

A low-angle photograph of a tall, silver metal lattice tower for an electricity transmission line, set against a clear, bright blue sky. Several power lines are visible extending from the tower across the frame.

Electricity Transmission Lines

Frequently Asked Questions

1. Who manages and transmits the electrical energy?

What is REN?

REN (REN – Rede Eléctrica Nacional, S.A.) is the company that provides public electricity transmission services in mainland Portugal and that performs the technical management of the Portuguese National Electricity System. REN – Rede Eléctrica Nacional, S.A., is part of the “REN Group”, i.e., REN – Redes Energéticas Nacionais, SGPS, S.A., which is responsible for ensuring the uninterrupted supply of electricity and gas in mainland Portugal.

What are REN’s main responsibilities?

Ensuring uninterrupted electricity supply at the lowest cost, with service quality and safety.

How is the Portuguese National Transmission Network (RNT) planned?

Investments are planned for 10-year periods and reviewed every two years. Decisions are based on the evolution and forecast of consumption and supply (power stations), ensuring permanent balance, quality and security of the network. These investments include internal reinforcements, support for the distribution network and interconnections with Spain, thereby contributing to the promotion of competition. The final decision rests with the member of the Government responsible for the Energy area, following a public consultation process.

May I review and comment on the investment plan?

Yes. All investment plans are subject to Public Consultation. They are published in advance, both on the website of the Portuguese Energy Services Regulatory Authority, ERSE (erse.pt), and, after the approval decision, on the website of REN (ren.pt).

Who pays for the investment?

Investments in the transmission network are covered by the tariff, whose amount is set by the Portuguese Energy Services Regulatory Authority (ERSE). They currently account for around 6% of the final price of electricity paid by end consumers. They may also be paid for under agreements entered into with promoters of certain energy production or large-scale consumption projects.

How does electricity reach my home?

Energy is generated in power stations by converting other sources (sun, wind, river and reservoir water, natural gas, among others) and is transmitted by REN’s networks and distribution networks to the places where it is consumed for a wide variety of uses (health, industry, housing, commerce, sport, leisure, etc.).

2. How are environmental assessments and licencing carried out?

Who decides where the power lines go?

REN identifies possible corridors for the power lines to pass through. Technical and administrative licencing is carried out by the Portuguese Directorate-General for Energy and Geology (DGEG), following environmental approval by the Portuguese Environment Agency (APA).

Are alternatives considered?

Yes, they are. All valid alternatives are assessed as part of the Environmental Impact Assessment (EIA) process. During the studies, updated information is requested from municipal councils and other administrative bodies. All information counts towards defining the best corridor and final route.

What are corridors and what are they for?

The corridors are strips of land approximately 400 metres wide, within which alternative routes can be evaluated. The goal is to identify a preferred corridor, within which impacts are minimised and where the power line will subsequently be built.

Is the entire 400-metre width of the corridor used by the power line?

No. The choice of corridor only serves to project the alternative routes within it for establishing the power line. Once the route has been chosen and the licence granted, a 45-metre strip centred on the axis of the power line is defined. Only a few of the future activities to be carried out within this strip, such as building licencing or the planting of certain types of fast-growing trees, require REN's approval, as laid down by law, for the sole purpose of ensuring the safety of people and property.

Are local communities consulted?

Always. The environmental assessment process includes a public consultation, publicised in various media outlets, on the website of the Portuguese Environment Agency and on the PARTICIPA.PT portal, and notices are posted in local councils, inviting all interested parties and the affected local authorities to participate. In some cases, edicts are published in Diário da República.

Are all power lines subject to environmental assessment processes?

All RNT power lines are subject to environmental studies and assessment by the licencing authority. Lines longer than 20 km are subject to a formal Environmental Impact Assessment procedure and to a Public Consultation.

How long do these take?

The process can take up to four years, ranging from the analysis of needs, Environmental Impact Assessments (EIA), the Environmental Impact Assessment procedure, and Public Consultations, to technical and administrative licencing, contacts with landowners and construction works.

Does REN build wherever it wants?

No. REN can only build in corridors approved by the Portuguese Environment Agency (APA) and with the respective licence issued by the Portuguese Directorate-General for Energy and Geology (DGEG).

3. What can be done after the power line is installed?

What is an RNT power line easement?

A power line easement consists of reserving the space (45 metres wide) necessary to ensure safety conditions, namely with regard to safety distances from the ground, trees, roads, railways and buildings considered conductive, under the conditions laid down in Portuguese law. Whenever the installation of a power line, especially a pole, affects the current use of the land, compensation shall be paid in accordance with the law.

Can the power lines pass over houses?

Under Portuguese DL11/2018, new power lines may pass over houses only under certain conditions, including when there is no technically and economically viable alternative, and subject to the landowner's consent. This Decree-Law also prohibits the construction of new sensitive receivers beneath existing power lines, such as permanent dwellings, healthcare units, schools, etc.

4. What are the effects of power lines on health?

Are the power lines hazardous to health?

Portugal has legislation in place that guarantees the total safety of people and property under and in the immediate vicinity of the power lines, in accordance with the latest recommendations from international health organisations. Portuguese legislation and regulations are in line with European legislation and the recommendations of the World Health Organisation (WHO). To give a sense of this level of safety, note that the World Health Organisation (WHO), through the International Agency for Research on Cancer (IARC), classifies the risk of electromagnetic fields (EMF) at the same level as the risk from drinking coffee. Further information is available at ren.pt.

Do the power lines emit harmful radiation?

Power transmission lines generate only very-low-frequency electromagnetic fields that do not affect living beings, which is why they are referred to as non-ionising, which means that they cannot break down the molecules in the body or affect the body's cells.

Are electromagnetic fields a hazard?

No. Electricity and magnetism are present on planet Earth and in all living beings, as well as in the environment around us. Human activities, both domestic and industrial, generate these phenomena at different frequencies. In our daily lives, we are all constantly exposed to electric and magnetic fields (EMFs). We all sleep and wake up to the sound of an alarm clock or mobile phone beside us, we switch on the toaster, the electric heating, the coffee machine, the washing machine, the dryer, the vacuum cleaner, the air conditioning or the microwave. We are all exposed to fields from train overhead lines or underground railways, car engines, computers and copying machines. All this equipment must comply with legislation, as do RNT power lines.

Do the power lines cause cancer?

After more than 40 years of exhaustive studies on this subject in various countries, the World Health Organisation (WHO) states that there is no consistent evidence showing a link between power transmission lines and cancer in humans or animals.

Is there a possibility of developing other diseases?

All possibilities of a link between exposure to EMFs and various types of cancer, cardiovascular disease, depression, suicide, infertility and miscarriage, among others, were studied. After multiple international studies, most scientists find no valid link between these conditions and EMFs. As REN is not a health authority, more detailed information or opinions on this matter can be obtained from the Portuguese Directorate-General for Health (DGS).

There are several studies and questions about the risk of EMFs.

Who should I believe?

All transmission and distribution power lines, including electrical installations in our homes, produce electromagnetic fields, as do mobile phones, microwaves, washing machines and electric shavers. If you have any questions, please contact the Portuguese Directorate-General for Health (DGS) or consult the World Health Organisation (WHO) website. Despite extensive international research, there is no evidence that exposure to electromagnetic fields (EMF) within the recommended limits poses any health risks.

REN measures the intensity of EMFs around its power lines whenever requested, in order to verify its compliance with legislation, in addition to the regular monitoring it carries out along the power lines.

What is the MEDEA project?

REN seeks to inform all those interested in this topic and supports a number of programmes to this end, such as the MEDEA Project (medea.spf.pt), which is sponsored by the Portuguese Physics Society (SPF), and encourages secondary school students to carry out projects on measuring very-low-frequency electromagnetic fields at their school, at home, and in the vicinity of power transmission lines, and to seek scientifically credible information on the possible effects of these fields on human health.

Do power lines make noise?

Power transmission lines can produce a noise that is similar to a slight humming sound. This sound results from a physical phenomenon called the “corona effect”, and is detectable in wet weather, fog, rain or light wind. The power lines are always designed to minimise this phenomenon and to ensure that the sound emitted complies with all legal limits.

What should I do if the noise bothers me?

If you notice that this type of noise seems to be above normal levels, you should report it on the REN website at ren.pt. We will respond immediately to the incident, measure the noise level at the site and, if values that do not comply with legislation are confirmed, we will proceed to correct them. Power lines operating at 150 kV and 220 kV generate noise levels below 30 decibels, while a 400 kV line produces around 40 decibels (a quiet room typically registers about 30 decibels, and an ordinary conversation can reach approximately 65 decibels).

5. Exposure limits for electromagnetic fields (EMFs)?

What are the limits recommended by international organisations?

In 1998, the International Commission on Non-Ionising Radiation Protection (ICNIRP) recommended 5 kV (kiloVolt per metre), as the maximum electric field strength, and 100 μ T (microtesla), as the maximum magnetic field strength, regardless of distance and exposure time. These values are also used by the World Health Organisation (WHO) and proposed in European Council Recommendation No. 1999/519/EC. In 2010, taking into account the latest findings on the subject, the ICNIRP revised its recommendations (available on the ICNIRP website at icnirp.org), indicating 200 μ T (microtesla), which further reinforces the safety of European legislation.

How were the reference values established?

The WHO conducted an exhaustive survey of credible studies on the effects of EMFs, taking into account the most vulnerable segments of the population, such as children, the elderly and the sick, and identified exposure levels likely to cause undesirable biological effects. The reference levels were obtained by applying a safety factor of 50 (reference values 50 times safer than this threshold).

Does REN comply with the law?

Always. All RNT power lines strictly comply with Portuguese law and European Union (EU) and World Health Organisation (WHO) recommendations, and this compliance is verified by the competent authorities.

What values can we find in everyday life?

The magnetic field of a 220 kV power line, at a distance of 30 metres, is around 2 μ T (microtesla), four times lower than the magnetic field of a washing machine, at 30 centimetres, which is around 8 μ T (microtesla).

How far away should I be from a transmission power line?

Health safety is not determined by distance, but by the measurable values of the electric and magnetic fields. On 220 kV power lines, minimum distances to the ground of 12 metres are ensured, while on 400 kV power lines the minimum distance is 14 metres. In Portugal, compliance must be and is ensured throughout the entire easement, even directly beneath the power lines.

I feel uncomfortable when I walk past a power line. What could it be?

In certain situations, for example under overhead power transmission lines, some people may feel electrical charges and notice that their hair stands on end. This situation does not pose any risk. It merely causes some discomfort, which disappears as soon as they move away.

How is compliance with legal limits verified?

During the design phase, calculations are made regarding the expected values of the electromagnetic fields generated by the power line in operation, which are subsequently confirmed by measurements. Measurements are carried out by accredited entities, whenever requested, to verify the proper operation of the power line and that the values generated by the electromagnetic fields are in accordance with those calculated during the design phase and in compliance with legal requirements.

I saw someone on television holding a fluorescent lamp under a wire, and it emitted light. I was very surprised. Is there really any risk?

No. A fluorescent lamp may emit a slight glow as a result of the normal electromagnetic field generated under a power transmission line, simply because the current excites the fluorescent gas inside the lamp, just as might happen if the same person were standing near a car when the engine is started. This is a normal, purely electrical phenomenon with no consequences for human or animal health.

If I have a pacemaker, can I walk under a power line?

Yes, you can. As a precaution, doctors advise people with implanted electronic devices, especially first-generation pacemakers, to avoid exposure to power lines. If it occurs, it causes discomfort that disappears as soon as the person moves away from the power line.

Do the power lines interfere with my radio, television or mobile phone reception?

No. Transmission lines are designed to avoid interference with radio, television and mobile phone signals.

Do power lines capture lightning strikes?

No. Power transmission lines do not increase the likelihood of lightning strikes during thunderstorms. However, the power lines may act as lightning rods for houses located beneath their axis, as the supports are excellent conductors of lightning to the ground, protecting people, houses and wooded areas.

Are domestic animals at risk under a power line?

No. Animals can move around and graze peacefully under a power transmission line. Scientific studies have found no link between magnetic fields and adverse effects on health or fertility in grazing animals.

6. Which is the best solution: overhead power lines or underground cables?

Do underground power lines have the same flexibility as overhead power lines?

No. Underground cables must be installed in trenches on public roads that will not undergo any changes in route in the long term or, alternatively, on expropriated private land, with any construction or economic use being prohibited. REN's access to the entire route must be guaranteed without any restrictions.

Are underground cables more advantageous than overhead cables from a safety perspective?

No. In both cases, all rules and regulations must be complied with to ensure the safety of people and property.

Are underground power lines more expensive than overhead power lines?

Yes. On average, they can be ten times more expensive than overhead power lines.

What is the practice in other countries?

Throughout the world, the installation of underground cables is an exception used only in very specific situations (e.g., in the vicinity of airports and especially in consolidated urban areas). Worldwide, only 1% of power lines above 220 kV are buried.

7. Crossing private property:

How can you find out if a power line will run across your property?

In cases where there is an Environmental Impact Assessment, the first point of contact between local communities and a power transmission line project occurs through public consultation carried out by the Portuguese Environment Agency. This is the appropriate forum for citizens to consult technical documents and the planned route, as well as to make comments or suggestions about the project. In cases where there is no public consultation, the communication is made through notices posted in local authorities and announcements in newspapers and in Diário da República, the Portuguese Official Gazette, providing information regarding the intent to establish administrative easements.

What information do you receive from REN?

REN will provide you with information regarding the area of your property covered by the easement; the encumbrances and restrictions to which your property is subject; the trees that will have to be felled; the quantities and characteristics of the poles to be installed on your property (where applicable); the amount of compensation proposed by REN (where applicable); REN's contact details so that you can seek clarification for any questions you may have.



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