lines. Interestingly, only in the case of poles will RTE resort to compulsory acquisition or agreed purchase of lands.

French law entitles property owners to receive compensation for any damage to land, buildings and crops, as well as for any restrictions that may be imposed in relation to the types of crops that can be grown[59]. RTE pays this compensation in the form of single payments, except for compensation for damaged crops, which is usually paid every year for nine years. Any impact on crops, whether it be damages or restrictions, falls under the auspices of a national protocol that been negotiated between RTE and the farmer representative organisations when accessing the level of compensation to determine the value of the crops. For example, in 2017, a hectare of corn was determined be worth €2,599 for compensation purposes. However, damages to land and buildings are estimated on a case by case and with no specific guidelines as to value.

There is no entitlement to compensation for any restrictions on subsequent development that be imposed because of the infrastructure. Neither is there any compensation paid for noise or any claimed health impacts. Loss of visual amenity because of new lines or other infrastructure is also compensated by means of a single payment. The value of this payment is determined by an independent commission, again on a case by case basis. Third party property owners may also be compensated if the construction causes an adverse effect on the visual amenity with the level also being determined by the independent commission.

[59] Law n° 2014-1170, article L.112 1-3

Under comprehensive guidelines issued by the French Chamber of Agriculture for 2017 in relation to compensation for agricultural property owners and farmers in proximity to overhead high-voltage transmission lines, assessment of compensation for any damage suffered is split into two individual parts and the compensation will be paid as two individual sums[60]. The first is for pylons and accounts for the surface area that is lost as a result of the installation of the pylon(s). The second is compensation for overhanging lines. A third can potentially be added if several pylons are installed on one property[61].

The level of compensation for pylons is calculated by RTE based on two factors. The first is the surface area that is occupied by the pylon. This includes a 1.5 metre safety zone around each pylon and the potential damages to the land that may result. This latter value is based in part on the type of crops that are grown on the land. The second factor is the type of land involved. Land is classified into three categories: polyculture, natural grasslands, and a third category encompassing grazing, moors, uncultivated lands and rocks[62]. Both polyculture and natural grasslands are each subdivided into two further (unspecified) sub-categories. Table 6.1 shows some sample payments that are made to owners for pylons and other structures[63].

Table 6.1: Examples of Payments to French Land Owners for Structures (Euro)

Area	Polyculture land	Grassland	Other
Post (<1.42m^2)	30 – 38	12 – 16	1
Pole(s) (<1.42m^2)	133 – 166	55 – 70	1
Pylon (5-10m^2)	290 – 363	122 – 152	4
Pylon (25-35m^2)	543 – 680	228 – 286	16
Pylon (95-115m^2)	1,676 – 2,095	703 – 880	54
Pylon (195-215m^2)	2,578 – 3,222	1,082 – 1,353	106
Pylon (335-375m^2)	3,968 – 4,960	1,666 – 2,084	188
Pylon (495-515m^2)	5,068 - 6,335	2,129 – 2,661	257

Source: Chambres D'Agriculture France et. al. (2017)

[60] 2017 Barèmes D'Indemnisation Agricoles, (Scales for the Indemnification of Permanent Damage to Agriculture). Report published by Chambres D'Agriculture France, FNSEA, ENEDIS and RTE, 2017.

[61] This additional compensation C is computed as follows: $C = (N-1) \times (\frac{1}{3}) \times (\frac{S}{N})$ where N is the number of pylons and S is the sum of all pylon compensations due for pre-existing and new installations.

[62] The corresponding value of crop categories were calculated taking into account average crop rotation observed in the region (département), average crop yield, based on the figures of 1998-2002 inflated by 10% to account for medium-term increase (except for corn) and prices observed in the département which most closely match those of the assessed area or a national average.

[63] This is just a sample. Considerably more detail is included in the publication. The ranges arise due to the sub-categories that are taken into consideration.

Payments to land owners are one-off if the owner does not farm the land. However, compensation is also payable to land operators, whether or not the individual who farms the land also owns it. These payments are recurring for up to 9 years. Table 6.2 shows sample values of payments to operators for pylons in the first years. Payments in subsequent years are broadly similar. Operators are not entitled to any compensation for uncultivated lands, moors and rough grazing.

Table 6.2: Examples of Payments to Operators for Structures (Euro, first year)

Area	Polyculture land	Grassland
Post (<1.42m^2)	4.10 – 5.50	1.40
Pole(s) (<1.42m^2)	27.40 – 34.20	5.50 – 6.80
Pylon (5-10m^2)	52.00 – 64.30	13.70 – 16.40
Pylon (25-35m^2)	72.50 – 90.30	24.60 – 31.50
Pylon (95-115m^2)	158.70 – 198.40	58.80 – 73.90
Pylon (195-215m^2)	225.80 – 281.90	83.50 – 104.00
Pylon (335-375m^2)	318.80 – 398.20	119.00 – 147.80
Pylon (495-515m^2)	392.70 – 491.20	146.40 – 183.30

Source: Chambres D'Agriculture France et. al. (2017)

The determining factors for the overhang compensation are the tension of the transmission lines – the higher the tension, the higher the compensation – and the type of land. Polycultures and natural grasslands are categorised together while grazing, moors, uncultivated lands and rocks fall into a distinct group. The compensation amount is calculated on the basis of 'linear metres' i.e. the distance of a corridor that is subject to overhang. The width of the corridor depends on the type of circuit and voltage being carried. Table 6.3 shows the amounts that are paid annually for lands in polyculture, horticulture and grassland.

Table 6.3: Overhang Payments to Owners and Operators (Euro per linear metre)

Line	Owner	Operator	Owner/Operator
2-circuit, 400kV	0.68	1.27	1.94
1-circuit 440kV	0.44	0.82	1.27
All lines 225 or 150 kV	0.44	0.82	1.27
All lines 90kV or 63 kV	0.21	0.42	0.63

Source: Chambres D'Agriculture France et. al. (2017)

Land owners, but not operators, are also entitled to overhang payments for rough pastures, moorlands and rocks. Details are shown in Table 6.4.

Table 6.4: Overhang Payments to Owners of Rough Lands (Euro per linear metre)

Line	Payment
1 and 2-circuit, 400kV	0.056
2-circuit 225kV	0.056
1 circuit 225kV and all 150 kV	0.029
2-circuit 90kV or 63 kV	0.029
1-circuit 90kV or 63 kV	0.014

Source: Chambres D'Agriculture France et. al. (2017)

There is also a minimum payment of €20 whenever compensation is due even if the calculated value is actually inferior. However, if the property changes hands, the new owner will not receive compensation.

RTE never buys land in urban areas except for poles. Again, the TSO seeks to sign an agreement with the owner of a property that will be affected by a line. If the owner doesn't want to sign this agreement, RTE applies to the Préfet which gives a compulsory easement over the property.

Compensation is paid for every 400kV and 225kV pylon and for other infrastructure in the form of a single payment. As in the case of agricultural land, compensation is calculated according to a set of published scales. The payment is currently set at €2,368 for 225kV pylons and €4,730 for each 400kV pylon[64]. Property owners are also compensated for newly installed transformers. The current rate is €146,645 for a 400kV transformer[65].

This compensation is given as a legally binding one-off, inclusive and definitive payment. Measures are also in place to ensure that if ownership of the property changes, the new owner cannot receive compensation.

The published tables provide very detailed scales for the calculation of compensation payments and remove much of the need for arbitration. In as far as the consultants can ascertain they provide a good indication of the actual outcomes i.e. of the actual compensation that is paid for the impact of transmission lines in rural areas. Although the level of payments is not dependent on early agreement and RTE does not provide incentives to do so, the right to obtain compulsory easement over properties through a process that is administered at local levels if agreement is not reached in a relatively

[64] http://bofip.impots.gouv.fr/bofip/196-PGP.html
[65] http://bofip.impots.gouv.fr/bofip/798-PGP

short time provides a good incentive to use this straightforward mechanism without much arbitration.

RTE has also developed community payment schemes that have begun to operate in recent years. However, rather than the more common procedure of making payments directly to local community groups, these payments are made to local governments who administer them. This involves negotiating a variety of compensation and mitigation measures for grid expansion projects with the relevant Préfet and local authorities. In this process, the Préfet decides on a commission, usually including local politicians, agricultural representatives, the local chamber of commerce and commission for tourism, when a new overhead line in planned. This commission has control over a sum up to 10 per cent of the overall project costs for a 400 kV overhead line and 8 per cent for lower voltage lines, and can decide on its distribution[66]. The funds are given directly to affected municipalities and can be spent on local projects often including undergrounding existing distribution lines or fixing local buildings.

The Haute-Durance project is an example of this in practice. This project involved 100km of new overhead lines. RTE and the Préfet of the Haute-Alpes district agreed a community support plan with total payments of €6.9 million involved. Over 87% of this was to be paid directly to town councils for specified projects distributed according to the distance of line that crossed each area.

6.2 Germany

Four system operators, 50Hertz, Amprion, TenneT and TransnetBW, own and operate the German electricity transmission system and are responsible for ensuring that it is adequate to meet demand. Expansion of the transmission network will be a major issue in Germany over the next number of years partly due to growing demand but also as a result of the national decision to reform energy policy in response to climate change and the Fukushima disaster. This reform means that renewable energy sources will account for most new generation capacity. Wind energy, which is concentrated in the north of the country, will play a large part in this development and will need to be transported to the areas of high demand around cities in the western and southern areas.

[66] Renewables Grid Initiative (2016) *Community Payments: Case Studies from Across Europe*

Each year the four TSOs work together to draft a Scenario Framework as an estimate of how they see electricity generation and consumption developing over the next decade. This is then used as the basis to identify where the grid needs to be strengthened. The TSOs draw up an Electricity Network Development Plan and an Offshore Network Development Plan that form the basis for a Federal Requirements Plan Act that establishes the necessity and priority of the projects set out in the Act to meet requirements. The TSOs then apply to the *Bundesnetzagentur* (the regional authorities) for approval to implement projects. The Bundesnetzagentur decides on route corridors and the precise route of a new line within a corridor is determined in the Planning Approval Procedure. Emphasis is placed at this stage on finding a route that has the least impact on people.

There are differences between the TSOs in some of the details regarding practices in dealing with landowners but broad commonalities. These similarities arise for three main reasons. First, there is a considerable body of governing law across all regions and all the TSOs have developed their practices in line with this. Second, the TSOs have developed agreements with national representative organisations leading to various reports and guidelines that apply across the country. Third, the TSOs work together to agree practices and compensation levels between themselves so that the outcomes are fairly similar irrespective of which TSO a landowner is dealing with. This prevents the level of compensation becoming a competitive weapon for the TSOs and also ensures smoother planning and operations where national infrastructure projects may involve cooperation between different TSOs.

The approach favoured by TSOs is to try to agree an easement contract with property owners for access and construction. The agreements provide the TSO with the required rights of way and set out details such as who benefits from the authorisations, what the corresponding rights are and what limitations the passage of the power lines entails. This restricts owners from making full use of their land and the agreement is entered in the land register to guarantee the rights of the TSO in perpetuity, even after a change of ownership. The agreed purchase of lands is rarely sought and TSOs do not usually pursue separate rights of access or wayleaves. The lands remain the property of the original owners. A TSO will usually try three times to get an agreed solution before going down the compulsory route. About 5% of cases fail to find agreement. When this happens, the TSO starts a compulsory acquisition or expropriation process with the relevant authority.

German law entitles landowners to compensation for any damage to crops or buildings, any restrictions of crops and devaluation of the property. Compensation is only paid under these headings. Devaluation of the property applies only to land or a corridor of

land within a restriction zone under a line and compensation is never paid to third parties outside the zone. This zone will usually amount to an area of 8 to 10 metres squared around pylons and 30 metres, left and right of the line's overhang protection corridor, but this can vary depending on characteristics of the location. There is no right in law to compensation for any restrictions on development, future highest use value, loss of visual amenity, noise or health issues that may be incurred or perceived as result of new lines and none is paid under these headings. Effectively, no compensation is ever paid to third party individuals outside the restricted zones and there is no right in law for any such payment to be sought, except for private roads that are used for access.

In 2016, the *Bundesministerium für Wirtschaft und Energie* (BMWi) (Federal Ministry for Economic Affairs and Energy) commissioned a study on compensation practices by TSOs in Germany[67]. A background question that prompted the study was whether the compensation practices that are used and the levels of payments that are made are appropriate given the levels of new infrastructure that are foreseen as being required over the upcoming period. The study was published but the BMWi has not yet made a final statement on this study's findings. However, the findings in that study are in line with the information that has been acquired by the consultants from the TSOs.

The legislation requires that compensation for damage to buildings has to be paid in full in a single payment following review by an independent assessor, unless the damage can be restored by the TSO. The levels to be paid are guided by agreements between the TSOs and farmer organisations. Damage to crops is also compensated at 100% in a single payment according to the yield loss again following agreed guidelines. If there are restrictions placed on future crops this is also compensated at yield loss at a value of 30% of the loss in the second year after the construction project and 20% for the third year. This is the only recurring compensation that is paid.

The offers made by TSOs for compensation for the devaluation of the property within the restricted overhang zone around lines are usually at 20% of its current market value or ground value for a corridor along the line of width 40 to 70 metres depending on the voltage. Interestingly, if an agreement is not found and the expropriation process is

[67] Das Bundesministerium für Wirtschaft und Energie (2016) *Entschädigung von Grundstückseigentümern und -nutzern beim Stromnetzausbau - eine Bestandsaufnahme*. Report prepared by Frontier Economics and White & Case. https://www.bmwi.de/Redaktion/DE/Publikationen/Studien/entschaedigung-grundstueckseigentuemern-nutzern-stromnetzausbau.html (Federal Ministry for Economic Affairs and Energy, 2016, *Compensation of land owners and users in the development of electricity networks - an inventory.*)

undertaken the level of compensation can be expected to lie in a range from 10% up to 20% of the value. The market value is as estimated by a surveyor using recent price sales in the area, the ground value is the value that the local municipality places on the property. Land prices vary considerably across Germany with 2013 values quoted in the Frontier Economics report ranging from €1.05 to €4.74 per sq. metre for farmland with an average of about €2 per sq. metre. Consequently, compensation payments vary considerably. Typically, the payment will be about €12 per linear metre of overhang per €1 per sq. metre market value i.e. for the average value of €2 per sq. metre, a farmer will be paid €24 per linear metre. A minimum payment of €50 to €100 is usually made where there is only a small area impinged and values are low as a result of agreements with farmer representative organisations.

Obviously, payments in urban areas can be considerably higher as land values are likely to be much higher as a result of expectations of increased value due to possible rezoning in the future. TSOs do not take this possibility into account and there is no legal obligation to do so beyond such impact as may already be seen in land prices in the area. If problems arise they will typically lead to expropriation proceedings and this possibility will only be considered if there is clear pre-existing evidence of imminent rezoning or use as building land.

Land within the specified area occupied by pylons and poles is compensated at 100% of its ground or market value[68]. Compensation payments lie in the range of €888 to €10,581 per pylon and are usually fixed across the whole length of a line in a specified project. Property owners have the right to appeal the valuations to an independent expert. The TSO pays the cost of this appeal if the outcome is higher than the offer.

Land used in forestry is usually paid a flat fee of €500 to €2,000 depending on the age and species of the trees. The level of compensation that is paid for the use of private roads will vary depending on the size of the road but is usually about €1 per square metre up to a maximum of €400 for each recipient.

Two additional forms of compensation are also regularly provided. First, TSOs will usually compensate landowners for professional fees that might arise with a minimum value of €100 or higher if greater fees arise. Most such payments are usually less than €300 in the case of overhead lines. Second, some TSOs will pay a premium for the land compensation if an agreement is reached with the landowner within 8 weeks of the start

[68] Jennissen and Wolbring (2010), *Hochspannungsmast-Entschädigung. Schriftreihe Agrar-Tax*, Heft 113, HLBS Verlag, Sankt Augustin is used as a guideline for valuing the impact of pylons.

of negotiations. This will typically amount to €0.25 to €0.50 per square metre for the affected lands but cannot exceed 50% of the market value of the property. However, this would appear to be in something of a grey area as some TSOs interpret agreements as requiring that all landowners in similar situations are compensated equally. Either way, no recurring payments are ever made or agreed and there is no subsequent right to claim compensation once the agreement is signed or the compulsory easement process is undertaken.

Community payment schemes are described as common and usual in Germany and, unusually, their development is mostly based on legislation rather than initiatives by the TSOs. German legislation (StromNEV, §5(4)) requires TSOs to pay compensation with an upper limit of €40,000 per km of line to local communities represented by the *Landkreise* (parish council). Usual procedure is that the TSO contacts the *Landkreise* at an early stage in the planning process and seeks to agree contracts that specify the amount of the compensation and certain rights and responsibilities for both the TSO and the community. The amount of the compensation depends on the length of line that will cross the community's area, the voltage and the amount of supporting infrastructure. Once agreed, the money is paid over when the project is commissioned and the community is free to use the money as it sees fit without further involvement by the TSO. An example of this system in operation is the Schwerin-Hamburg project installed by 50Hertz. This involved a 380kV line connecting new wind energy installed capacity to cities in northern Germany. Agreements were made between 50Hertz and 22 of 23 communities along the route. The funds were paid by the TSO into the general budgets of the local councils who have responsibility for expenditure on areas such as local social facilities, social welfare payments and regional roads. All the TSOs are following similar approaches to address community gain.

6.3 Italy

Terna Group, a publicly quoted company, is the owner of the Italian electricity transmission grid and has been licensed by the Italian Government to transmit and manage electrical power flows across the country. Its subsidiary, Terna Rete Italia, manages the transmission of electricity nationwide. It controls about 63,900 Km of high voltage lines, equal to 98% of the total Italian high voltage grid, making it Europe's largest independent operator in terms of kilometres of lines managed.

Procedures for building new transmission facilities are defined in Italian Laws, in RD no. 1775 of 11th November 1933, as subsequently modified and integrated by DPR no. 616

of 24th July 1977. The building of new transmission facilities is also governed by Act no. 349 of 8th July 1986, related to environmental impact assessment, and by DPCM of 23rd April 1992 related to electromagnetic fields. While Terna normally seeks to find agreement with property owners, the 1933 law and Presidential Decree 327/2001 – the Consolidated Law on Expropriations – provide Terna with legal authorisation to use expropriation procedures for the construction of power lines.

The 2001 Presidential Decree is important as it also sets out the basis for the payment of any compensation arising from the act of expropriation and establishes that the level of compensation will be set according to the land's intended use. Voluntary agreements are also regulated within the same legal provisions. However, it is built into Italian law that the compulsory nature of expropriation will result in a lower level of compensation than would be the case if the property owner voluntarily cooperates with the TSO and reaches an agreeable solution. This is explicitly designed to incentivise cooperation.

Under article 45 of the Presidential Decree, the owner of a property has the right to reach an agreement with Terna regarding the value of property. The owner's right to seek an agreed solution runs from when a project is declared to be of 'public utility' but expires at the time the expropriation process is begun by Terna[69]. However, Terna will normally act to begin the compulsory process only if it considers that an agreement is not forthcoming. In this time frame the owner has the possibility to proceed with a voluntary transfer of the land and receive a higher level of compensation than can be expected if the rights have to be acquired through expropriation.

The provisions in the Decree effectively mean that the compensation associated with purchasing land or an easement over land that is in a built area or is considered to be suitable for use for construction (*terreno edificabile)* will equal the market value of such land. However, Article 40 establishes that compensation for agricultural land will amount to the land's agricultural use value plus the value of any legally constructed building on the property. This means that when setting the value of any land that is taken out of a farmer's use only the value of cultivation that is currently being undertaken on the property is considered. The decision excludes from consideration any possible future uses of the land, other than current agricultural activities.

There are defined legal rules for valuing a property for compensation.

[69] The 2001 Presidential Decree lays out the framework for Terna, and for other relevant authorities or institutions, to act as the expropriating authority i.e. it provides Terna with the power to undertake a compulsory purchase if no agreement is reached.

- For an area suitable for building compensation will be equal to the market value of the property (as per article 37) increased by a premium of 10%.
- Compensation for legally constructed buildings will be equal to their market value (Article 38).
- Compensation for agricultural land is equal to use value as agricultural land (article 40) with an added premium of 50% relative to the base value.
- In the case of an agricultural area cultivated directly by the owner, the value is equal to three times its calculated value (article 40).

In most cases Terna makes a one-off payment of the compensation that has been agreed with the land owner to obtain the rights for the power lines. Table 6.5 shows that Terna uses its expropriation powers but only in a minority of cases.

Table 6.5: Usage of Easement Powers by Italian TSO

	2016	2015	2014
Voluntary Agreement	5,886	10,836	11,162
Coercive Application	1,971	126	910
Total Easement	7,857	10,962	12,072

Note: The numbers in this table indicate to the number of property owners that are deemed to have been affected by the construction of new power lines having been involved in easement negotiations and compensation payments.
Source: Terna (2017) Sustainability Report 2016

The data show that, over these three years, out of almost 31,000 cases of compensation being paid, the payment resulted from voluntary 'friendly' agreement being reached between the TSO and the property holders in over 90% of cases with coercive or legally enforceable easement agreements being obtained in the remaining cases. Indeed, in 2014 and 2015, the percentage of friendly resolutions was considerably higher.

If expropriation is required, the law allows the expropriating authority to nominate two different technical experts to conduct the process although the option also exists for one of these to be nominated by the property owner. A third expert is nominated by the president of the local civil court. If a voluntary agreement is not in place the premiums noted above should not be expected. Once the property owner explicitly accepts the compensation resulting from the estimation, the expropriating authority authorises the payment or the deposit of compensation.

It is clear that the approach that is taken by the Italian TSO is deeply influenced by specific legislation that allows for some negotiation between property owners and the TSO. However, the period within which this agreement must be found is limited by the

willingness of the TSO to act and move to compulsory acquisition and the TSO has considerable powers thereafter. The law is also quite prescriptive in relation to the levels of compensation that will be paid.

In recent years Terna has also developed community compensation processes and a legal framework has been developed around this process. Local governments have the right to request compensation measures to offset the impact of new infrastructure projects. Projects to be funded are identified first in discussions at regional or provincial level and then at the municipal level. The amount of money Terna can spend on each project for compensation is strictly regulated and is usually in the region of 6% of the total project cost[70]. Allocation of the funds to local authorities is undertaken in accordance with published guidelines and the local authorities then identify specific projects from within categories provided by Terna. Possible schemes for funding include environmental and urban upgrades, for example, public bike lanes, land use projects, or a new road. It is also required that the specific projects on which the funds will be spent must be of benefit to all residents of an area and not just to a specific group and must be undertaken on land that is in public ownership.

6.4 Spain

The national electricity grid in Spain is operated by Red Eléctrica de España (REE). REE was created in 1985 by the Spanish Government to provide a unified national power grid. Today, in the region of 20% of REE remains under the Government's control with the remainder having been floated on the Madrid stock market.

The acquisition of land for electrical infrastructure falls within projects of public interest and social relevance as defined in Article 130.1 of the Spanish Constitution. The concept of forceful expropriation is therefore relevant under article 33.3 of the 1978 Spanish Constitution, which affirms the state's right to strip a (natural or judicial) person of its rights and properties under specific cases related to public interest. If this is done it must be followed by appropriate compensation. Although previous to the current Constitution, the 1954's Expropriation Act, contains the legal procedure to follow in cases of expropriation. The legal basis to obtain an easement is clearly stated in the Spanish Civil Code within Articles 530 to 532. Electrical easements are specified in Article 56 and in the subsequent articles of Act 54/1997 of the Electrical Sector. These articles

[70] Renewables Grid Initiative (2016) *Community Payments: Case Studies from Across Europe*

specify the legal framework for overhanging easements and requirements for the installation of poles, pylons, towers and overhead cables. Royal Decree 223 of February 15th, 2008 provides clear guidelines that define the physical area for which compensation must be paid. This defines a 'security zone' where power discharges could hypothetically occur and thereby defines an isolated or corridor area. Compensation is never paid in respect of any area that lies outside of this zone.

The preferred approached used by REE is to obtain temporary access rights, easements and/or agreed wayleaves to undertake construction work or felling but it will also obtain compulsory wayleaves and compulsory acquisitions, when necessary. It avoids purchasing lands by agreement. Under the legislation REE is required to state the public interest or social relevance of its intentions and identify the properties or rights to be expropriated. This description is then evaluated by an official who must decide within a 20-day period, on the validity of the claim. Once this is established there is a 15-day period during which REE and property owners can agree on a compensation value for the property or right to be expropriated. Generally, this valuation is done with reference to a national valuation chart containing compensation values, known as the '*baremo*'.

Property owners are entitled by law to receive compensation for damages to land and to crops, as well as for any restrictions that are put on crops as a result of the construction of transmission lines and infrastructure. Property owners whose crops are damaged, are compensated accordingly to the crop's market value, whilst restrictions on crops are compensated in accordance with the principle of *capitalización de lucro cesante* (capitalisation of lost profit). Under this scheme, the property owner is compensated for the loss of future profits associated with the restrictions put upon their crops. All compensation payments are made as single one-off payments.

Although not strictly legally required to do so, REE also pays compensation for any damages to buildings as a result of the construction work unless all damage to land and buildings is fully restored. If restoration work is possible, REE will pay compensation equal to the rent of machinery and labour to restore the land or buildings or will undertake the work itself. However, it is not required to pay compensation for any restrictions on development, loss of visual amenity, noise or perceived health issues and does not do so.

Compensation for the permanent occupancy of land and for the easements are calculated according to the following rules:

- Pylons: Any land taken by the base of the pylon is compensated at 100 % of the land's open market value.

- Overhanging easement is compensated at 50% of the land's value.
- A right of way to access land for maintenance is agreed at 50 % of the land's value.
- Temporary occupancy for construction is compensated at 10% of the land's value.

While compensation is only paid in respect of land within the security zone, third parties who lands are not crossed by the lines are entitled to compensation if, and only if, it is shown that their property is directly affected by the right of way that REE obtains. This can be paid up to a maximum of 50% of the land's market value.

If the parties do not reach agreement, public arbitration is used to determine the valuation. REE must provide the officials with a detailed appraisal of the property or right, who then decide on the compensation. The property owner has the right to reject this decision. If this happens the case is moved to the Provincial Expropriation Jury to decide on the valuation. Once this is done the compensation must be paid as a single payment within 6 months.

Consultations undertaken for this report indicate that it is common practice for REE to try to avoid taking this process to the Provincial level and to try to agree compensation with property owners at an early stage. This is because experience indicates that the amounts that are paid thereby are generally lower compared to the amounts involved in decisions issued by the Provincial Expropriation Jury. The data to support this reasoning were not available, for reasons of confidentiality, but there is a clear logic in this strategy.

In reaching decision on offers of compensation, REE defines the area that will be affected by the works, including lines, pylons, towers and poles. The overhang area is defined according to the projection of cables at peak displacement, augmented by the legally required security zone. For other infrastructure, the area to be compensated is defined according to the electrical voltage in question and the area to be physically occupied. A guiding principle here is that this should be defined only as wide as is necessary.

REE has developed community benefit schemes. These take the form of collaboration agreements with autonomous communities and municipal councils to identify projects of community interest.

6.5 Sweden

The Swedish transmission grid is managed by Svenska kraftnät, a state-owned public utility that was created in 1992 by separating the power generation and transmission

functions of the public utility into two companies. It now has interests across the Nordic region. The company avoids the compulsory acquisition or expropriation of properties and works on the basis of obtaining agreed rights of access or easements. However, it retains the option to obtain compulsory rights of access or wayleave and it will purchase property for the construction of pylons if agreement can be found. Agreements on wayleave are obtained in about 95% of cases. Where difficulties arise, the TSO applies to the *Lantmäteriet* (Land Survey Office) which provides right of access[71].

Property owners are entitled by law to receive compensation. As well as payment for the acquisition of a property or a right over property, this entitlement extends to damage to land or buildings, damage to crops, restrictions on what corps can be grown, any restrictions on development that might be foreseeable as a result of the new lines, loss of visual amenity for residents within 200 metres of the line, and noise. However, payments for restrictions on crops never arise and payments for noise are rare. Payment for restrictions on future development are available only if the land is already zoned. Otherwise, only current use is taken into consideration.

The TSO seeks agreements with landowners for any land acquisitions that are required before construction begins. If acquisition is not required than a lease agreement is made that gives the TSO the right to build the infrastructure on a defined route on the property and to subsequently manage the line on the property. This agreement is then used by the TSO as the basis when applying to the Lantmäteriet for easement in perpetuity.

Built into the lease agreements are clauses in relation to the precise alignment of the line and what compensation the landowner will receive. The dimensions covered by the lease are specified in advance for both pylons and lines. For pylons this is generally restricted to the footprint of the structure. Lines are generally assessed using a 44 metre corridor. Consequently, compensation is set out before any construction begins. Compensation may be paid under a number of headings:

- the entire property if it needs to be acquired.
- acquisition of a part of the property plus any impact on the rest of the property.
- The preliminary study, at SEK3,000 per property (€300) plus serious damage.
- damages due to works.
- the use of private roads where there is an agreement, usually paid at SEK1,000 (€100) per road.

[71] The Lantmäteriet is a public authority under the Swedish Ministry of Enterprise and Innovation. It role is the building and developing of infrastructure including purchasing, owning and selling property. It is also responsible for property division in Sweden and providing information on property holdings.

- storage sites compensated at SEK2,000 per ha (€200 per ha) in rural areas or 3% of the value per annum in zoned areas.
- any harvested timber or deforestation.

Compensation may also be paid should the landowner incur legal costs.

The amount of compensation payable is calculated using guidance provided by the Lantmäteriet. The value is based on an assessment of the impact of the new infrastructure on the market value of the property in question and the compensation will be equal to any fall in value plus a 25% premium. Professional valuers are used to identify the loss suffered by the landowner. An additional 20% is also payable if the land owner accepts the offer with an upper limit of SEK4,500 (€450) per hectare.

The level of farmland compensation payment varies greatly across Sweden as the value of land in southern Sweden is considerably higher than in the northern parts. The average payment in the Sydvästlänken project for a transmission line from Hallsberg to Nässjö in southern Sweden to the west of Stockholm was SEK22 SEK per m^2 (€2.20 per m^2). On a small project around the town of Ljusdal, which is further north in the middle of the country, the payment was SEK3-8 per m^2(€0.30 to €0.80 per m^2). Overhang payments are made on a linear metre basis at SEK2 per metre (€0.20 per metre).

The value paid for damage to crops varies according to the crop and market prices according to the *Åkernorm* (standard published prices). Establishment of a new crop is compensated at a standard rate of SEK3,500 per hectare (€350 per ha) or at actual costs if these are higher but within reasonable limits. Compensation for the establishment of new grassland is paid at SEK2,000 per ha (€200 per ha).

Premature cutting of forestry is often an issue in this respect. The TSO values this forestry according to expert guidelines and has provided some indicative values for the compensation that is typically paid. These are shown in Table 6.6.

Table 6.6: Examples of Forestry Compensation in Southern Sweden (€ per hectare)

IS	Age (years	Compensation
T22	10	1,115
T28	10	1,350
G22	5	1,256
G32	5	2,079

Source: Svenska kraftnät

Compensation for loss of visual amenity is based on expert assessment, but there is no defined mechanism in place to assess payments for noise as the problem has never been encountered in practice even though provision for the payment of compensation exists in law.

Under the Swedish Expropriation Act, any damage to property must be replaced or compensated. Full compensation according to market value is paid if the damage can't be repaired. Damage arising to a residence as a result of close proximity to the line can come under this heading. If the building is an inhabited residence, the TSO will offer to buy the whole house at market price plus a 25% premium if the magnetic field from the line is registered at or above 0,4 µT. this offer will also be made if the building is within 10 metres of the transmission line. Moving costs are also compensated at a rate of SEK15 to 50,000 (€1,500 to €5,000) per property.

All compensation is paid as a taxable lump sum payment within three months of signing the agreement contract. No recurring payments are made under any heading.

Third parties may be entitled to payments under a number of headings. This includes devaluation of the property, restrictions on the growth of trees, and loss of visual amenity if a house is located within 200 metres[72]. If the magnetic field is too high, then an offer to buy a house is made even if the lines do not cross the property. Any appraisal of loss of value is done by an independent valuer who compares the value of the house with and without the transmission lines.

[72] While 200 metres is generally considered to be the limit for the payment of compensation it is not a legally defined hard limit and courts have the power to extend this limit in specific cases.

7. Smaller European Countries

7.1 Austria

APG is the largest transmission system operator in Austria operating across all regions with almost 7,000 km of transmission lines and about 12,000 pylons under its management. It is currently in the process of constructing or upgrading two major 380kV transmission liens: the line from St. Peters to Salzburg and the line from St. Peters to the German border where it will meet the lines maintained by the German TSO TenneT.

The process for obtaining permission to construct new lines in Austria depends on whether the lines are wholly within one region of the country or whether they cross regional boundaries. The procedure for obtaining permission also consists of a preliminary study in a closed hearing to determine if the project is in the public interest. If this is determined a detailed study is prepared for an authorisation hearing where landowners along the line are included. While this hearing is held in local areas, it is not public but is restricted to recognised stakeholders. This process will normally conclude with permission to proceed. Parties then have a period to object.

Austrian law allows for the construction of power lines in almost all places once it is deemed to be in the public interest. Compensation is payable to property owners where permanent disadvantage as a result of the line can be shown. It is paid as a single payment and is payable only in relation to property that is within the area for which a right of way has been obtained or is within a restricted zone. Compensation is paid for land under towers and poles and restrictions on land under lines. This corridor is normally defined as 30 metres either side of the line in the case of 380kV and 220kV lines and 25 meters either side for 110kV two circuit lines. No compensation is paid for visual impacts, noise, perceived health impacts or any other risks that are claimed to arise from the line even if the property is within the restricted zone. Property owners whose property is located outside these areas have no right to compensation.

The level of compensation that is payable follows guidelines agreed for each separate project between the energy regulator and the relevant Regional Chambers of Agriculture. The area to be compensated for poles and pylons (F) is calculated by the formula F = (a+10) x (a+22) where a is the width of the pylon's footing in metres. The value of the payment is estimated by first classifying the land into four main categories – arable, pasture, rough pasture, and non-productive land – and then into additional

subcategories depending on expert opinion of the quality of the land and the crops that are normally grown. The value of the compensation depends on the value attached to the land and can vary across a wide range. Local expert opinion is used to identify values. Compensation for forestry is provided based on expert opinion of the value of any forest that is cleared and cannot be replaced. If the forest can be regrown the compensation includes payment for the cost of reforestation.

A premium is payable if more than one pylon is to be erected on a single property. This premium will normally amount to an additional 15% for a second tower, 30% for a third tower and so on. If pylons already exist in a particular field, then these are used in determining these premium payments although no compensation is payable for existing structures. A second premium may also be payable depending on the distance between a pylon and a farmhouse. This increases the compensation for pylons within 100 metres of a farmhouse by 30% and by 10% if the house is within 150 metres of the pylon. The TSO stresses that this payment is made because land that is near a house is considered to be more valuable than land further away and does not reflect any consideration for health, visual amenity or development potential as payments are not made for these concerns.

Overhang compensation is also payable, but the amount is fixed as a single amount per sq. metres within a restricted corridor and is not based on the value of the land. The consultants were unable to ascertain the current rate for this payment. Landowners are also compensated as a single lump sum payment for costs incurred in reaching agreement with the TSO.

In urban areas property owners within the right of way or restricted area are compensated for loss of property based on negotiation between the TSO and the property owner. If agreement cannot be found expert opinion is used. No compensation is payable for any property outside the identified area.

7.2 Bulgaria

Elektroenergien Sistemen Operator EAD, a subsidiary of Natsionalna Elektricheska Kompania EAD, was founded in 2007 and is responsible for the operation and maintenance of the transmission network and for electricity market balancing in Bulgaria. A number of 400kV projects are currently under construction in the country, having been designated as projects of common interest under EU Regulation 347/2013

and are included in the ENTSO-E Ten-Year Plan for the Development of the Electric Transmission System in Europe[73].

Where a development project is proposed on private property, the TSO must first acquire a right of ownership or a right for construction. The TSO generally does not generally seek to acquire property, but it is legally entitled to seek easements over private property for projects that are deemed to be in the public interest. The precise lands and dimension need to be identified in advance. If this is achieved the property owner is entitled to be compensated for the easement. If agreement cannot be achieved and the TSO can show that it is not possible to develop the infrastructure without utilising the property, the TSO will apply for expropriation in favor of the state. To do so, the TSO requests the Minister of Energy to undertake a compulsory purchase of the property under the terms of Chapter Three of the State Property Act.

Compensation will normally be paid for any damage to crops of buildings, and for any subsequent restrictions on crops or on construction development within the easement area. In line with the legal requirements, compensation is not payable for loss of visual amenity, noise or perceived health impacts. The amount of compensation for damage to property is decided in accordance with Articles 210 and 211 of the Spatial Development Act. This means that the value is determined either by mutual agreement between the TSO and the property owner or following an assessment by a licensed appraiser if they cannot agree a value. Any compensation payable for restrictions on crops or on development within the zone of the easement is assessed in a similar manner.

Damages to crops are first assessment by a commission appointed by the mayor of the respective municipality and the amount of compensation is then decided following an assessment by a licensed appraiser.

Property owners may also receive compensation for restrictions on construction within the easement zone. Again, this assessment is made under Articles 210 and 211 of the Spatial Development Act by a licensed appraiser unless there is prior mutual agreement between the TSO and the property owner.

Limited information could be obtained on the value of compensation that is usually paid. However, the land within the easement zone is typically compensated at BGN5 per sq.

[73] See https://www.entsoe.eu/major-projects/ten-year-network-development-plan/ten%20year%20network%20development%20plan%202016/Pages/default.aspx

metre (€2.56 per sq. metre) for the area under a pylon. The area under the overhang for which the easement has been obtained will usually be compensated at around BGN2 (€1.02 per sq. metre). Payments are always made as a single lump sum at the time of the construction and no recurring or annual payments are made. No premium is added to encourage early agreement and there is no provision for compensation for third party property owners where the property lies outside the easement area. The TSO does not have a community benefit scheme in place and there is no legal basis for communities, local councils or authorities to claim compensation.

7.3 Croatia

The electricity system in Croatia is managed by HOPS d.o.o. Croatian Transmission System Operator Ltd. HOPS seeks permission to construct infrastructure primarily through the acquisition of easements including rights of way but will also purchase lands either by agreement or through expropriation if required. If compulsory action is required HOPS has legal rights to seek compulsory easements or acquisition under the Croatian 'Law on Expropriation and Determination of Fees' (*Zakon o Izvlaštenju i Određivanju Naknade*).

The areas liable to easement are not set and are determined on a case by case basis following the advice of a certified geodesist who works on behalf of the TSO. Property owners are then entitled to compensation for the reduced market value of the property as a result of the easement being imposed. The property owner is also entitled to compensation for any damage to land, buildings or crops. No compensation is payable for any restrictions that may be placed on crops other than what is assessed within the reduced value of the property. Similarly, there is no separately identified legal basis for compensation for restrictions on construction, loss of visual amenity or other environmental or health factors, the assumption being that these will be captured within the compensation for loss of market value.

Legal regulations require that the TSO must restore any damage to land, crops and buildings. If this is not possible, the level of compensation for any damage is determined by an assessment by a qualified expert. Damage to crops is usually a simple calculation of the area of the damage in sq. metres by yield per sq. metre by the market price of the crop.

The regulations also stipulate that the compensation for the reduced market value of the property are estimated by a qualified expert working within detailed regulations. The

overall assessment of any reduction in market value if done under the Croatian Real Estate Valuation Act (*Zakon o Procjeni Vrijednosti Nekretnina)*[74]. If the loss in value is as a result of restriction on crops the value is assessed at the time the EIA is being prepared in line with Regulations NN80/13, NN61/14 and NN 118/17[75]. If it arises as a result of restrictions on development the assessment is done in line with Regulations NN 153/13, NN 65/17 andNN148/2010[76]. Loss of visual amenity is not recognised under law and while noise is assessed it is not an issue in the determination of value. Because of this approach and reliance on the assessment of expert opinion on a case by case basis, the consultants were unable to obtain estimates for the levels of compensation that are payable.

Payment of compensation for loss of value is not restricted to properties within the easement area and may be payable to third parties outside this area. There is no definitive area or distance from the line for the payment of this compensation and the liability depends on the assessment by a qualified expert in line with the detailed regulations.

Any compensation is always paid as a single payment with no provision for recurring payments. No adjustment is ever made to reflect or incentivise early agreement. The TSO does not operate any form of community benefit scheme and there is no basis for such a scheme outside regulations for determining that a property has suffered a loss of market value as a result of the construction of transmission infrastructure.

7.4 Estonia

Elering AS acts as the TSO in Estonia. Elering is a government owned, but independently operated, regulated company formed in 2010 and has responsibility for the electricity transmission network, much of the electricity distribution network and, since 2015, the gas transmission network in the country. It manages 1,697 kilometres of 330 kV lines and 158 kilometres of 220 kV lines within the network. A major part of Elering's investment strategy relates to ongoing decoupling from the previous Russian

[74] https://narodne-novine.nn.hr/clanci/sluzbeni/2015_07_78_1491.html
[75] See: https://narodne-novine.nn.hr/clanci/sluzbeni/2013_06_80_1659.html and https://narodne-novine.nn.hr/clanci/sluzbeni/2014_05_61_1138.html
[76] https://narodne-novine.nn.hr/clanci/sluzbeni/1994_04_30_520.html and https://narodne-novine.nn.hr/clanci/sluzbeni/1998_08_106_1463.html

transmission system and closer integration into the EU's systems. This requires the construction of new cross-border interconnectors and supporting transmission lines.

Section 58 of the Estonian Law of Property Act requires property owners to 'tolerate' the construction of electricity transmission infrastructure on their land. As a first step, the TSO identifies and establishes protection zones around overhead lines extending to 25 metres for 110 kV lines on each side of the lines and pylons and to 40 metres for 220 kV and 330 kV lines and pylons. The TSO then seeks to acquire easements over these zones and rights of way to access. These are entered on the land register. If the TSO cannot obtain the necessary agreement it seeks to buy the land needed using compulsory acquisition if required. This process is administered by local government authorities and the decision is entered onto the construction register. The obligations of landowners in relation to lines and their rights to compensation are laid out by law along with restrictions on activity in the protection zone around lines[77].

The Law of Property Act means that the owner of land is entitled to apply for compensation, known as toleration payments, when infrastructure is placed on their land. However, a Supreme Court decision (Case No. 3-4-1-25-11 of 17 April 2012) disrupted the system when it declared that the rates of toleration payment that had been established based on the Law of Property Act and that were payable up to that time, were contrary to the constitution. However, the Supreme Court did not specify how compensation payments to land owners should be calculated nor how they could be made without a legal basis.

Despite this impasse, neither the Estonian legislature nor the regulator established new rates of toleration payment or a legal basis for making these. This impasse continued until the Supreme Court decided (Case 3-2-1-87-14 of 11 March 2015) that toleration payments could be made by the TSO providing a refund of land taxes for areas where rights over land had been acquired. Based on this decision, Elering has offered compensation by means of a reimbursement of any land taxes that are due for property within a protection zone of power lines since 2015. This is a recurring annual payment for which landowners must apply and is seen as a temporary solution. Work has begun within the legislature to create the legal basis for the payment of compensation to landowners and so this is likely to change in the future.

[77] Restrictions on operations in the protection zones are regulated by sections 70 and 77 of the Building Code and Regulations issued by the Minister of Economic Affairs and Infrastructure.

The legal difficulties mean that, despite the right to compensation being in the Law of Property Act, there is no automatic right to compensation. Landowners must apply and Elering must pay if an application is made, but there is no obligation to pay compensation if a correct application has not been made. There is no distinction between different headings for which compensation must be paid, contrary to what is seen in most countries. It is based only on a fall in value of the property.

In the case of new lines, Elering provides a one off payment based on the decrease in the value of the property once the easement contract has been signed. This is done on a voluntary basis given the lack of a legal basis and the procedure is set in the Elering internal Investments Procedure document. The impact on value is based on an assessment by an independent valuer and is generally set at 33% of the value of the property. No adjustment is ever made to reflect early agreement by a landowner. However, if an agreement cannot be made then the TSO buys the property through compulsory acquisition and no further payments for toleration are made as the land is now the property of the TSO.

A similar approach is taken for payments for losses in forestry land where there is clearance and, typically, restrictions on replanting. These will typically be the value of the growing forest at maturity. Any such compensation is paid for easements only and not for compulsory acquisition where the single purchase payment is straightforward.

The level of compensation – toleration payment – that is paid for overhang is determined by rules that are set out in internal documentation in Elering. The calculation is undertaken by applying a formula in each case, but this has not been published. However, payments for pylons and towers are set in the documentation and lie in the range of €250 to €1,000 depending on the size of the land that is taken.

Payments for new lines are made as single payments but toleration payments are paid annually for existing lines. No payments are ever made to third parties in respect of any perceived impacts if their property does not lie within the restriction zone. Beyond these measures, Elering has not developed any community benefit schemes and does not perceive that there is a legal basis for doing so.

7.5 Finland

Fingrid Oyj is the transmission system operator of Finland with nationwide responsibility for the management of the high-voltage grid, cross-border interconnectivity and the

functioning of the internal electricity market. The company has published a main grid development plan which describes the grid's development process and development objectives of planned investments for the period 2017–27[78]. The plan is consistent with the grid plan for the Baltic Sea region and the Ten-Year Network Development Plan (TYNDP) covering the entire European Union.

Cross-border interconnectivity and capacity has increased considerably over the last 10 years. The Finnish electricity system is now connected to northern Sweden and northern Norway via high-voltage alternating current connections and to central Sweden, Estonia and Russia via direct current connections. A Nordic grid plan will be compiled in 2019, and it will expand development needs for cross-border connection in the Nordic countries. Along with internal regional developments, particularly in relation to the transmission system in the Lapland region, the implementation of this plan will entail considerable infrastructure investment in Finland.

When constructing new infrastructure, Fingrid seeks an easement over a transmission line area that provides it with a limited right of use and imposes restrictions on the landowner regarding the allowable use of the area as well as prohibiting any construction not related to the transmission line. The TSO has a right of way in this transmission line area and it is flanked by a border zone on either side. The width of the restricted line area varies depending on the line's voltage as does the width of the area in which building is prohibited. For 110kV lines the right of way is generally 26 to 30 metres, for 220kV it is in the range of 32 to 38 metres, and for 400kV lines it is generally 36 to 42 metres in width. The border zone is always 10 metres either side of the line area and the allowable height of trees in the border zones is restricted to 10 metres at the edge of the line area, increasing by 1 metre in height for every 1 metre further away from the lien until the border area is reached. Construction is prohibited in this border area. This total area includes the areas for pylons and additional areas are not identified for these structures.

Easements are acquired through an expropriation procedure leading to a state permit from the Finnish Government. Property owners have a legal right to compensation for losses incurred as a result of this expropriation. All the rights to be acquired by the TSOs and the restrictions that will be placed on the land owner are defined in the easement. This expropriation process is administered through the local office of the National Land Survey of Finland. A committee is formed headed by an engineer from the office who is appointed to oversee the proceedings and it also comprises two trustees appointed by

[78] Fingrid (2016) *Main Grid Development Plan 2017-2027*.

the local council. This committee defines the reasons for the payment of compensation and decides on the amount to be paid to landowners. Landowners are invited to attend the first meeting to discuss issues such as the significance of the expropriation permit, practical measures related to the expropriation proceedings and construction of the line and initial issues in relation to compensation. Fingrid is not represented on the committee and has no role in deciding on the level of compensation to be awarded other than the initial identification of the easement zone. Permission for the use of private roads during the construction period is agreed separately by Fingrid and property owners in road reviews in the presence of an outside expert, if required.

Property owners in Finland have a legal right to compensation for any damage to crops or to buildings during construction, for any restrictions that are placed on development and for loss of visual amenity. In addition, the TSO may pay compensation for restrictions on crops in the line area. All compensation payments are made as a single payment and there is no provision for recurring annual payments. The TSO will also pay additional premiums of 10 to 15% above what is recommended by the expropriation committee to property owners who sign letters of intent at an early stage.

Restrictions on the use of forestry land under the lines and farmland that is used for pylons are compensated at 100% of the land's market price. Compensation for losses of crops is estimated by determining the yield of the area and deducting the costs so that the farmer's net income is compensated. These estimates are based on published agricultural studies which contain charts that indicate the amount of compensation that is payable. The committee decides on compensation as a single payment per hectare impacted. Other agricultural studies are used to estimate the impact of heavy machinery used during construction on yields and compensation is determined for this. Payments for damage to land will usually amount to €0.50 to €1.50 per sq. metre for farmland and €0.01 to €0.10 per sq. metre for forestry land.

Compensation for restrictions on development is payable, but the process of identifying the level is described as 'very discretionary'. The criterion used is 'economic loss' and if it is determined that a proposed building can be erected at another place on the property no economic loss is considered to arise. However, property that has development potential, for example near zoned city areas, are compensated based on their raw land value determined according to market price. The compensation on the right of way area will generally be in the region of 60-80% of the market price and 30-50% of the market price in the border zone. The rate of compensation varies quite a lot and can be from €0.10 up to €10 per sq. metre. These values are assessed during the expropriation procedure.

There is a legal right to compensation for loss of visual amenity tied into loss of value of a property. Decisions in this regard are made by the committee in the expropriation procedures. Court decisions in relation to infrastructure in built up areas over a number of years are used to inform these decisions and the compensation paid is usually a certain percentage of a residential property's total value. This can vary from a few hundred to tens of thousands of Euro depending on the location.

According to Fingrid, it may sometimes compensate for the impact of noise and health impacts although these factors are not identified in the relevant law. However, no details were made available in relation to how these issues are assessed or how much compensation is ever paid.

Payments are not restricted to property owners within the line zone and third party compensation may be payable to property owners if it can be shown that there is a devaluation of the property or a loss of visual amenity as a result of the transmission line. The two concepts are treated as equivalent i.e. loss of visual amenity will be reflected in a fall in the property's value. Decisions in this regard are generally based on court decisions that have created a precedence with distance of the property from the line being a primary consideration. There is no defined limit beyond which compensation is not paid, but the legislation requires that significant inconvenience must be experienced by a property owner in order to qualify to be compensated. As a general rule, expropriation procedures usually determine that there is no economic loss if the distance between a property and a line is greater than 100 metres. Fingrid does not operate an additional community gain scheme.

7.6 Latvia

Augstsprieguma Tikls operates the transmission system in Latvia. It operates as an independent company and as well as managing the 330kV and 110kV system within Latvia it also balances the electricity market and is responsible for interconnection with neighbouring systems including Estonia, Lithuania and Russia and other Baltic area TSOs. The reconstruction of the 330kV Estonian connection is a major current investment project.

The TSO does not seek agreement with landowners when constructing a new line. Instead, the route is decided and compulsory acquisition or expropriation is used to gain access to construct infrastructure on private lands. Latvian Energy Law provides for

rights to be gained to any land required for the construction of power lines with compensation being paid in line with internal regulations that have been developed by the TSO. The dimensions of the area to be appropriated are generally defined as the area under towers or pylons and a 30 metre protection zone either side of lines in rural areas. In urban areas, the protection zone is set at 7 metres either side of the wire for 110kV and 12 metres for 330kV lines.

In addition to the area that is expropriated, property owners are entitled in law to receive compensation for any damage to land, buildings or crops during construction, and for any restrictions that are placed on crops or on development within the restriction area. Compensation is also available for devaluation of a property but there is no legal right to compensation for loss of visual amenity or noise as these are all considered to be fully assessed within any devaluation and the TSO does not accept that any health impacts arise once standard guidelines are maintained. The TSO compensates in line with these legal requirements as a single payment.

The level of compensation for damage to crops and buildings is set at 100% of actual losses. Compensation is paid for loss of development potential and for any devaluation of a property whether or not it lies within the protection zone. In other words, third parties can claim compensation even if their property is outside the protection zone, but the property must lie within 30 metres of the line. Consequently, this provision arises only in urban areas.

For properties within the protection zone, it is common for compensation of 20% of the national market price of land to be paid to account for devaluation due to restrictions on development and use. No premium is paid for early agreement with landowners as the TSO utilises the expropriation from the start without seeking prior agreement. The TSO has not developed a community benefit scheme.

7.7 Lithuania

Litgrid is the electricity transmission system operator for Lithuania and has responsibility for developing strategic energy projects of national significance. This identification is made to enable the smooth construction of high-voltage power lines as, once approval has been obtained, the TSO has the right to obtain easements. Furthemore, existing transmission lines are governed by servitude provisions in the Law on Electricity that provide Litgrid as the TSO unrestricted access to carry out grid maintenance and works on lines.

The policy of the TSO is to always seek an agreed easement with landowners and the company avoids compulsory acquisition, purchase or expropriation of land. It also seeks to obtain this agreement before the project has been approved. The easment area is defined for lines as 20 metres on both sides of the line for 110 kV lines and 30 metres on both sides for 330kV and 400kV lines. No additional area for pylons is identified.

Once this agreement is in place, the Law on Electricity provides the TSO with the right to construct new power lines on the privately-owned land. Title to the land is not affected by the agreement and the owner can continue any usual activities on the land. However, some restrictions are placed on the part of the land that falls within the line protection zone which coincides with the easement area. Signing also means that the land owner permits the operator to use and service the newly constructed power line.

Landowners are paid cash compensation for agreeing to the easement or servitude on their lands. In addition to this payment, property owners are also entitled by law to compensation for any damage to crops or plantations and any felling of forestry that is required. The are also entitled to compensatoin for any restrictions placed on the land relative to its original or current use. Compensation is only paid under these headings and no compensation for devaluation of the property or for environmentnal impacts is paid. Compensation is always paid as a single payment with no recurring payments.

Calculation of the level of compensation is based on a methodology that has been approved by the Government of Lithuania an is releted to the area that is subject to the easement. However, Litgrid offers compensation to any land owner who signs the servitude agreement before the date of approval of the line construction that is 30% larger than will be determined by using the Government methodology. If a land owner does not sign the servitude agreement offered, the amount of the compensation is calculated according to the methodology approved by the Government without the extra 30%.

Compensation payments are only made for areas within the easement/protection zone and no compensation is paid to third parties with properties outside this zone. No community benefit scheme has been developed.

7.8 Netherlands

TenneT TSO B.V. operates the transmission system in the Netherlands and utilises a wider range of strategies and compensation methodologies in its engagements with property holders than is seen in most other small countries, particularly those in the Baltic region. The company has a long history and became TenneT in 1998 when it was appointed as grid operator under the Dutch 'Elektriciteitswet' (E-wet). It has also operated a significant portion of the German system since it acquired E.ON in 2010. Among the projects that TenneT is currently planning or constructing are the Randstad 380kV high-voltage connection and two offshore platforms near wind farms to be constructed off the coast of South-Holland.

Tennet follows a range of approaches to acquire the necessary rights for construction. These include the agreed purchase of lands, wayleaves and easements, lease of lands and compulsory land purchases, expropriations and compulsory easements if agreements cannot be concluded. If compulsory acquisition is required, this is undertaken under the 'Belemmeringenwet Privaatrecht' (the Private Barriers Act) of 1927, which facilitates compulsory access to build and maintain overhead lines and cables. This Act allows entities such as the TSO to undertake construction that is deemed to be public works on privately owned property. The TSO uses this legal instrument if no agreement is reached with owners on the shared use of the property.

Under the Act, the Minister of Infrastructure and the Environment is authorized to impose a tolerance obligation that means that the owner (or other beneficiary) of the property must allow TenneT to install a high-voltage lines and pylons on or above that ground. If TenneT cannot reach agreement with the landowner it submits a request to impose the tolerance obligation, provided the work is of public interest (as specified in Article 20 of the Electricity Act 1998). A similar procedure is followed if compulsory purchase of the property is necessary except that the Ministry of Economic Affairs, not the TSO, must initiate the procedure in that case.

The width of the strip identified for the easement depends on the capacity of the lines, the type of masts and pylons involved and the type of connection. It will normally equal the width of the mast, the outward swing of the guides and the safety zone plus a margin of 1 meter. It may also accommodate warning spheres and may be influenced by the prevailing wind direction.

Property owners are entitled by law to receive compensation for any damage to land, buildings or crops during construction or maintenance, any restrictions that may be

placed on crops and restrictions on development within the strip. They are also legally entitled to compensation for loss of income and for devaluation of the property. There is no specific legal entitlement to compensation for EMF, but Government policy mandates that compensation must be paid for residential property if the EMF exceeds certain limits. Compensation is paid under all these headings but not for loss of visual amenity or noise as these are considered to be captured by any devaluation of the property.

TenneT is obliged to treat everyone equally and the TSO seeks to determine compensation levels at the start of a project. Compensation for devaluation of the property is initially offered based on an evaluation by the TSO. The main compensation offered is a closing fee for a right of way agreement and a temporary cooperation fee for being able to access the area and undertake the works. The cost of the right of way agreement is currently €3.07 per sq. metre for a 7.5 metre safety zone on either side of the line plus €1.535 per sq. metre for any other areas included in the safety zone. Therefore, for example, in the case of a 60 metre total width safety zone, the payment is just over €115 per linear metre. For the user agreement, the fee is €1.23 per sq. metre of work area for the first 5 sq. metres per pylon and €0.615 for additional sq. metres of work area per pylon. So, for a pylon requiring a work area of 8 metres by 8 metres, the fee will total €42.59 per pylon. A premium of 20% of the total assessed costs of the agreement (either the right of way or the user agreement) is paid if an owner signs the agreement within 6 weeks of the offer.

Compensation for damages is based the principle that the beneficiary should be in the same capacity and income position after the construction of the high voltage line as before. This is paid as a one off payment at the time of construction for loss of capacity and an annual payment for loss of income on agricultural land as a result of the construction of a pylon. Details are shown in Table 7.1.

Table 7.1: Indicative Estimates of Compensation for Loss of Capacity and Income (€)

Footprint of Structure	Loss of Capacity (One Payment)	Loss of Income (Annual Payment)
50 sq. metres	2,384	585
100 sq. metres	2,768	620
125 sq. metres	2,960	623
200 sq. metres	3,536	660
250 sq. metres	3,920	685
350 sq. metres	4,688	735

Source: TenneT Internal Document, May 2nd, 2017

Payments for damages to crops in 2016 are shown in Table 7.2. These are advance payments that are made before the work begins. If more damage actually occurs additional payments are made. For crops on contract cultivation, the contract prices are paid. This crop damage compensation is adjusted annually in accordance with the agreements reached between LTO Nederland (Landen Tuinbouw Organisatie, the *Dutch* Federation of Agriculture and Horticulture) and Gasunie, the national gas company in the Netherlands.

Table 7.2: Payments for Crop Damage, € per sq. metre (2016)

Type of Crop	Compensation per m^2
Grassland (full year)	0.24
Grassland (work started after 1st July)	0.17
Grassland (work started after 1st September)	0.09
Wheat	0.20
Rye	0.09
Barley	0.17
Oats	0.12
Maize	0.23-0.27
Sugar Beet	0.37
Edible Potatoes	0.58
Starch Potatoes	0.30

Source: TenneT Internal Document

Landowners are also entitled to compensation for repairing damage done to the land during construction. In the event of damage TenneT will pay the full cost of the damage, according to standard fees as contracted with LTO. If no standard fee applies, the damage is mutually agreed or, if there is no agreement, by binding valuation from three experts. Restoration was compensated in 2016 at €32.50 per hour of labour required and €76.50 per hour of machine time required on crop land (€69.50 per hour of machine time on grassland). These values are also adjusted annually in accordance with agreements reached between LTO Nederland and Gasunie. All payments are one off except for the annual payment to compensate for loss of income.

If the property owner does not accept the TSO's offer and it is not possible to find agreement it is possible to have any damage to the value of the property determined by experts. The basis for this is contained in the general provisions of the building right. The loss is determined by up to three experts: one appointed by the property owner or other claimant, one by TenneT and the third nominated by these experts. The owner and the TSO must first agree the appraisal assignment which is then provided to these experts.

A similar process is used in the case of perceived health impacts for residential property except that the offer that is made by the TSO is usually for the purchase of the house. However, buy-out and continued living is possible.

Compensation is not limited to property within the safety or easement zone and compensation for devaluation of property, restrictions on development and potential health issues is payable to third parties with properties outside this zone. Devaluation of property is compensated by the Government through a process within the planning system – Plan Damage – and is then charged to Tennet. If restrictions are placed on development Tennet assesses claims for damages and agrees compensation. If no agreement is found expert opinion is used to assess losses.

Regarding EMFs and claims for perceived health impacts, the TSO employs a precautionary policy (*voorzorgsbeleid*) and offers to buy houses that fall within the EMF of new overhead lines. The amount of the compensation is determined by three experts as standard. No limit is set for distance from the line in respect of third party claims.

7.9 Portugal

REN (Redes Energéticas Nacionais) is the national Transmission System Operator in Portugal with responsibility for the management and security of the national electricity system. Planning is guided by the Portuguese Safety Code for High Voltage Electrical Lines, along with international norms and recommendations not covered by the Code. Additional National Regulations also restrict the placement of transmission lines. For example, in urban areas, safety distances are defined for buildings and roads and there are restrictions placed on urban planning which may include exclusion zones. There are also restrictions on proximity to Cultural, Historical and Archaeological sites. In rural areas, there are restrictions regarding safety distance between lines and irrigation appliances and there are special restrictions if the lines run through an area that is pre-defined as an agricultural or ecological reserve or is a forest area.

The concept of public interest is given considerable weighting in the Portuguese planning system. As a result, the approval of an electricity transmission infrastructure proposal is considered to be a recognition that the it is indeed in the public interest for the project to proceed. The provides the basis for the TSO to have access to the property that is required for its construction. This does not change the property rights attached to any property but introduces limitations on its use. As a result, the existing owners continue to own any land under a line.

Routes for new transmission lines are designed to avoid overpass of buildings and it is understood from the planning approval that a corridor must be secured that is free from any buildings. However, under the law that establishes the conditions for the right of way, construction of buildings under the line is allowed provided safety distances are met. REN also has a legal right to be consulted by the planning authorities in relation to any application that might impinge on an established corridor in order to verify that the necessary technical conditions are met.

Once planning approval is obtained, REN enters a negotiation process with property owners to agree compensation whenever the installation of lines, towers or poles specifically hinders the usage of the property. Compensation will normally be paid for damage to crops, cutting of trees, property devaluation, and any damage to the property resulting from the construction works unless this damage can be repaired. The main principle followed by REN in determining the level of compensation is that the property owner should be in an identical financial situation, to the greatest extent possible, than had the line not been installed on the property. This is considered to be the fundamental factor in establishing the level of compensation. To this end, the TSO will compensate for:

- A reduction of property income, relative to the establishment of the administrative easing, for parcels of land where trees are cut.
- Changes in land usage, due to the installation of supporting infrastructure.
- Temporary access and use of the land for works and equipment.
- A fall in production in irrigated and non-irrigated farmland.
- Any damage to lands by personnel, machinery or vehicles.
- The destruction of fruit trees or vines.
- Damage to access routes, walls and fences.

Loss assessment and compensation calculations are conducted by qualified assessors. Subsequently, REN contacts and informs the property owners of the value of compensation, which is equal to the sum of the different individual compensations to which the property owner is entitled. If the parties agree on the value, a compensation agreement is concluded, and the property owner receives payment.

If an agreement is not quickly reached in a particular case it moves on to arbitration through the General Energy Directorate or to the courts if necessary. Any of the parties may request the establishment of arbitration. In these situations, both REN and the property owner nominate two distinct referees, whilst the Directorate General of Energy and Geology (DGEG) nominates a third referee as President of the Arbitrage Commission. Subsequently, the parties jointly determine the compensation value. If the value still is

not agreed, the property owners can appeal and go to court. The appeal will then follow the process established in the Code of Expropriations. Importantly, whenever the usage of the property is deemed to be of "public utility", REN is entitled by law to initiate the installation of electric line before the conclusion of the compensatory process.

In practice, agreement is found between the parties in almost all cases. According to REN, in 2016, it had to resort to impasse release mechanisms just six times out of total consultations with 2,126 owners who had been contacted for the purpose of establishing compensation for easements related with the installation of power lines[79].

7.10 Serbia

Elektromreža Srbije, founded in 2005, is the State owned TSO for Serbia. It manages in the region of 1,650 km of 400kV lines and 2,170km of 220kV lines. The system is connected with all neighbouring countries except Albania through 400kV lines and there is considerable investment planned in upgrading elements of the network and international connections.

The TSO undertakes construction on private property by seeking compulsory acquisition/expropriation of land or compulsory wayleave or easement. The TSO does not engage in negotiations directly with owners to get agreed outcomes. Property can be expropriated, or ownership can be limited, only in the public interest as determined by the Government and requires the payment of compensation that cannot be less than the market value.

The areas required are identified in advance based on the voltage of the line and the types of towers to be constructed. The land that is required for the transmission line corridor is specified in the Serbian Energy Law. Owners are entitled by law to compensation. The process is that a competent authority as identified in law issues an expropriation act after being petitioned by the TSO and the court determines the level of compensation to be paid. Property owners are also legally entitled to compensation for any damage to crops, land or buildings during construction and for any restrictions that may be placed on the crops that can be grown on the land.

[79] http://relatorioecontas2016.ren.pt/en/05-sustainability-at-ren/53-management-and-performance/531-social-performance/

In all cases, the level of compensation is determined on the basis of expert opinion on a case by case basis. The main factors taken into account in determining the levels of compensation are the location, the quality of the land and whether it is agriculatural land or is zoned for development. This opinion is provided to the courts who then decide on the comensation that is payable. Payments are always made as a single sum and there is no provision for recurring payments for perceived loss of income. No premium is paid for early agreement as the system is compulsory. No compensation is paid to third party property owners whose property is not within the zone that is required for the works. Neither is there a community benefit scheme in place.

7.11 Switzerland

Swissgrid is the national TSO of Switzerland with responsibility for about 6,700km of lines and 12,000 pylons. When seeking permission to construct on private land, the TSO initially looks for an agreed right of access and easement with the owner. If this is not possible and the owner does not sign an easement contract the TSO seeks a compulsory easement. The right to do so is based on a requirement that Swissgrid acts in the broader public interest[80]. It does not seek to buy the property and currently has about 55,000 easement contracts across the country governed by the Swiss Civic Code. Easements can be permanent (for the duration that the line will be in place), but some older contracts were for a specified period of time, often 50 years.

Easements are compensated based on the difficulties caused by the line that are tangible at the time the line is erected or when the easement is renewed. Most Swissgrid easements relate to agricultural land and the amount of compensation is based on the joint recommendations of the Swiss Farmers' Union (SBV) and the Association of Swiss Electricity Companies (VSE). If the line crosses land with planning permission a construction restriction is normally included as an easement and the compensation will take this into account.

Property owners are also entitled to be compensated for damage to buildings or crops and for restrictions on crops or construction within the easement area. There is no legal entitlement for compensation for loss of visual amenity or other environmental factors or for loss of property value. Damage to building or crops during the construction phase

[80] The basis is the law (StromVG) is available at https://www.admin.ch/opc/de/classified-compilation/20042411/index.html. The basis for determining the public interest of a project is set out at https://www.admin.ch/opc/de/classified-compilation/19300026/index.html)

is paid on the principle of the restoration of the initial situation. The TSO seeks to agree this with the owner but, if this is not possible, an expert will be called in to determine the level of compensation. If this is refused the issue is decided by a court. Compensation for loss of yields is also based on the opinion of an expert. Similarly, compensation is paid for lost profit due to restrictions on development that arise at the time of the construction based on expert opinion.

The amounts of compensation are based on agreements between the Swiss Association of Electricity Companies (VSE), the Swiss Farmers' Association (SBV), Swiss Federal Railways (SBB), Swisscom and Swissgrid.[81] These agreements are made publicly available and are adjusted every two years in line with the Swiss Consumer Price Index to allow for inflation. Compensation for poles and masts in 2016-17 is shown in Table 7.3.

Table 7.3: Compensation Payable in Switzerland for Structures (CHF)

		Poles	Masts
Arable land	Very intensively used	2,503	3,576 – 8,301
	Intensively used	2,065	2,951 – 7,544
	Less intensively used	1,749	2,498 – 6,123
Grassland	Very intensively used	936	1,367 – 3,874
	Less intensively used	438	627 – 1,873
	Rough pasture	164 – 220	235 - 938

Note: 1 CHF equals approximately €0.87. The range in pylons depends on the type of pylon involved. Details are included in the agreement.
Source: VSE et al (2016)

Lattice type pylons are compensated according to the area that is required under the base. Agreed compensation rates for 2016-17 are shown in Table 7.4. Alterations to these rates of 5 to 35% are made depending on the slope of the land under consideration. Again, these are agreed by the utility operators and the farmers' union.

Compensation is payable for overhang with the rates depending a range of factors including the voltage and the types of infrastructure. Lines with 110kV to 150kV and a protection zone of up to 12 metres width are compensated at CHF8.82 per linear metre (€7.59 per metre). Lines carrying 230kV to 400kV and a protection zone of 20 metres either side of the line are compensated at CHF12.60 per linear metre (€10.96 per metre).

[81] See VSE et. al. (2016) *Entschädigungsansätze für elektrische Freileitungen und Masten (Compensation approaches for electric power lines and masts)* available at https://www.agriexpert.ch/de/dienstleistungen/entschaedigungen/leitungen-und-masten/

Table 7.4: Compensation Payable in Switzerland for Lattice Pylons (CHF)

		4x4 m.	5x5 m.	6x6 m.	7x7m.	8x8 m.
Arable land	Very intensive	10,141	11,480	12,427	13,956	15,621
	Intensive	9,107	10,292	11,291	12,690	14,204
	Less intensive	7,740	8,493	9,385	10,596	11,900
Grassland	Very intensive	4,695	5,458	6,290	7,234	8,271
	Less intensive	2,330	2,775	3,172	3,708	4,301
	Rough pasture	1,167	1,388	1,587	1,854	2,151

Source: VSE et al (2016)

A fee is also paid for costs incurred in concluding and certifying the contract equal to CHF130 (€113). This is paid the first time the contract is concluded or if there are major amendments made. If any damage is done to the land compensation of CHF59 to CHF70 (€51.30 to 60.90) per hour is payable for restoration.

Most payments are made as a single payment but payments for restrictions on crops are payable annually for 25 years following construction.

No compensation is ever paid to third parties. The line or the protected area has to cross an owner's property or else there is no legal basis for compensation. However, Swiss grid has developed a community benefit scheme. This involves replacement measures ('*Ersatzmassnahmen*') to compensate for the impact of a new line on the landscape (landscape disruption). The process involves the federal council which decides, following consideration of the recommendations of a support group under the lead of the Swiss Federal Office of Energy (SFOE), which measures should be taken. An example of a possible measure would be the undergrounding of cabling of an existing overhead distribution grid line.

7.12 Information on Other States

Information has been obtained from a range of sources on practices in a number of other countries which did not respond to the survey or who responded but declined to provide the information requested.

Belgium

Elia acts as the Belgian TSO with full responsibility for managing the system in the country, investing in the grid, balancing the market and international interconnection. It is also part owner of 50Hertz, one of the four TSOs in Germany. A lot of emphasis is placed on interconnection and Belgium is deeply integrated into the EU single electricity market with ongoing investment in its system of interconnectors. An example is the 380kV ALEGrO interconnector project with Germany.

The approach that is taken in Belgium is rather different to other countries as there are important differences in the underlying legal concepts. A key issue is that there is no provision in Belgian law for acquiring a right of way over private land and so the idea of obtaining an easement in the way that it is generally used does not arise. However, it is possible to get an authorisation to go through and act on private lands provided there are no buildings or walls on the land that would need to be impacted. This is governed by privacy laws rather than laws on property ownership. As a consequence, if a TSO were to run an overhead line through a private property, even with all the necessary authorisation and planning, if the property owner were to subsequently receive permission to construct a building on the property or even a wall around that property that enclosed it, the line would have to be removed as it would be impossible to access any pylons on the property without infringing on privacy as defined under the law.

The TSO does not wish to be caught in this position of being unable to access infrastructure without breaking the law. Consequently, the usual practice is to buy any property that is required to build pylons. The property that is required to access the pylons is also purchased. This is done through an initial offer. If this is refused, then expropriation is used with compensation based on market prices. This is a single payment and there is no provision for any further claims.

Clearly, the requirement to actually buy the land under the pylons as well as land required for access, as opposed to only acquiring an easement, means that this can be an expensive option particularly in rural areas where public roads may be quite distant from the locations of the pylons. Consequently, Elia has favoured placing cables underground in recent projects as a more cost effective approach as authorisation for construction can be obtained and there is a much reduced need to buy land since no structures need be placed on private property.

The lines are hung over the property and there is no payment for overhang. Neither is any compensation paid to third parties and no compensation is made for visual impact or any perceived environmental or health impacts.

Czech Republic

ČEPS, a joint stock company wholly owned by the State and under the direction of the Ministry of Industry and Trade, is the national TSO in the Czech Republic. It is responsible for the maintenance and upgrading of the transmission system comprising 43,479 km pf 400kV lines and 1,909 km of 220kV lines. It is also responsible for the development of international connectivity and the integration of the system into the EU market.

New infrastructure is regulated by the Czech 'Building Law'. In advance of construction, the TSO seeks rights of way and easement along a protection zone defined as 15 metres either side of the outline conductor of 220kV lines and 20 metres either side in the case of 400kV lines. The easements carry restrictions such that the property owner is not allowed to build any structures or to grow plants higher than 3 metres. The TSO also seeks rights for the construction of pylons. These usually relate to an area of 60 sq. metres including the base and a mandatory protection zone of 1 metre in width around the base. Occasionally the TSO buys the required land.

Property owners are entitled by law to compensation (No. 458/2001 Sb. 'the Power Energy Law') for the right to use their land for construction and for the ongoing use of the land for power transmission. The level of compensation payable is based on a series of legal instruments and regulations. However, the payment needs to be agreed and so the actual compensation paid is the outcome of negotiations between the TSO and the owner. If the TSO decides that it is not possible to reach agreed it can petition the local authorities to decide on compensation so that permission for construction can proceed. This level can be further appealed to the courts for a final decision.

The TSO has to seek an easement agreement with landowners before the local authorities will give permission to construct a new line. The land usually remains in the possession of the owner and compensation is paid as a one off payment to reflect limitations placed on the property. The TSO usually buys the land if a sub-station is to be constructed.

Denmark

Energinet is the national TSO of Denmark. It is owned by the Danish state and operates as an independent public enterprise under the Ministry of Climate and Energy. New infrastructure requires approval under both the Electricity Act and the Planning Act. The former requires it to be shown that the new infrastructure is needed i.e. it in is the public interest. If this is done the relevant Minister provides the approval to proceed. The latter requires that the siting of all structures must be approved at local, regional and

national level. The final approval is given by the Minister and can both issue guidelines for the regional planning process and can overrule decisions that are made at the regional level. Issues in relation to the visual impacts and EMFs are discussed at this stage and the emphasis is placed on minimising impacts.

For a recent infrastructure development involving 400kV lines restrictions were placed on a defined area of coverage along the corridor of the lines[82]. This area was defined according to the movement of the lines and amounted to about 41 meters wide at the pylons and 58 meters wide in the middle of the range between pylons. Plants are restricted to 3 metres in height within 13 metres either side of the middle of the lines. This increased according to distance from the line to 12 metres in height at 15 metres distance and 27 metres height at 25 metres distance.

Compensation was provided to landowners for easements placed on land, land acquired, and damage. However, compensation was not limited to properties within the corridor and was available to third parties. For example, people living within 280 metres from section were compensated for the loss of visual amenity as a result of the new infrastructure. However, the main strategy employed by the TSO is to try to construct along a route that minimises impacts.

Norway

STATNETT is a state owned TSO in Norway. The process that is followed appears quite similar to Denmark in that two permits are required, one from the Local Council under the Town and Country Planning Act and one provided centrally by the Water Resources and Ministry of Petroleum and Energy under the Energy Act.

The TSO normally seeks an easement over private property to obtain a right to build and maintain infrastructure including forest clearance under transmission lines. A written agreement with a landowner is usually arranged for smaller projects and will be attempted for larger projects as expropriation is a time consuming process. However, expropriation in court is a normal procedure for larger projects involving several properties. The court also sets the compensation to be paid. Expropriation and permission to use the property before expropriation, is usually applied for at the same time as applying for the electrical licence under the Energy Act.

[82] Aabenraa Kommune (March 2017) 400 kV Overhead Connection Kassø-Frøslevlejren: Environmental Report and EIA Statement

A recent project indicates the approach that is taken. This project involved the construction of a 420kV line from Ofoten to Balsfjord. When Statnett was awarded the licence from the Ministry to construct the line, a permit was granted to expropriate the necessary land and rights. Statnett requested judicial assessment to obtain guidelines on compensation while at the same time initiating a dialogue with landowners and rightsholders in order to reach agreements. The TSO finalised amicable agreements with most of the 450 affected landowners and rightsholders for compensation and easement rights. Where no agreements were possible the TSO went to court to exercise the permit it had been granted. Compensation for those that did not enter agreements was based on a judicial assessment undertaken by the Ofoten District Court. The decisions of this court are binding on both parties.

Slovenia

ELES is the national TSO for Slovenia. It is currently engaged in two 400kV projects: from Divaca to Bericevc and from Civkovce to the Hungarian border. Both of these projects have been designated as being of national importance as are all projects connected with the development of the transmission network. These are just part of a much larger planned upgrade of the system and a number of projects have been designated as projects of common interest by the EU.

Projects are initially proposed in the National Spatial Plan and then given the necessary approval by the relevant Minister. A planning process then identifies the route for a line which is then used to obtain a construction permit. At this stage it is necessary to identify the precise line and it is usual for a corridor to be defined at 40 metres for 220kV lines and 60 metres for 400kV lines. The TSO needs to obtain the necessary agreements from landowners before construction can begin and the process of doing so usually starts well before the permit is granted. If agreements are outstanding, the TSO will seek compulsory easements form the courts but tries to avoid this as it can result in considerable delays. The permit to begin construction is only valid once all agreements for the route are in place.

8. Other Areas

8.1 New Zealand

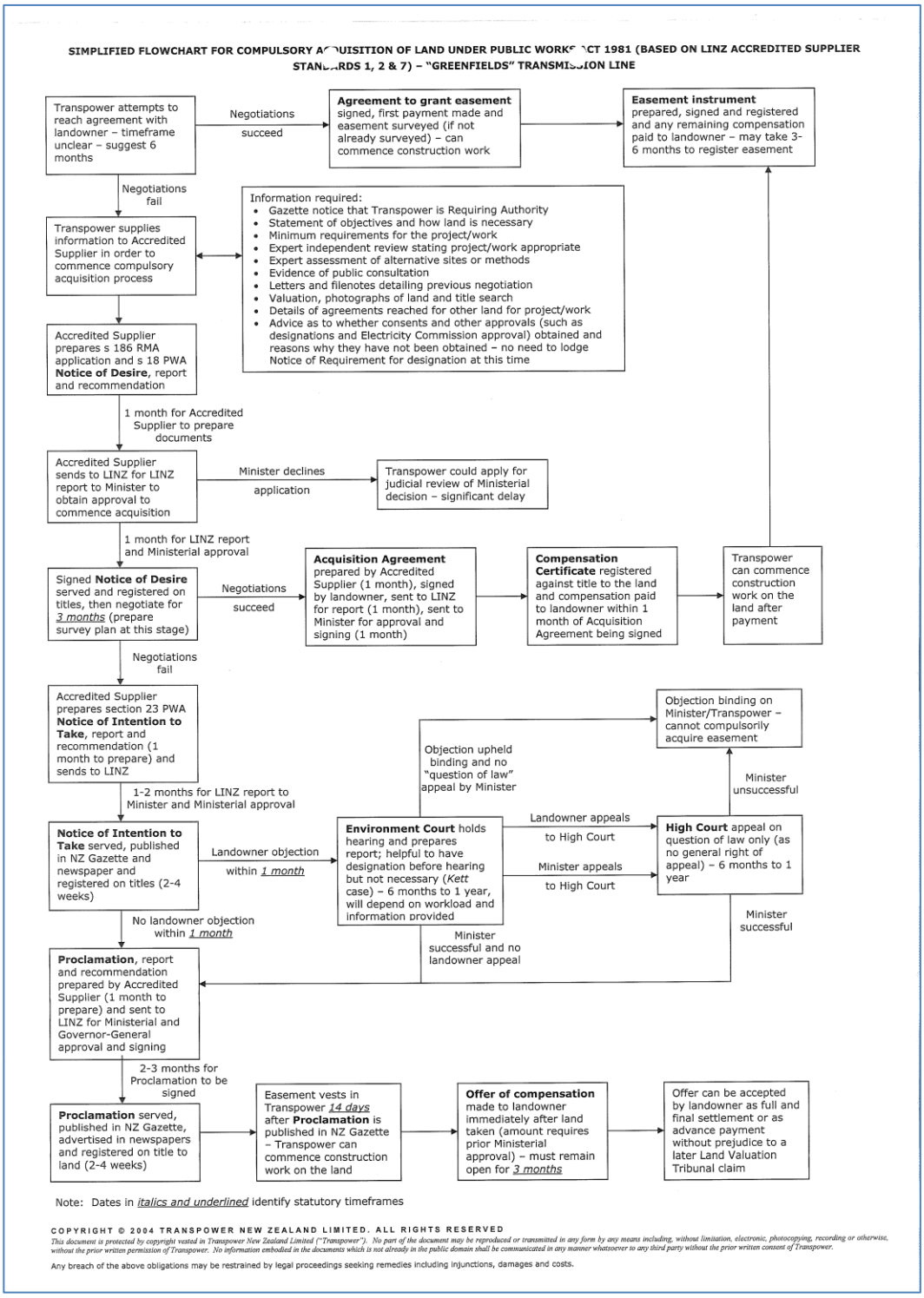
Transpower, a state owned corporation, is the national TSO for New Zealand. A key Government strategy statement from 2008 – the National Policy Statement on Electricity Transmission – recognises the need to operate and maintain the National Grid as a matter of national significance and this strengthens the hand of the TSO in undertaking construction on private property.

Transpower's rights to enter land and maintain lines originate from the Electricity Act 1992. The TSO considers that an easement agreement is always required when new lines are to be constructed and may also be required if existing lines are to be upgraded and the level of work exceeds the changes that the TSO can make in the normal course of maintenance under the Electricity Act. When a transmission line is involved the TSO seeks acquisition of a registered easement interest i.e. it is registered on the certificate of title for the property. The agreement covers the TSO's access obligations and rights and describes the property interest that is being purchased by the easement.

The TSO usually tries to reach agreement with landowners in relation to easements on private property. If no agreement is found the TSO will seek expropriation to secure the rights it requires. The process for compulsory acquisition is specified under the Public Works Act 1981. Under the process, once authorised by the Minister of Land information, authorised Crown agents undertake a minimum 3-month period of negotiation with the landowner before serving a Notice of Desire to Acquire an Interest in Land. However, while this period is specified, neither the precise actions that are required nor what outcome must be achieved in this period are specified.

Following a further negotiation period, a Notice of Intention to Take Land is served on the landowner. After a further period, the actual taking occurs under Gazette Notice. Figure 8.1 below provides a detailed flow of this process.

Figure 8.1: Flowchart of Process for Compulsory Acquisition in New Zealand



Source: Transpower (2006) *North Island Grid Update Project – Amended Proposal – Attachment C: Project Delivery Risk*, Appendix A[83]

[83] https://www.ea.govt.nz/dmsdocument/166

For towers, pylons and poles the easement will generally be for a minimum of 12 metres around the structures plus a further marginal area to address EPR risk[84]. For lines the easement width is generally equal to the maximum design blow-out plus a 4 metre margin. This corridor is referred to as the buffer zone and varies depending on the line voltage. Some restrictions apply within buffer zones, but these are not considered to interfere with usual farming practices.

The buffer zone typically consists of a 12 metre red zone either side of the centreline of the transmission line and around support structures. In this zone, there are restrictions on construction and major earthworks. There is also a green zone typically comprising two strips of around 20-25 metres wide on each side of the red zone where the only restriction is that the landowner must ensure that any activity does not interfere with the transmission infrastructure according to published regulations[85]. Typically, a new 220kV line will have a minimum easement width of 50 metres but this can be larger in locations where line swing is expected to be greater and will be larger for higher voltages. In the North Island project discussed below, the corridor width varied between 130 metres in forested areas and 65 metres on other lands.

Property owners are entitled by law to receive compensation. This entitlement covers any damage to land or to buildings, any restrictions on crops or on development in the buffer zone, loss of visual amenity and noise. These final two headings are not specifically valued but are considered under injurious affection. The principle of equivalency is used in assessing compensation for these elements so that the compensation should mean that the landowner is neither better nor worse off due to the easement and the subsequent undertaking of the works. Actual damage is either remediated or compensated for under a general 'make good' or 'disturbance' arrangement. The assessment seeks to identify a fee based on a before and after assessment basis in relation to the actual easement area plus an assessment of 'injurious affection' in relation to any effect on the value of the property outside the actual easement area. The Public Works Act 1981 states that compensation for injurious affection must be paid even when no land is acquired.

[84] EPR risk refers to earth potential rise and occurs when current discharges from a power line cable or earth. EPR can also occur on transmission tower footings when there is a fault on that tower. Lightening can also be a source of EPR.

[85] The regulations are set out in NZECP34:2001, a mandatory code of practice that sets minimum safe distances from transmission lines to protect persons, property, vehicles and mobile plant from harm or damage from electrical hazards. The Code establishes clearance distances to buildings and structures, the ground, and other lines, as well as the minimum distances between poles and towers for buildings, structures and excavations.

If the easement compensation can be agreed between Transpower and the landowners under the Electricity Act 1992 the payment will usually take the form of an annual lease that is paid to the landowner. Although Transpower seeks to achieve this it is not allowed to pay a premium over the levels that are set in the legislation in order to incentivise agreements. If an agreement is not reached the easement is secured under the Public Works Act 1981 and the payment is a single payment for the easement[86].

If an agreement is not found and the compensation is to be paid under the Public Works Act 1981, both the easement compensation and the injurious affection compensation payments are determined by registered valuers followed by a mediation process if this is necessary. The principles that are applied by the valuers when doing the valuation are set out in the Act. As the intention of the valuation process is to hold the landowner financially neutral of the works, compensation addresses both any devaluation of property and loss of development potential. Therefore, under these principles, the reasonable potential, i.e. the highest and best use, of a property is taken into consideration in the valuation process.

This assessment is based on the market value of the land. The value of the easement will comprise the value of the land under pylons and the value of the additional area under the lines that is defined to be within the lines corridor or buffer zone. For pylons, the land is compensated at 100% of its value as it is no longer available for use. The land is effectively taken out of use where it is used for forestry and so the value of the easement is 100% of the value of the land. In the case of grazing, compensation is typically calculated at 40% of the land value, at 50% for dairy and 60% for horticulture and other uses. These percentages can vary a bit between different schemes. Any compensation that is paid under the Public Works Act 1981 is paid as a one-off payment and there are no recurring payments.

Injurious effect is defined in the Electricity Act 1992 but, in practice, it is assessed as compensation for aesthetic factors and permanent disturbance. Aesthetic factors are assessed as a percentage of the land's value, but the impact is assessed across 'corridors of affection' that are assumed to run parallel to the lines. There are considered to be three such corridors on either side of a line with effects decreasing the further the corridor is from the line. The estimates are based on corridors that are twice as wide as

[86] As a state-owned enterprise, Transpower does not have direct access to compulsory acquisition under the Public Works Act 1981. Instead it uses section 186 of the Resource Management Act 1991 which enables a Requiring Authority (such as Transpower) to apply to the Minister of Lands to take land required for a project of work as if it were a government work.

the height of the nearest tower so that a 60 metres tower would have three 120 metre corridors of affection on each side giving 720 metres in total. A decreasing percentage of the land's value is applied to each corridor the further it is away from the line.

Although compensation for environmental factors is payable to property owners, it is only payable to those whose property is directly affected by transmission line easements and associated access rights of way. Third parties whose properties are not included in the zone and for which there is no easement in place are not entitled to compensation.

Transpower CommunityCare Fund

Transpower has developed the CommunityCare Fund to provide funding to community-based projects in areas that are impacted by new and existing infrastructure by making one-off grants of between NZ$5,000 to NZ$50,000 (€2,950 to €29,500) to projects. The fund is available to all regions throughout New Zealand where Transpower has grid assets. The length of time the infrastructure has been in place is not an issue, but the TSO actively promotes the Fund to areas where new projects are being developed such as along the route of the Bunnythorpe to Haywards conductor replacement project which is currently being developed. A wide range of groups can apply, such as any independent, local, non-profit organisation or community group including non-government organisations, charities, schools as well as regional and district councils.

The fund is targeted at communities in close proximity to the grid, often defined as within 5km of transmission lines, who are affected by the lines. However, the project that is actually funded can be more distant if the benefits accrue to those who live close to the lines. The projects need to be long lasting projects that benefit the wider community, have a high level of community involvement and participation and the community needs to be able to demonstrate that it has already raised some funds from other sources to undertake projects. Applications for funding are assessed against these criteria. In addition, the fund now applies criteria to ensure that 15% of the grants that are provided are given to Maori organisations, that preference is given to projects that have Maori, community and environmental benefits and projects that benefit groups from lower socioeconomic areas in Auckland. The fund specifically rules out funding administrative, operational or ongoing costs, funds that make grants, projects that are generally funded by the government, projects that have already been completed and any projects that might affect Transpower's operations.

8.2 North Island Project

An example of Transpower's processes in practices was seen in the North Island Grid Upgrade (NIGU) project and indicates that even where the legal requirements are all in place there can be many problems in finding appropriate levels of compensation. The NIGU project was approved with a maximum capital allowance of NZ$824 million in 2007[87]. Transpower is regulated by the Commerce Commission and must apply to the Commission if it proposes to recover from customers any capital expenditure in excess of what was approved. In 2013 it applied to recover costs for final expenditure on the project of NZ$894 million, an excess of NZ$70 million over what had been approved. It attributed a significant part of the cost over-runs to costs associated with securing the access rights to around 310 properties that were required for the construction.

The issue was examined by external consultants and their report provides useful information on New Zealand's compensation process in practice[88]. The report found that the assessment of the value of an easement involved three elements: the value of the land to which the easement applies, injurious affection associated with the line, and other losses or damages.

In relation to the first of these, the value of the easement depends on the conditions of the easement – which tends to be broadly standard – and on the value that is attributed to the land. This is variable. Ideally, this is based directly on market sales but, in reality, a proxy known as an easement fee is used. This values the easement as a percentage of the underlying land value, but this value is usually based on known values that have been used to find earlier agreements, rather than on actual market sale prices. One impact of this approach is that any rise in a valuation will be built into the next valuation and a trend can emerge so that the easement fee values can diverge quickly from actual market prices if a high number of agreements are being concluded over a short period of time.

Despite exceeding the approved budget by some distance, the managers in the TSO who were most directly involved in negotiations with landowners maintained that they were never required to reach generous settlements with landowners but did engage with

[87] '*Evaluating Transpower's property and easement acquisition strategy and implementation for the NIGU project*'. Report prepared by Calverton Business Consulting Group for the Commerce Commission in June 2014. The text here is the consultants' interpretation of that report and its findings

[88] This part of the project had an estimated cost of NZ$187.4 million, NZ$61.7 million higher than the original estimate of $125.7 million.

landowners to agree easements and settlements based on independent valuations. In some cases, properties were purchased using similar valuation principles. However, the settlements were far higher in many cases than original budget expectations and there was evidence that the agreed compensation trended upwards as the need date approached.

Injurious affection – the fall in value of unencumbered land as a result of the easement on part of the property, which is assumed to include loss of visual amenity and other environmental and health impacts – is the second element in the calculation of compensation. In the NIGU project, this was based on the three parallel corridors as discussed earlier with compensation set as a percentage of the land value. Initially, these percentages were expected to be between 2.5% and 12.5%. However, by the time the agreements were being finalised the percentages had increased to 5%, 10% and 15% of the land's value. This increase pushed up the compensation valuations somewhat above what had been projected but increases in the values that were used for the land, as discussed above, were also important.

The third element of compensation for permanent disturbance covers a broad range of issues and was assessed on a case by case basis as evidence emerged. This was very difficult to project in advance and was found to be one of the main reasons why initial estimates for compensation were so much below actual outcomes.

Transpower strategy was also uneven. Discussions with landowners had begun in October 2004 before planning approval was obtained. At this time Transpower sought outright property acquisition rather than the purchase of easements since there was a risk that in the event that the project did not proceed the company would be able to monetise its property investment whereas an easement would be worthless. One issue that was identified by Transpower was that a lengthy planning decision process meant that most landowners tried to defer any meaningful engagement with Transpower until that decision was made. Some who were opposed to the project took the view that they might well be able to prevent the project proceeding at all.

A key issue was that Transpower's initial property acquisition strategy had required compulsory acquisition and it initiated proceeding for compulsory acquisition in respect of a large number of properties. This was done on a scale that had not been seen in the past. Later, following the appointment of a new CEO, this changed and greater emphasis was placed on negotiated outcomes. When final approval for the project was received the company decided to focus on easement purchases with freehold purchase as a back-up option.

Transpower also had little experience in large scale land freehold purchase or easement negotiations and relied heavily on external consultants for valuation and easement negotiations. This led to fractious relationships between the company and landowners and was changed so that Transpower staff became directly involved in negotiations. However, a lot of time had been lost and there was then an acceleration in the number of completed easements, a development that also coincided with the passing of further stages of the planning process. The delays and changes in strategy meant that property holders knew that Transpower would wish to conclude agreements and not lose more time in undertaking compulsory acquisition.

Taken together, the result was that lack of experience, changes in strategy and a prolonged period of uncertainty over approval resulted in a period where there was a rush to get agreements in place and the compulsory acquisition powers were pushed to the back as a viable option. When combined with some grey areas in how valuations were to be reached in practice, the effect was that the costs of achieving agreements increased well beyond what had been projected.

8.3 United States & Canada

There are a number of reasons to expect that practices followed by different TSOs in federal countries comprising a number of states that retain specified powers at state levels – such as the US, Canada and Australia – would show greater uniformity in practices across states than in the case of Europe, even when the operators are closely aligned with one state or restrict their activities to a single state. For a start, while states can have their own legal provisions, the all operate within a single national legal framework that will influence fundamental concepts and measures such as property rights. These frameworks preceded the growth of electricity systems. This is not the case in Europe where sharp differences in legal systems continue unless specifically address by the EU's *Acquis Communautaire.* Second, these countries have a single language and dominant cultures – both societal and business. This means that TSOs in one state are more likely to learn and to copy practices elsewhere leading to greater homogeneity over time. People are also more likely to move between different TSOs and National Associations will be more influential than in the case of Europe where national differences continue despite progress with integration and the growth of EU institutions. Third, electricity grids, particularly in the US, have tended to be managed by private companies rather than the publicly owned TSOs that dominated Europe up to a couple of decades ago and that still exist in many countries. Such private companies

tend to have less of a national focus and be open to opportunities to innovate in order to expand beyond their state boundaries. Some progress has been seen in Europe in this direction, for example, TenneT which operates in both Germany and the Netherlands, some cross border ownership and increasing integration into regional rather than national markets.

In the US, primary authority for permitting and siting new transmission lines lies at the state level, although the Federal Energy Regulatory Commission (FERC) has limited siting authority. Most states have granted authority to review the location and routing of transmission lines to the State Public Utilities Commission (PUC). Transmission lines may also be subject to some degree of local or municipal control.

Most states require that a grid operator must show a need for new transmission infrastructure before approving a project proposal that will involve a need to acquire property or easement rights either compulsorily or through agreement. An environmental impact assessment is also generally required as part of the planning process. Approval will generally culminate in a 'Certificate of Need' or a 'Certificate of Public Convenience and Necessity'. Once these are in place, the grid operator can move towards obtaining rights.

Property rights are not generally dissimilar to the norm in Europe. Grid operators generally prefer to obtain easements rather than to purchase property as this generally suits both the operator and the landowners. The general conditions of these in terms of the rights and obligations they confer appear similar to other countries. The size of the easement will be affected by the usual range of factors but in rural areas a corridor of 150 feet (46 metres) width is usually considered necessary for a 345kV line. The corridor will be up to 250 feet (76 metres) for a 500kV line. Easements are perpetual and are not subject to termination or expiration unless released by the TSO, should it decide to do so when it removes a line. Once an easement is signed, it becomes part of the property record. As in Europe, the TSO, the landowner who signed the easement and all future owners of the property are bound by the terms of the easement agreement.

Operators generally prefer to obtain easements by agreement. If an agreement cannot be reached, the grid operator can initiate a state-governed process known as condemnation, under which a judge and a panel of impartial individuals decide whether the easement is needed and its value. The condemnation process varies from state to state but, for the most part, states have established strict procedures for determining the amount of compensation a landowner should be paid for an easement that involves the construction and maintenance of a transmission line.

If it is necessary to purchase a property and agreement is not possible and the necessary approvals are in place, an operator will normally have a right to exercise the power of eminent domain[89]. Eminent domain is the authority to take private property for public use and is akin to compulsory purchase or expropriation in Europe except that it refers to the purchase of the land rather than the compulsory purchase of an easement. However, not all grid operators can avail of eminent domain and it is restricted to public utilities in some states. Some states also require operators to at least try to negotiate in good faith with property owners for a period before they can exercise eminent domain. Once attempts to reach a voluntary agreement have failed, operators are normally authorized by the state's regulators to utilise eminent domain to get the land they need[90]. The power of eminent domain is also governed by the Takings Clause in the Fifth Amendment, which requires that property that is acquired in this manner must be put to Public Use and that Just Compensation must be provided to the owner.

Landowners also are eligible for reasonable compensation for property damage that may occur when the transmission line is being constructed and during repair and maintenance. Whether decided by agreement or compulsion, compensation is typically assessed based on fair market value. The usual way to determine fair market value is that a court estimates the value that a buyer would pay a seller for the land at its highest and best use on the open market. Compensation for easement rights is usually provided as a one-time payment. However, owners can sometimes opt to spread the payment out over time by receiving annual instalments with interest on the remaining balance. These terms will be included in the easement document.

It has not been unusual for grid operators to make offers above the norm in recent years in order to get agreements in place. Berry (2013) provides some examples[91]. The Montana-Alberta Tie Line is a 214-mile, 300 megawatt transmission line from Lethbridge, Alberta to Great Falls, Montana. It was developed to transmit wind energy generated in both the U.S. and Canada. The project developers offered landowners typical easement payments and also agreed to pay for three years of any lost crop production and to make

[89] Grid operators usually consider eminent domain to be a last resort. For example, Idaho power reports that it has seldom been used and has not been used at all in the past 20 years. See Idaho Power (2009) Working with Landowners. https://docs.idahopower.com/pdfs/AboutUs/PlanningForFuture

[90] In Minnesota, when a transmission line crosses a rural property, a landowner, under certain conditions, may request that the utility purchase the entire property.

[91] Berry, A. (2013) *Getting Right-of-Way Right: Landowner Compensation for Electric Power Transmission Rights-of-Way*. Working Paper, Lincoln Institute of Land Policy

annual pole payments of about $200 per pole. These payments were more than the industry average and helped to get resistant landowners on board with the project.

The Rock Island Clean Line runs approximately 500 miles from northwest Iowa to Illinois. Acquisition of rights-of-way began in 2014. The developers offered both easement payments and per-pole payments. Landowners could choose a one-time payment of $6,000 for a single pole or $18,000 per lattice, or an annual payment of $500 per pole or $1,500 per pylon for as long as the structures remain on the property.

Clean Line Plains & Eastern Project

This project was developed to transmit wind energy from the Oklahoma Panhandle region to customers in Arkansas, Tennessee and other southern and south-eastern states. The developer sought to negotiate easement agreements of 150 to 200 feet in width on a voluntary basis with property owners and set out a clear code of conduct to govern all interactions with the owners.

Owners were provided with a written offer to purchase the easement. The compensation offered was 100% of the fair market value of the land crossed by the easement area, even though the ownership of the land would not change, and most of it could still be farmed. The value of the land in each area was to be assessed by a market data study or an appraisal undertaken by a certified independent appraiser. Compensation for land would be as a one-time easement payment.

Landowners would also be paid for each transmission structure on the property and it was expected that 1% of the total area would need to be taken out of production. In this case, the landowner could opt for a one-time payment or for annual payments that would continue for as long as the structure was on the land with a 2% annual increment. The payments for a single pole or lattice mast would be a $6,000 one-time payment or $500 annually while they would be $18,000 one-time or $1,500 for a lattice pylon.

The operator provided a worked example in its published brochure for a property with a market value of $3,000 per acre, a line spanning half a mile with a 150 foot easement along its length and two lattice pylons. It was assumed that the owner had opted for a single payment. This example results in an easement payment of $27,300 and structure payment of $36,000 giving a total of $63,600.

Compensation would also be provided to cover all fees for recording the easement and for any title insurance. Farmers would also be compensated for any damages to crops, forestry, livestock caused during construction, operation or maintenance.

Manitoba-Minnesota Transmission Project

Manitoba Hydro put together a compensation package offer for landowners where the 500kV transmission line crossed their property in order to get easement agreements with farmers[92]. An 80 metre easement corridor was typically required. Four types of compensation were offered.

- Land Compensation for the signing of an easement agreement;
- Compensation for any damages to land, buildings or crops caused by construction;
- Compensation for each tower located on agricultural lands;
- Ancillary Damage Compensation: where Manitoba Hydro's use of the right-of-way directly or indirectly impacted the use of the property by the owner.

Compensation for the easement agreement was offered as a one-time payment. Its value was determined by the total areas required and the current market value of the land and was offered at 150% of the current market value. For example, if the easement area required was 1,609 metres long and 80 metres wide, the total area of the easement is approximately 31.81 acres. If the land were assessed at $2,300 per acre, the compensation would be $109,745.

Construction damage compensation was offered as a one-time payment to be negotiated on a case-by-case basis. The operator offered to either repair, to the satisfaction of the landowner, any damage to property and compensate for damages such as the reapplication or rejuvenation of compacted top soil where the remedial work requires farm machinery and the expertise of the landowner. Compensation was also offered for damage to crops based on the current value of the harvested crop according to the Manitoba Agricultural Services Corporation (MASC) insured value. Worked examples were provided in advance.

The impact of pylons was also offered as one-time payment for each transmission tower placed on land classed as agricultural. The compensation was calculated to cover losses due to land that has been permanently removed from production, reduced productivity around pylons, the additional time required to manoeuvre machinery around each

[92] A buyout offer was also possible if the route of the line was within 75 metres of the landowner's residence. This offer would also include compensation for all related and reasonable relocation costs.

structure and an allowance for losses due to the double application of seed, fertilizer and herbicides in the area around each structure. The calculation also considered four types of land, the type of structures and the location of structures relative to boundaries.

Production data provided by MASC were used. Based on this approach, pylons with a base size of 10 metres square would lead to compensation of $6,640 each on natural grasslands, /$12,730 each on seeded pasture, $17,930 each on cereal crop land and $25,520 each for land used for corn or potatoes.

Ancillary damage compensation was also provided as a one-time payment and was payable if the infrastructure impacted irrigation or drainage, or restricted access to other areas of the farm not in the corridor. It was also payable if there was a restriction on the current highest and best use of the land. This was to be assessed on a case by case basis.

Alberta PowerLine

Alberta PowerLine is a partnership between ATCO and Quanta Services to design, build, own and operate the Fort McMurray West 500-kV Transmission Project. This involves the construction of approximately 500 km of new transmission lines. The developer submits applications for the new infrastructure for approval to the Alberta Utilities Commission (AUC), an independent agency of Alberta, Canada. Alberta Powerline has published its approach to obtaining the necessary rights and lands for the construction of transmission lines[93].

Compensation is payable to landowners under four headings:

- Early resolution and access compensation package that is payable as a one-time payment to landowners who finalise an agreement at an early stage;
- Right of way agreement that includes payment for access and disturbance;
- A pre-paid damages agreement that covers damages to crops that might occur during construction or lost yield in the following year;
- Annual structure payments for structures placed on the land.

To be eligible for the early resolution compensation, landowners must finalise both a Right-of-Way Agreement and an Early Access Agreement with the developer prior to an AUC decision. If this is done Alberta PowerLine pays the landowner $10,000 per parcel

[93] Alberta Powerline (2015) *Right-of-Way Compensation Program.* All values in this section are in Canadian dollars. At the time of writing, one Canadian Dollar is worth US$0.80 and €0.64.

of land for early access to the property and early acceptance of the right-of-way agreement terms. This payment is made in two stages: $1,000 on signing and the balance following approval from the AUC.

The right of way agreement includes an easement payment, an entry fee payment and a general disturbance payment. The compensation for the right of way agreement was set at the fair market value of the area under the easement. The entry fee is paid in respect of each agreement and depends on the number of acres involved. It was set at $500 per acre, with a minimum of $250 and a maximum of $5,000 per agreement. The general disturbance payment for inconvenience during construction was set at $1,250 for pasture and rough land, $1,500 for land with crops if located at the boundary and $1,750 if located within a field, and an additional $1,000 for each residence on the land. These amounts were paid as a single payment prior to the construction but after the developer had received approval from the AUC.

The value of compensation for pre-paid damages is shown in Table 8.1.

Table 8.1: Pre-paid Compensation for Damages

	Cropland	Pasture
Loss of use value per acre	$475	$200
Year one (% of crop value)	100%	100%
Year two (% of crop value)	50%	50%
Total compensation per acre	$715	$300

Source: Alberta PowerLine (2015)

These payments were based on expected losses. Farmers could choose to wait until the construction was completed and assess damages at that stage. In any case, a post construction assessment was planned, and compensation would be paid over and above these amounts, if due. This was paid at the same time as the easement payments.

The value of compensation in the form of annual structure payments varied depending on the type of structure, the type of land use and the location of the structure within the field. The values are shown in Table 8.2 for the two main structures that were planned for the line. These payments were scheduled to begin when the line came into service but would be paid retroactively to the date when the right of way agreement was signed. They are to be made each year for as long as the structures remain on the land and the rates are due to be reviewed every 5 years.

Table 8.2: Annual Compensation for Structures

Type of Structure	Land use	Location	$ Per Structure
 Guyed 'V'	Cropland	Boundary	800
		Midfield	1,600
	Pasture/Bush	Boundary	350
		Midfield	700
 Steel Corner Tower	Cropland	Boundary	700
		Midfield	1,400
	Pasture/Bush	Boundary	275
		Midfield	550

Source: Alberta PowerLine (2015)

It is clear from this review that the developers offer a range of payments not unlike in European countries. Payments are not overtly made for issues such visual impact or health impacts and payments are restricted to property holders who sign easements. It is also clear that developers are interested in offering incentives to get early agreement as this can avoid costs associated with uncertainty and with undertaking legal actions to gain compulsory access. The contrast with the New Zealand case where Transpower was prevented from offering premiums to incentivise early acceptance is obvious.

8.4 Australia

The structure of the Australian transmission system is somewhat different to other countries in that the Australian Energy Market Operator (AEMO) undertakes many of the functions of TSOs elsewhere, but much of the business is carried out by 5 transmission network service providers (TNSPs). Table 8.3 provides some background information on the TNSPs and the length of transmission lines each manages.

Table 8.3: Australian Transmission Network Service Providers

	TNSP	Owner	Lines (Km.)
Queensland	Powerlink	Queensland Government	13,986
New South Wales	TransGrid	NSW Government	13,957
Victoria	SP AusNet	Singapore Power (51%)	6,553
South Australia	ElectraNet	Private investment funds	5,591
Tasmania	Transend	Tasmanian Government	3,688

Source: Australian Energy Market Commission

AEMO makes decisions in relation to investments even though SP AusNet actually owns and maintains the network in Victoria. As a result, even though it is one country, there is considerable variation between the states even at a high level in terms of how they manage the transmission network.

The TNSPs generally seek easements as the means to access lands to build and maintain transmission lines. The exception is for substations where the TNSPs generally buy the land. The main legislation guiding property rights is the Acquisition of Land Act 1967 and easements are obtained under this Act. Typical easement widths are 60 metres total width for 500kV double circuit lines on 60 metre high towers, 65 metres for single circuit 500kV lines on 40 metre high towers, and 58 metres for 330kV single circuit lines on 32 metre towers. The easements are recorded on the Certificate of Title and restrictions are placed on crops and construction in the area. Landowners remain responsible for maintaining the land within the easement but the TNSP is responsible for maintaining any tracks it may build to access lines or pylons.

Landowners can claim compensation under the 1967 Act. Compensation may be claimed by a landowner if a new easement is acquired or if an existing easement is widened and may also be claimed by someone who holds a lease on a property is a new easement is acquired. However, if an owner has a mortgage on the property the mortgage provider is entitled to first claim on any compensation that may be paid.

In Victoria, compensation is assessed by a registered property valuer that is appointed by the TNSP (Powerlink). This valuer can be independent or an employee of the TNSP. The compensation assessment is based on a valuation of the land before and after the easement is taken. It will also include the value of land under any tracks that are constructed to access the easement. Compensation is paid for each transmission line structure depending on the type and number of structures that are placed on the land. It is also paid for the visual impact of any structures. Any restrictions on crops are also included.

As well as compensation for the easement, some TNSPs will compensate professional fees that may be incurred by a landowner when notified by the TNSP of their intention to acquire an easement.

An initial offer is made based on the advice provided by a valuer. If this is refused Powerlink will enter negotiations with the property owner. If no agreement can be found either party has the option to transfer the decision on compensation to the Land Court. The Court's decision is binding on both parties and the Court has the power to award

costs for the Court's time against either party. Perhaps as a result, it is very rare for decisions to be referred to the Court and agreement is almost always found before it gets to this stage.

Once agreement is reached and the amount is determined, the TNSP contacts the mortgage provider is there is one associated with the land. The mortgage provider then has a chance to claim the compensation. If, and only if, it does not do so, but provides formal consent to the easement, will the compensation be paid to the property owner. This is done only after it is formally registered on the title. Compensation payments are liable to income tax and capital gains tax.

TransGrid Community Partnership Program

This program in New South Wales provides funds to not-for-profit groups for community projects. To qualify, the project must be shown to provide tangible benefits to a community living in close proximity to TransGrid transmission lines and must not require ongoing support. A number of activities are specifically excluded including areas normally funded by public funds, conferences and travel, and projects with a religious, political or sectarian purpose. The program is targeted at smaller projects and, typically, the funds awarded in respect of any one application are in the region of AUS$5,000 (€3,165).

9. Main Findings

The main, and rather obvious, finding of this report is that there is considerable variation in the approaches that are used by TSOs to compensate land owners and in the levels of compensation that are paid. Indeed, it would not be meaningful to try to summarise the information given the extent of the differences. Researchers have also found it difficult to provide comprehensive information across countries as while many TSOs will provide general information on practices regarding land and access rights, they tend to be very guarded in relation to the outcomes of arbitration processes where agreements are not easily found or payments that are made for impacts such as injurious affection.

Despite this, there are a number of important commonalities that can be seen in the principles that guide the approaches and in the outcomes that are produced. Relevant provisions in the legal framework in each country, particularly in relation to private property rights and the formal rights of electricity operators are very important in terms of the approaches to compensation that are seen. These vary hugely. TSOs keep to these and have designed their approaches around them. Some also go further and have designed schemes to promote the acceptance of projects.

Some types of compensation are provided by all TSOs. These include payments for damages to land or crops and the usual practice is to try to restore before offering 100% compensation for losses. A similar approach is taken with respect to loss of crops, but there are a lot of differences in practices regarding how to do this.

For the most part, TSOs prefer to obtain easements than to purchase property with some exceptions. Most TSOs attempt to get agreements in place, but some move directly to compulsory acquisition of rights. Many TSOs build in premia to incentivise early agreement, but some are prohibited from doing so. The concept of national interest is important in many countries and where a project is defined as such the TSO often has considerable powers to act. Where this is the case and where there are unlikely to be additional delays or costs associated with the compulsory approach then TSOs are likely to follow this route.

It is very rare to specifically compensate for issues such as visual intrusion, noise or health as the potential for these impacts is usually not recognised in law. This is in keeping with the findings covered in the literature review where formal studies of the impact of transmission lines have found little or no evidence of links between proximity to the lines and health effects. However, in a small number of cases, compensation is

paid either because of Government regulations or due to precaution on the part of the TSO.

It is more common to compensate for loss of value in a property on the assumption that these impacts will be captured into the value. Interestingly the basis for this assumption is far from definitive. The literature review indicated that clear relationships between new infrastructure and sale prices are seldom found. However, appraisers usually build in a discount and there is some evidence for a relationship when a case study approach is used. The results of these studies are generally considered less robust than econometric analysis, and subject to anecdotal influence. However, they appear to be influential in the values that are used in assessing compensation as these are generally based on appraisers' valuations rather than analysis of sales results.

TSOs usually only pay compensation for any impact on valuations within a specified area that coincides with a technically defined protection corridor. This usually coincides with the easement area. Third party claims are not usually considered for compensation. However, in some countries where devaluation of property is a criterion, third party claims are allowable. Limits can be technical but more likely within a range such as 100 metres.

There is huge variation in relation to how to compensate for loss of land but the use of valuers or agreement with national farmer representative organisations are common approaches. Many countries also have detailed laws to guide valuations.

Compensation is usually paid as a lump sum irrespective of its basis. The exception is where there is a loss of earning potential that may result in recurring annual payments. However, these payments exist in only a minority of countries. Some countries have payments for overhang that are also provided as recurring annual payments but again this is a minority.

It is difficult to be definitive in relation to the prevalence of compensation for injurious affection. The provisions in many countries would appear to specifically exclude such payment. Where they take place, there is considerable secrecy regarding how they are determined and under what headings they are provided.

Some TSOs have developed community benefit schemes but the practice is still not widespread. Most have little or no legislative basis and are often viewed as a way to address local opposition and often work through municipalities and local authorities in order to influence regulatory agreement.

Despite reasons for commonality in federal states, there are a range of differences in the practices that are followed and in the outcomes that are produced. These arise due to different corporate strategies, some differences in States' institutional and regulatory environments and differences in the projects that are undertaken in respect of scale, geographical locations and objectives.

There is one further commonality across many countries. Irrespective of the validity of perceptions regarding the impact of transmission infrastructure on property values, the situation has developed such that proposals to develop new transmission infrastructure have often resulted in confrontational situations rather than agreements. These tend to take the form of public protests, a very long planning process and legal actions. Efforts to date to devise ways to deal with these that do not rely on strict limits on property rights have had patchy success at best and the issue is a cause for concern in many countries.

Appendix: Questionnaire for TSOs

KHSK
Economic Consultants

Roinn Cumarsáide, Gníomhaithe ar son na hAeráide & Comhshaoil
Department of Communications, Climate Action & Environment

Study on Practices in Relation to the Compensation of Property Owners in Proximity to Overhead High-Voltage Transmission Lines

Please answer the questions in as far as they are relevant to your organisation. There are 15 questions in total, many of which can be answered by a simple YES or NO.
Please provide additional information as you see fit to better explain the specific practices of your TSO. On the final page, please provide links to any online documents that you think might be of relevance to this study.

Your details:

Name: ……

TSO name: ……

Country: ……

Your name and your TSO's name are requested so as to avoid us sending you follow-up emails. If you do not wish to provide these details, please provide the name of the country in which your TSO operates.

Question 1:

What practice do you follow when seeking permission and a legal right to construct new infrastructure on private property? (Please tick all that apply).

Towers, Pylons & Poles		Lines	
Compulsory Acquisition/Expropriation		Compulsory Acquisition/Expropriation	
Agreed purchase of lands		Agreed purchase of lands	
Compulsory wayleave/right of access		Compulsory wayleave/right of access	
Agreed wayleave/right of access		Agreed wayleave/right of access	
Easement		Easement	
Lease of lands		Lease of lands	
Other		Other	

If other, please give details:

Question 2:

If compulsory acquisition, expropriation or compulsory access is used, please provide details in relation to the process that is used in advance of compulsion:

Question 3:

Are the dimensions of the land over which a right you may acquire usually specifically defined or delineated?

If 'YES', please provide details on the dimensions.

	'YES' or 'NO'	Dimension of land (metres)
Pylons, Towers & Poles		
Lines		

Question 4:

Are property owners **entitled by law** to receive compensation for the construction of transmission lines and infrastructure on their property? Please delete as appropriate.

YES **NO**

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Question 5:

If there is an entitlement by law to receive compensation, please indicate which of the following headings are reasons why compensation must be paid:

Damage to land or buildings	
Damage to crops	
Restrictions on crops	
Consequent restrictions on development	
Loss of visual amenity	
Noise	
Possible health issues	
Other (please specify)	
~~~~~~~~~~~~

Question 6:

Whether or not there is a legal obligation to pay compensation, is compensation ever paid under any of the following headings:

Damage to land or buildings	
Damage to crops	
Restrictions on crops	
Consequent restrictions on development	
Loss of visual amenity	
Noise	
Possible health issues	
Devaluation of property	

Question 7:

How is the level of compensation decided under any of the headings for which it is paid? (Please provide as much detail as possible).

Damage to land or buildings	
Damage to crops	
Restrictions on crops	
Restrictions on development	
Loss of visual amenity	
Noise	
Possible health issues	
Other (please specify)	

Question 8:

What rate or level of compensation is paid under each of these headings? Please provide details such as rate per pylon or square metre, distance from structures, etc.

Damage to land or buildings	
Damage to crops	
Restrictions on crops	
Restrictions on development	
Loss of visual amenity	
Noise	
Possible health issues	
Other (please specify)	

Question 9:

If compensation for the devaluation of property or loss of development potential is ever paid, please provide details on how this is assessed and by whom:

Question 10:

Are payments under each heading usually made as a single payment or a recurring annual payment?

	Single Payment	Annual Payments
Damage to land or buildings		
Damage to crops		
Restrictions on crops		
Consequent restrictions on development		
Loss of visual amenity		
Noise		
Possible health issues		
Other (please specify)		

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Question 11:

Is the level of compensation that is paid to property owners ever adjusted to reflect prior cooperation with the TSO? (Please delete as appropriate).

YES **NO**

If YES, please provide details.

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Question 12:

Is compensation paid to third party property owners in the vicinity of new transmission lines but where the lines do not directly cross the property of those owners under any of the following headings?

	Yes	No
Devaluation of property		
Restrictions on development		
Loss of visual amenity		
Noise		
Possible health issues		
Other (please specify)		

Question 13:
If the answer was 'YES' for any category of payment in Question 12 please provide details regarding the level of payment and its basis of determination:

Devaluation of property	
Restrictions on development	
Loss of visual amenity	
Noise	
Possible health issues	
Other (please specify)	

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Question 14:
Is there a distance limit from the line beyond which compensation is never paid? (Please delete as appropriate).

YES **NO**

If YES, please provide details.

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Question 15:
Does your TSO have a Community Benefit Scheme in place? (Please delete as appropriate).

YES **NO**

If YES, please provide details.

Please provide links to any online documents that you think might be of use or of relevance to this study.

Thank you for taking the time to complete this survey. It is much appreciated.