ELECTRICITY TRANSMISSION NETWORKS

Generality

1. Electricity transmission networks include transmission lines and their grip, substations and access roads maintenance. Lines consist mainly of conductor cables, pylons and shrouds.

2. The voltage and capacity of transmission lines determine the size of these key elements. The structure of the towers, for example, is directly related to the voltage and the required capacity of the line. These can be simple constructions of wood poles in the case of transmission lines to low voltage up to 46 kilovolts (kV). Wood towers are used for H-shaped transmission lines whose voltage varies between 69 and 231 kV and freestanding steel constructions for simple lines 161 kV or more. Up to 1,000 kV trans-mission lines are possible.

3. Transmission lines can range from several kilometers to hundreds of kilometers in length. The ROW in which the transmission line is constructed can range in width from 20 meters to 500 meters or greater depending upon the size of the line and the number of transmission lines located within the ROW.
   Transmission lines are primarily overland systems and can be constructed to span or cross wetlands, streams, rivers, and near shore areas of lakes, bays etc. Underground transmission lines are technically feasible but are very expensive:

Potential Environmental Impacts

4. Electric power transmission lines are linear facilities that will affect natural and sociocultural resources. The effects of short transmission lines can be localized; however, long transmission lines can have regional effects. In general, the environmental impacts to natural, social, and cultural resources increase with increasing line length. As linear facilities, the impacts of transmission lines occur primarily within or in the immediate vicinity of the ROW. The magnitude and significance of the impacts increase as the voltage of the line increases, requiring larger supporting structures and ROWs. Operational impacts also increase. For example, electromagnetic field (EMF) effects are significantly greater for 1,000-kV lines than for 69-kV lines.

5. Negative environmental impacts of transmission lines are caused by construction, operation and maintenance of transmission lines. Clearing of vegetation from sites and ROWs and construction of access roads, tower pads, and substations are the primary sources of construction-related impacts (see Table 10.2 at the end of this section for a summary of all potential impacts). Operation and maintenance of the transmission line involves chemical or mechanical control of vegetation in the ROW and occasional line repair and maintenance. These, plus the physical presence of the line itself, can be a source of environmental impact.

6. On the positive side, power line ROWs, when properly managed can be beneficial to wildlife. Cleared areas can provide feeding and nesting sites for birds and mammals. The "edge" effect is well-documented by biologists; it describes the increased habitat diversity resulting at the contact between the ROW and the existing vegetation. Power lines and structures can serve as nesting sites and perches for many birds, especially raptors.

Special Issues

Effects on Land Use

7. Electric power transmission lines have the greatest impact on land resources. A dedicated electric power transmission line ROW is required. Grazing and other agricultural uses are usually not precluded in ROWs, but other uses are generally not compatible. Although ROWs are not generally very wide, they can interfere with or fragment existing land uses along the ROW. Long transmission lines will affect more areas and result in more significant impacts.

8. Transmission lines can open up more remote lands to human activities such as settlement, agriculture, hunting, recreation, etc. Construction of the ROW can result in the loss and fragmentation of habitat and vegetation along the ROW. These effects can be significant if natural areas, such as wetlands or wild lands are affected, or if the newly-accessible lands are the home of indigenous peoples. :

Clearing and Control of Vegetation in Rights-of-Way

9. A variety of techniques exist for clearing vegetation from the ROW and controlling the amount and type of new plant growth. From an environmental point of view, selective clearing using mechanical means or herbicides is preferable and should be evaluated in project EAs. Broadcast aerial spraying of herbicides should be avoided because it affords no selectivity, releases unnecessarily large amounts of chemicals into the environment, and because it is an imprecise application technique, may result in contamination of surface

waters and terrestrial food chains, as well as elimination of desirable species and direct poisoning of wildlife.

Health and Safety Hazards

10. The installation of lines at low altitude close to places of human activities (eg. Roads or buildings) increases the risk of electric shock. In general, the technical standards of design and installation limit this risk. Pylons and transmission lines may affect air traffic around airports and pose a danger to aircraft flying at low altitude, especially aircraft serving agricultural management activities.

11. The electricity transmission lines create electromagnetic fields. Electric and magnetic fields lose intensity as it moves away from the lines. Although the scientific community does not agree entirely on the issue of biological effects of electromagnetic fields, the findings suggest that there may be health risks exist.

Induced Development

12. Depending on their location, the lines can generate induced development on land adjacent to the grip or those become available. In areas that do not have sufficient resources or housing allowances cleared can become prime locations for illegal constructions which, in turn, lead to new environmental impacts, overload local infrastructure and services collective. It is not unusual to see people moving along the power lines carrying on business. This exposes a number of increasingly important to electromagnetic effects or risk of electric shock

Table: Electricity distribution networks

Potential negative impacts		Mitigation measures
indirect impacts		
1	Vegetation degradation, habitat loss and invasion of exotic species along the ROW, access roads and around substations	• Use appropriate clearing techniques (e.g. Manual rather than mechanical clearing). • Maintain a natural ground cover within the lines. • Replant disturbed areas. • Check the right-of-way to maximize the benefits for wildlife
2	Fragmentation and degradation of habitat.	• Determine the route of the grip to avoid natural areas, such as wilderness areas and sensitive habitats. • Protect habitats (e.g. Natural vegetation) below the lines. • Take the necessary steps to avoid an obstacle to natural fire regime
3	Easy access to wilderness.	• Install allowances avoiding sensitive natural areas. • Develop plans for the protection and management of these areas. • Use discontinuous roads maintenance.

4	Runoff and sedimentation caused by the leveling of access roads, the erection of towers and construction of substations, alteration of hydrological regimes caused by road maintenance.	• Locate the grip so as not to affect water bodies, floodplains and wetlands. • Install sediment traps or screens to control runoff and sedimentation effects. • Minimize the use of backfilling. Use many culverts. • Design drainage ditches to protect surrounding land.
5	5 Loss of use of land and displacement of the population due to the erection of towers and construction of substations.	• Locate the grip to avoid resource cultural and agricultural. • Adopt tower designs that reduce standards ROW width required and that have the least possible land uses. • Adjust the length of the spacing of the towers to reduce their impacts. • Organise relocations according to Bank procedures.
6	Chemical pollution from chemical maintenance techniques	• Use mechanical clearing techniques, animal grazing or selective chemical applications. • Select herbicides with minimal side effects. • Do not use the aerial spraying of herbicides. • Maintain naturally low vegetation along the ROW.
7	Dangers to the birds because of the presence of the line and tower.	• Select the location of the grip so that it does not disturb the habitats of birds or air routes used by birds. • Install towers and lines in minimizing the risk to birds. • Establish deflector coils in places where birds can collide with the lines.

8	Airplane accidents caused pat pylons and lines.	• Locate the grip to avoid flight paths of airports. • Install markers to minimize the risk to aircraft at low altitude.
9	Effects caused by electromagnetic fields.	• Locate the influence in a place that does not affect human activities.
10	Degradation of cultural and aesthetic visuals accordingly building sites.	• Install the grip to avoid sensitive areas which include tourist and scenic sites. • Erect green screens to conceal the facility. • Select structures and aesthetically appropriate materials. • Use of lower voltages, use of DC systems or buried cables to reduce or eliminate the visual impacts of lines, structures and rights of way.
Indirect impacts		
1	Development induced during construction and around the construction.	• Provide very detailed plans which answers to the problem of induced development are made. • Provide facilities to reduce demand. • Provide technical assistance in planning and control to local communities.
2	Increasing access to wilderness areas.	Locate the grip away from the wilderness. • Establish a system controlling access.

Alternatives to projects

13. The assessment of impacts on the environment should include an analysis of reasonable alternatives so that the ultimate goal of the project, which is to supply electricity to places that need it, can be achieved. The analysis may show that these solutions are the ecological point of view, sociocultural and economic, more acceptable than the originally proposed project. The following solutions are among the possibilities to consider :

- The option of doing nothing to address the capacity ;
- choice of voltage lines ;
- distribution lines direct current (which way are closer) ;
- sources of electrical energy alternatives;
- construction of smaller and closer to demand power plants to replace the transport of large quantities of electricity ;
- plans for energy management and demand in order to reduce the additional demand ;
- improvement of existing facilities ;
- alternative routes and other locations of substations ;
- underground transmission lines ;
- other construction methods, taking into account their cost and reliability ;
- other tower design and alternative materials (eg structures of wooden poles , steel or aluminum structures , etc. . .)
- Other designs and technical maintenance of roads.

14. It is essential to consider the alternatives with regard to the route of the line and the location of substations. Indeed, the careful determination of the influence of the line and the location of substations can help minimize, if not avoid, many negative impacts that the lines of electricity on the environment.

Management and Training

15. The choice of route is the hardest and most difficult decision to make when it comes to build and operate a line of electricity transmission. The engineers working on the project should work with environmental scientists to determine the route of the line and develop mitigation measures. A training program for operation of electricity transmission lines safe for the environment can be justified if the staff does not have sufficient knowledge and experience. The main areas of expertise required for the environmental management of electricity transmission lines are those related to the assessment of environmental and social impacts. It may, moreover, it is not necessary to provide a training and management for the environment regarding interviewing techniques of-way, including the proper use of chemicals and mechanical clearing .

16. The training program should be part of the assessment of environmental impacts of the project and count on the participation of the consultant environment. The staff of the contractor for the project dealing with environmental issues should, if possible, participate in the evaluation of environmental impacts. This would allow a better understanding of aspects of the project that affect the environment. It is indeed essential that staff know the purpose of mitigation and monitoring measures recommended and might have to be implemented.

17. Local, regional and national agencies involved in the assessment and approval of the project may also need training to monitor and ensure compliance with regulations during the construction and operation of the transmission line to electricity.

Management and Tracking

18. The conditions for the monitoring of a proposed power transmission lines depend on the one hand , the kind of environmental resources that are affected and , secondly , the importance of the impacts that ' they undergo . Monitoring of construction may be necessary to avoid impacts on land use or the environment and to ensure that recourse to appropriate mitigation measures. The monitoring of these impacts will be short (eg. Few weeks) , and progress with the construction of the line. This monitoring may become more important when it comes to cross bodies of water or wetlands, or approaching wilderness or cultural sites. It will be made from an inspection of materials, construction methods and mitigation measures. The right of way maintenance operations must also be monitored so as to ensure that use of appropriate methods of vegetation control, monitor the invasion of exotic species and order to support any decision that would result in benefits for wildlife.