CHAPTER 1. DESCRIPTION OF THE PROJECT

CONTENTS

1 GENERAL BACKGROUND INFORMATION

1.1 Introduction

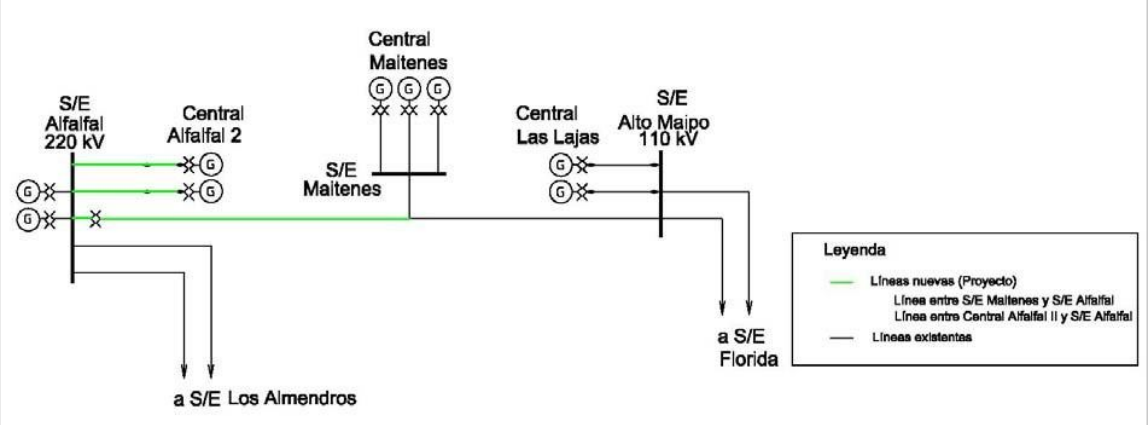
AES Gener S.A. evaluates the project "Electric Transmission Lines S/S Maitenes – S/S Alfalfal and Alfalfal II Power Plant – S/S Alfalfal", through this Environmental Impact Assessment (to be explained in the following lines); from now on "The Project", consisting of 2 electric transmission lines of 17,1 kms. total extension, will connect the Central Interconnected Grid Las Lajas and Alfalfal II, power plants, both approved by PHAM Project, through the Special Resolution N°256/09, March 30, 2009.

Likewise the electric transmission system is made up of 2 lines:

- Line between S/S Maitenes and S/S Alfalfal: 110 kV circuit and 7,6 kms long
- Line between Alfalfal II Power Plant and S/S Alfalfal: 2 circuits of 220 Kv and 95 kms long.

The Project will make use of the current transmission line between S/S Alto Maipo and S/S Maitenes for the connection of Las Lajas Power Plant.

Chart-1 Diagram of the electric system involved



Source: AES Gener S.A.

The lines between S/S Maitenes and S/S Alfalfal will be entirely constructed as well as between the latter one and Alfalfal II Power Plant, from the tranches previously indicated. The existing segment between S/S Alto Maipo and S/S Maitenes will be used to connect the energy of Las Lajas power plant.

Likewise, the Project also includes the expansion of the existing S/S Alfalfal, in 0.45 has to carry out the corresponding connections between the new transmission lines.

The project will be located in San José de Maipo district, Cordillera province, Santiago Metropolitan Region, at the interior of property (ROL N° 300-06) of National Assets.

Considering the information previously indicated, the Project needs to be registered into the System of Environmental Impact Evaluation, according to:

- Letter b) from article 10, Law N° 19,300 and Letter b) from article 3, from the Regulation System of Environmental Impact Evaluation (D.S. Nº 95/01l MINSEGPRES), because it corresponds to a new high voltage electric transmission line and to the expansion of S/S Alfalfal and

- Letter p) article 10, Law N° 19,300 and letter p) from article 3 Regulation System of Environmental Impact Evaluation (D.S. Nº 95/01 - MINSEGPRES), because it is a project to be developed in an Area of Tourist Attraction (according to D.L. Nº 1.224), under official protection.

1.2 Name of the Project

The name of the Project is "Electric Transmission Lines S/S Maitenes – S/S Alfalfal II — S/S Alfalfal".

1.3 Owner's Information

Owner:	AES Gener S.A.
ID:	94.272.000-9
Telephone:	686.89.00
Fax:	686.89.91
Address:	Mariano Sánchez Fontecilla N° 310 3rd Floor, Las Condes,
Santiago Legal Rep.:	Juan Ricardo Inostroza López
ID:	7.838.601-0
Telephone:	680.48.63
Fax:	680.48.18
Address:	Jorge Hirmas Nº 2960, Renca, Santiago.

1.4 Objective of the Project

The Project "Electric Transmission Lines S/S Maitenes – S/S Alfalfal and Alfalfal II Power Plant – S/S Alfalfal" aims to authorize and approve the electric connection of PHAM Project, specifically of Alfalfal II and Lajas power plants to the Central Interconnected Grid.

1.5 Project Location

The whole Project will be developed in San José de Maipo District, (Cordillera province), which belongs to Santiago Metropolitan Region.

The approximate coordinates UTM (Datum PSAD56 Meridian 19), for locating the Project are as follows:

Chart 1-1 Project location Data

Tower/Vertexes	UTM Coordinates/Datum PSAD56 Meridian 19	
	East	North
Transmission Line between S/S Maitenes y S/S Alfalfal		
Tower 20	382914	6289490
Tower 21	382998	6289576
Tower 22	383211	6289546
Tower 23	383556	6289498
Tower 24	383916	6289657
Tower 25	384103	6289739
Tower 26	384332	6289840
Tower 27	384424	6289881
Tower 28	384684	6289995
Tower 29	384936	6290106
Tower 30	385214	6290135
Tower 31	385624	6290176
Tower 32	385807	6290346
Tower 33	385968	6290463
Tower 34	386199	6290703
Tower 35	386538	6290974
Tower 36	386718	6291112
Tower 37	387140	6291262
Tower 38	387381	6291356
Tower 39	387538	6291417
Tower 40	387782	6291541
Tower 41	388037	6291602
Tower 42	388292	6291664
Tower 43	388525	6291721
Tower 44	388841	6291771
Tower 45	388920	6292042
Tower 46	388961	6292391
Tower 47	389064	6292538
Tower 48	389175	6292774
Frame	389230	6292780
Transmission Line between Alfalfal II Power Plant and S/S Alfalfal		
Frame	385243	6287124

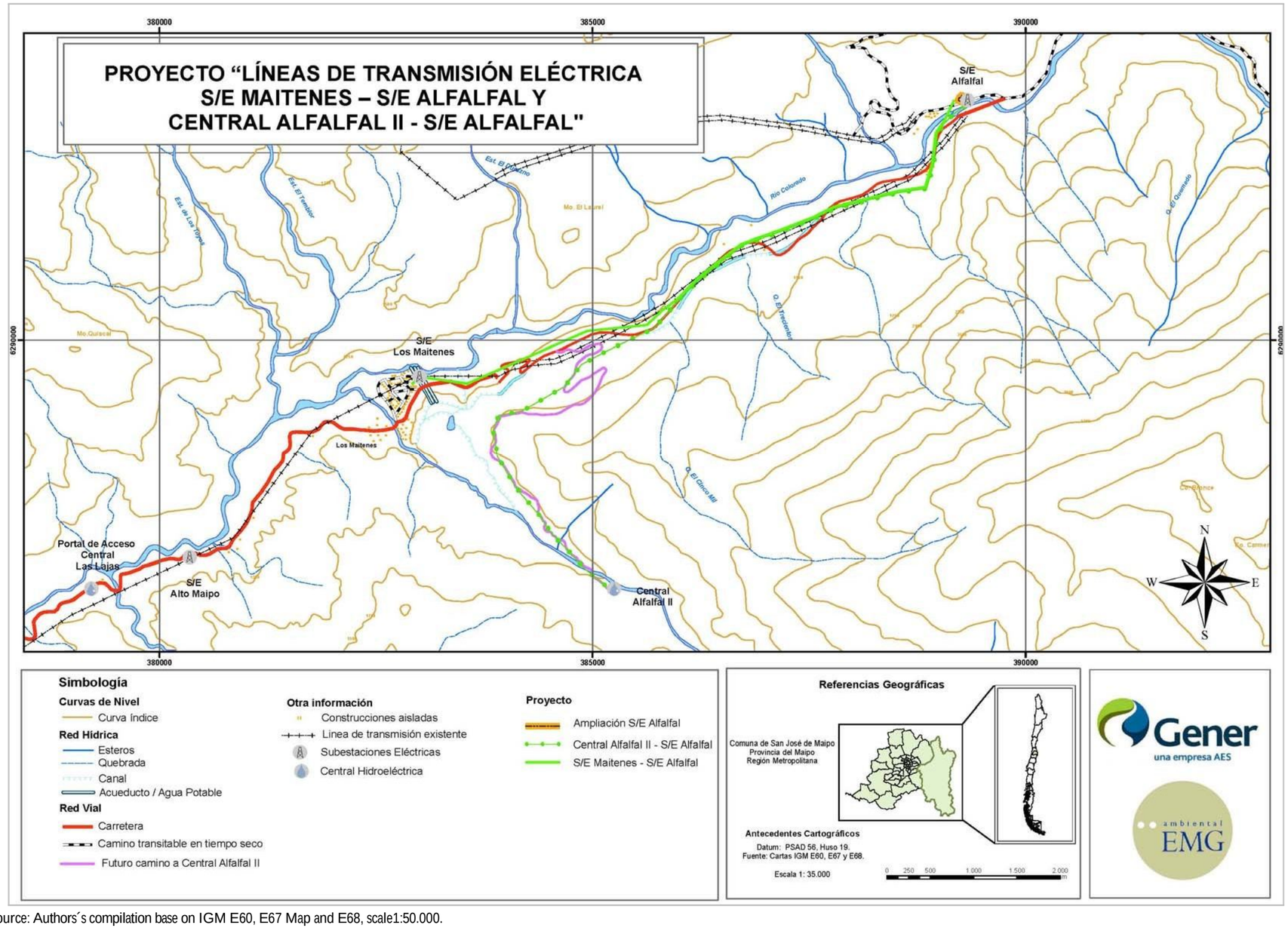
Tower/Vertexes	UTM Coordinates Datum PSAD56 Meridian 19	
	Este	Norte
Tower 1	385140	6287165
Tower 2	384889	6287374
Tower 3	384700	6287581
Tower 4	384489	6287812
Tower 5	384364	6287998
Tower 6	384110	6288298
Tower 7	383901	6288655
Tower 8	383851	6288964
Tower 9	383916	6289131
Tower 10	384190	6289183
Tower 11	384672	6289464
Tower 12	384870	6289717
Tower 13	385129	6289859
Tower 14	385343	6289963
Tower 15	385714	6290142
Tower 16	385983	6290450
Tower 17	386214	6290687
Tower 18	386549	6290954
Tower 19	386727	6291095
Tower 20	387147	6291243
Tower 21	387389	6291337
Tower 22	387546	6291398
Tower 23	387788	6291521
Tower 24	388032	6291580
Tower 25	388285	6291642
Tower 26	388529	6291701
Tower 27	388857	6291753
Tower 28	388940	6292039
Tower 29	388981	6292384
Tower 30	389069	6292514
Tower 31	389194	6292631
Tower 32	389350	6292748
S/S Alfalfal Expansion		
Vertex 1	389261	6292827
Vertex 2	389249	6292798
Vertex 3	389234	6292804
Vertex 4	389220	6292772

Tower/Vertexes	UTM Coordinates / Datum PSAD56 Meridian 19	
	East	North
Vertex 5	389317	6292730
Vertex 6	389343	6292791
Vertex 7	389332	6292796

Source AES Gener S.A.

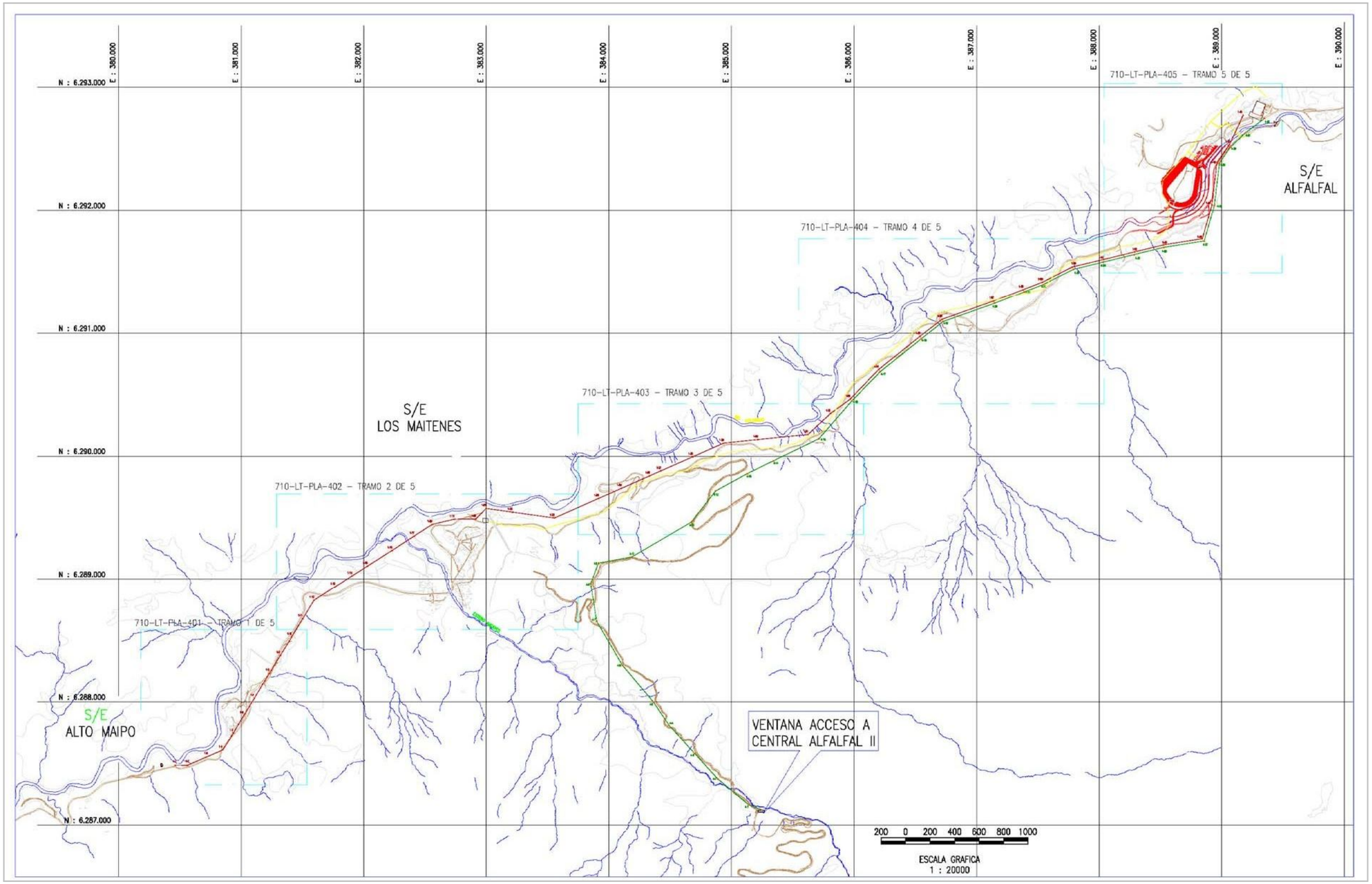
The following diagrams present the location and Project layout; the Project details are shown on appendix 1.

Diagram 1-2 Project Location



Source: Authors´s compilation base on IGM E60, E67 Map and E68, scale1:50.000.

Diagram 1-3 Project Layout



Source: AES Gener S.A.

1.6 Fundamentals of the location

The Project Location is due to the need of transporting the generated energy through the future Las Lajas and Alfalfal II power plants, which belong to AES Gener S.A. (part of the PHAM Project) in order to inject the generated energy into the Central Interconnected Grid

The final layout of the tranche was decided upon different location variables taking into account minimizing impact and the natural features of the Area. Thus the tranche was established near existing public roads (future access road to Alfalfal II Power Plant[1]), using strips of land already intervened and avoiding proceedings to obtain authorization of new access roads for the construction of Towers.

Likewise, the general criteria considered for the location of the Project were as follows:

- The areas close to highway administration locations were prioritized and also the existing paths, as well as the areas previously intervened for Tower location.
- The location of structures was set up, preferring areas with no natural vegetation under conservation.

1.7 Project Area

The total area that the Project covers is of 61,25 has, from which the useful area that the construction engineering works comprises will be of 1,35 has, distributed as follows:

- Electric Transmission Structures: the Project includes an Area of 0,9 has for the location of its 61 Towers[2].
- Substation: It is only considered the expansion of S/S Alfalfal, which corresponds to an Area of 0,45 has.

The remaining Area, corresponds to the restriction strip of both lines, equivalent to 59,90 has. This strip includes the pruning of trees, according to the distance established in NSEG 5 /71 Regulations and under forestry criteria.

1.8 Investment

The total investment to carry out the engineering, procurement, operating license, construction, assembly, tests and initiation of project operations is of about US$ 13,000,000.

[1] This road was environmentally evaluated based on PHAM Project.

[2] It has been considered to use an Area of 12*12 m for each tower.

1.9Manpower

Following, is the presentation of the estimated manpower for the project, during the construction and operations phases.

1.9.1 Construction Phase

The qualified and non-qualified manpower required for the lines construction corresponds to an average of 80 workers, with 90 at the most, working together during the different construction phases. The greatest number of manpower will be hired for the execution of structure foundations, organized in teams of 11 workers as the largest number.
In connection with the expansion operations of Alfalfal Substation, estimations indicate that the largest number of workers required will be of 50 people per month, which means an average number of 35 workers per month.

The following chart specifies the expertise area of staff required for the Project construction phase.

Chart 1-2 largest number of estimated personnel required per expertise area, during the different Project construction phases.

Activity	Personnel	Amount
Topography	Topographer	1
	Building Supervisors	2
Ground movement – excavations	Daily workers	20
	Foremen	2
	Machine Operators	2
Foundations	Carpenters	8
	Ironmongers	6
	Daily workers	15
	Foremen	3
Assembly of Structures	Structure Assembly Specialists	10
	Daily Workers	6
	Foremen	2
Compact landfills	Daily workers	4
Conductor Wiring	Daily workers	10
	Machine Operators	2
	Foremen	1
Conductor Tensioning	Line Specialists	4
	Daily workers	4
Equiment Assembly (S/S)	Daily workers	8
	Wire Fencing Specialists	5
	Electric Technicians	3

Activity	Personal	Amount
S/S Start-Up	Technical Staff	3
	Wire Fencing Specialists	5
Administration	Project Administrator	1
	Technicians	2
	Warehouseman	1
	Administrative Staff	3
	Daily Workers	5

Source: AES Gener S.A.

1.9.2 Operations Phase

The operations of the transmission lines will be carried out remotely, from AES Gener' s Power Dispatch Center, located at Renca Power Plant, nevertheless in case of unpredicted failure during transmission, operations will be carried out automatically at the terminal substations of each line, through automatic checking equipment, withdrawing from services the failed tranche and informing automatically about the wrong operations to AES Gener and SIC Central Grid.

AES Gener S.A. has a specialized Transmission System Operations Unit. The Unit is made up of two maintenance areas, one designed for substations and the rest for transmission lines. This Unit is in charge of an Electric Transmission Expert who is responsible for the maintenance of the whole electric transmission system of the company.

Maintenance operations will be performed by staff who currently executes these activities for the rest of the lines and substations of AES Gener, so that there will be no more new staff hired, associated to the Project operations. Likewise, S/S Alfalfal will not require additional workers for its operations, once the expansion has been completed

1.10 Useful Life

The expected useful life for the Project "Electric Transmission Lines S/S Maitenes – S/S Alfalfal and Alfalfal II Power Plant – S/S Alfalfal" has been estimated in 50 years. By the end of the period, the equipment and transmission system will be renewed, if these have deteriorated or are performing inefficiently.

1.11 Activities Timetable

The start-up of the Project operations has been programmed for the first semester of the year 2013.

The following chart specifies activities required to carry out the Project.

Chart 1-4 Project Timetable

Source: AES Gener S.A.

2 DEFINITION OF PHASES, ACTIONS AND CONSTRUCTION ACTIVITIES THAT THE PROJECT INCLUDES:

This Project is about the construction of two electric transmission lines and the expansion of S/S Alfalfal in three segments of 220 kV and 110 kV segments, including the setting up of a 110/220 kV transformer (300 MVA) to enable the circuit connection, from S/S Alto Maipo.

The transmission line will have an extension of about 17.1 kms, from which:

- The first line, between S/S Maitenes and S/S Alfalfal, of 7.6 kms long, involves the construction of one circuit line and two conductors per phase, with a 110 kV rated voltage, and a transportation capacity of 300 MVA; a restriction strip of 30 mts. width is required.

- The second line between Alfalfal II Power Plant and S/S Alfalfal of 9.5 kms long, corresponds to a double circuit line, of one conductor per phase with a 220 kV rated voltage and a transportation capacity of 300 MVA; a restriction strip of 40 mts is required.

By this way, the projected transmission lines will have the basic characteristics indicated in the following chart:

Chart 1-3 Characteristics of projected transmission lines

Parameter	Projected Lines	
	Line between S/S Maitenes and S/S Alfalfal	Line between Alfalfal II Power Plant and S/S Alfalfal
Rated voltage (kV)	110	220
Highest voltage (kV)	123	245
Nº of Towers	29	32
Insulator levels (on air) mm/kV	20	20
Rated frequency (Hz)	50	50
Number of Circuits	1	2
Number of phases	3	3
Conductor numbers per phase	2	1
Line length (km)	7,6	9,5
Insulator type (mm/kV)	20	20
Basic impulse insulator level (BIL)	550	1050
Conductor highest temperature (°C)	80	60

Source: AES Gener S.A.

It is important to point out that the design of the transmission line will agree with the latest publications of the following Rules and/or Regulations:

- Chilean legislation in force.
- Fuel and Electricity Superintendence.
- NSEG 5 En 71 Electric Assembly & Installation Regulations – High Voltage Electric Current.
- NSEG 6 En 71 Crossing & Parallel Positioning of Overhead Lines.
- Technical Rules: Security and Quality Service.
- ANSI: American National Standards Institute.
- ASTM: American Society for Testing and Material.
- IEC: International Electro Technical Commission.
- IEEE: Institute of Electric and Electronic Engineering.
- ASCE: Handbook N° 52 "Guide for Design of Steel Transmission Tower".

2.1Description of Line Components

The Project will contain tower structures of simple circuit and 2 aluminum conductors per stage for the line tranche between S/S Maitenes and S/S Alfalfal; for the line tranche between Alfalfal II Power Plant and S/S Alfalfal Power Plants, the Project includes a double circuit and an aluminum conductor per phase.

The characteristics of the Project conductors are described as follows. These include: overhead ground conductors (which include fiber optics) cables, structures and insulators employed:

2.1.1 Conductor

The main characteristics of the conductor to be employed are indicated in the following chart:

Chart 1-4 Characteristics of Conductors according to Project Lines:

Parameter	Projected Lines	
	Line between S/S Maitenes and S/S Alfalfal	Line between Alfalfal II Power Plant and S/S Alfalfal
Material	Aluminum alloy (AAAC)	Aluminum alloy (AAAC)
Gauge (MCM)	800	740.8
Cross Section (mm^2)	405.4	375.4
Total cross sectional area (mm)	26.1	25.1
N°of threads	37	37
Thread diameter (mm)	3.73	3.59
Unit weight (kg/m)	1112	1030
Breaking strain (kN)	117	108
Power/ Current Capacity a 80ºC (A)	760	717
Coefficient **of** thermal expansion	6140	6140
Modulus of elasticity	0.000023	0.000023

Source: AES Gener S.A.

2.1.2 Overhead Ground cable

The main characteristics of overhead ground cable, which includes fiber optic are shown as follows:

Chart 1-5 Overhead Ground Cable Characteristics Employed in the Project

Parameter	Projected Lines	
	Line between S/S Maitenes and S/S Alfalfal	Line between Alfalfal II Power Plant and S/S Alfalfal
Type	OPGW	OPGW
Nº of fibers	24	24
External Material	Steel and aluminum threads	Steel and aluminum threads
Diameter (mm)	12.9	12.9
Total section (mm^2)	100	100
Unit weight (kg)	588	588
Breaking strength (kg)	9400	9400
Discharge coefficient /1 sec (kA)	8	8
Thermal expansion (1/°C)	$13.8*10^{-}$	$13.8*10^{-}$
Modulus of elasticity (kg/mm^2)	13927	13927

Source: AES Gener S.A.

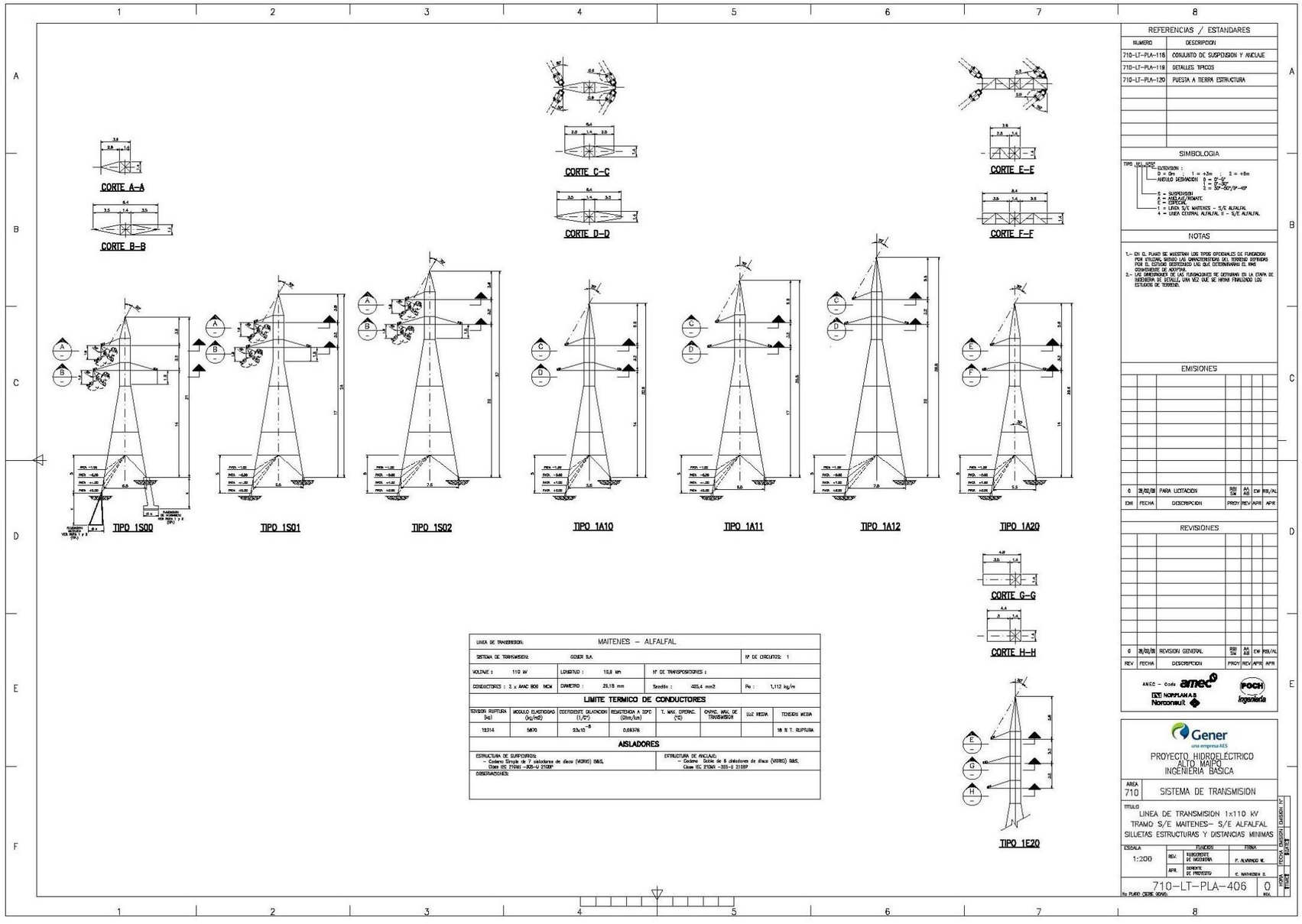
2.1.3 Suspension and Anchoring Structures

There will be two basic types of structures: suspension and anchoring, the decision of using each of these will be based on the need of employing anchoring towers at their endpoints, each time the line forms a non-extended angle and also because of the ground topography. Likewise, the structures will present height variations to adapt these differences to the ground configuration (look at structure diagram, Appendix 1)

The suspension and anchoring structures will be different for each projected line, in fact chart 1-5 presents the profile of structures, which will be employed for the 110 kV tranche (line between S/S Maitenes and S/S Alfalfal); while chart 1-6 presents the profile of structures to be employed for the 220 kv tranche (line between Alfalfal II Power Plant and S/S Alfalfal).

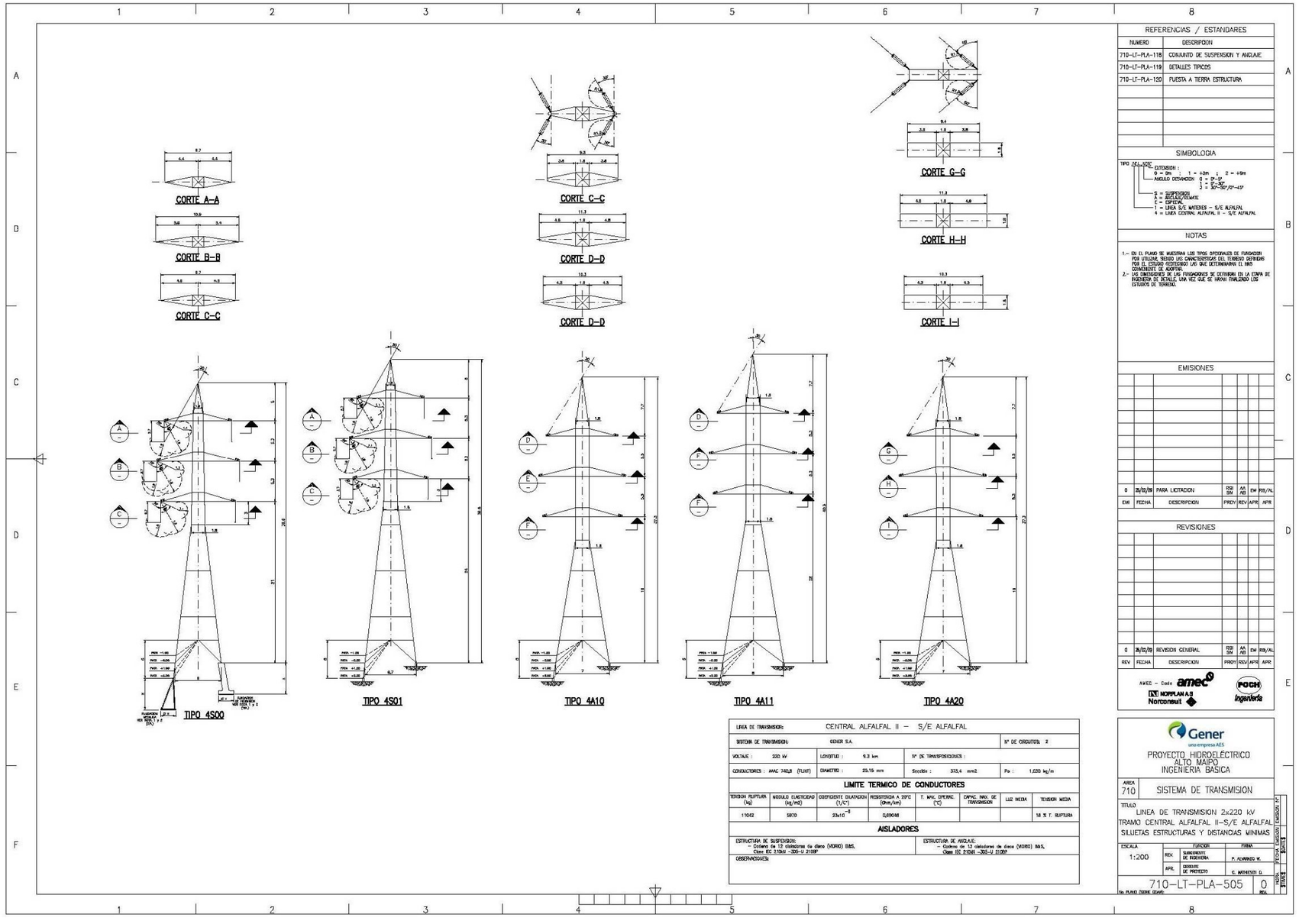
The total Towers width of the line located between S/S Maitenes and S/S Alfalfal will be of 8.4 mts at the cross bracing and with a maximum length of 7.5 mts at the base. The greatest width of line Towers, to be developed between Alfalfal II Power Plant and S/S Alfalfal, will be of 11.3 mts at the cross bracing and of 8.0 mts at the base.

Chart 1-5 Anchoring and suspension structures. 110 kV lines, S/S Maitenes – S/S Alfalfal tranche



Source: AES Gener S.A.

Diagram 1-6 Anchoring and suspension structures. 220 kV line, Alfalfal II Power Plant – S/S Alfalfal tranche



Source: AES Gener S.A.

2.1.4 Insulators

The insulators included for each insulation type required are shown as follows:

Chart 1-6 Summary of insulators required according to the type of insulation for each line

Parameter	Projected Lines	
	Line between S/S Maitenes and S/S Alfalfal	Line between Alfalfal II Power Plant and S/S Alfalfal
Insulation due to atmospheric overvoltage	6 disc insulators	11 disc insulators
Insulation due to switching overvoltage	7 disc insulators	14 disc insulators
Insulation due to leakage distance in insulators	8 insulators	17 insulators
Suspension chain insulation	8 insulators	17 insulators
Anchoring chain insulation	9 insulators	18 insulators

Source: AES Gener S.A.

In addition, lightning arresters will be installed at the line endpoints to avoid the spreading of wave discharges towards equipment and insulated cables which are beyond endpoints.

2.2 Restriction Strip

According to established regulations: NSEG 5 EN 71 and complying with PRMS (1994), the restriction strip width in relation to the activities developed under the transmission line is determined by:

- Cross bracing width
- Maximum arrow
- And the effect caused by the wind shift over the conductor and suspension chains, when these are included.

The restriction strips according to regulations and previously calculated are presented in the following chart. These strips consider the greatest temperature the conductor and environment can reach and also the span of greater length in each tranche.

Chart 1-7 Restriction strip according to tranche

Parameter	Projected Lines	
	Line between S/S Maitenes and S/S Alfalfal	Line between Alfalfal II Power Plant and S/S Alfalfal
Highest spans (m)	448	558
Maximum arrows (m)	14,3	19,4
Calculated strip (m)	29,88	39,6

Source: AES Gener S.A.

Bearing in mind the information previously presented, restriction strips according to tranche will be defined as follows:

- For the projected line between S/S Maitenes and S/S Alfalfal (110 kV) the rerouting of conductors have been considered; these are under highest wind speed, with a 30° angle in relation to the vertical and the greatest length of insulating chains, for suspension structures, plus available arrow of 14.3 mts at the span of greater length. Likewise the restriction strip width was defined of 30 mts for the span of greater length

- With respect to the line to be developed between Alfalfal II Power Plant and S/S Alfalfal (200 kV), the rerouting of conductors has also been considered, under highest wind speed with a 30° angle in relation to the vertical, and the greatest length of the insulating chains, plus available arrow of 19.4 mts for the span of greater length. Likewise the width of the restriction strip was defined of 40 mts for the span of greater length.

2.3 Distance to conductor

The distances considered are:

- Minimum distance to structures.
- Phase-to earth distance
- Minimum distance from conductor to ground.

Each of these are described as follows:

2.3.1 Minimum distance to structures

The minimum distances to structures are determined by article 105, of NSEG En 71 Regulation, which defines a minimum distance of 68 cms for 110 kV lines and of 68 cms to 134 cms for 220kV lines. These will be the minimum distances to consider for the new lines.

The Project has been designed for a 1.30 mts distance for the 110 kV tranche and of 2.60 mts for the 220 kV tranche, distances by far greater than the ones stipulated by the Regulation. These distances consider a 30° rerouting at insulators, caused by the wind at suspension structures.

2.3.2 Phase to earth distance

There are 3 main criteria to determine the minimum phase to earth distance in structures:

- National Regulatory System, according to article 105, NSEG 5 En 71 Regulation.
- Overvoltage at industrial frequency
- Overvoltage caused by switching.

According to the above information, the minimum distances can be summarized in the following chart:

Chart 1-8 Minimum Phase to Earth Distances

Condition	Suspension 110 kV	Suspension 220 kV	Anchoring 110 kV	Anchoring 220 kV
Phase to phase – horizontal	7.8 m	7.8 m	10,8 m	11,4 m
Phase to earth	1 m	1.5 m	1.4 m	2.5 m
Phase to phase - vertical	3.75 m	6 m	3.75 m	6 m

Source: AES Gener S.A.

2.3.3 Minimum Distance from Conductor to Earth

The minimum free height from conductor to earth will be established by NSEG 5 En 71, article 107, shown in the following chart:

Chart 1-9 Minimum Distance from conductor to earth

Condition	Distance NSEG 5 En 71	
	110 kV Line	220 kV Line
Land not suitable for traffic	6.66 m	7.32 m
Land suitable for traffic and secondary roads	7.16 m	7.82 m
Main road	7.16 m	7.82 m

Source: AES Gener S.A.

To calculate the distance of the conductor to the ground, the conductor was at its highest temperature, at highest current conditions circulating through it, with 35°C room temperature, at sites with les 1.000 msnm and with 30°C temperature in areas located above sea-level (1,000 msnm). This conductor temperature will be of 80°C for the110 kV tranche and of 60°C for the 220kV tranche, (to calculate the distance).

In addition, this calculation considered the conductor elongation, influenced by the "Creep" which is the elongation of aluminum conductors when these are subjected, under long periods of time to permanent tension at its endpoints, as is the case of overhead lines when elongation increases the arrow of conductors. This "Creep" will be calculated for a 10 year period, which is the time defined by international standards when the total elongation is in fact caused by this phenomenon.

It is important to point out that the topography of this area and the height of new Towers (3 different heights have been designed) will make the conductor, even at its lowest performance; remain over the minimum distance, bearing in mind the conditions previously described.

Thus conductors will remain much higher during the normal operation of lines, having the capacity to approach the minimum distance established, only during emergency periods and after 10 years of operations.

If by any reason, a conductor with a different performance, due to a manufacturing fault, after 10 years of operations, approaches the minimum distance or clearance established, the conductor will gain tension until reaching the values required by regulations under excessive conditions, which has been previously indicated.

2.4 Crossings

2.4.1 Crossings with other Overhead Lines

The line projected presents crossings with the overhead transmission line of 12 kV: Maitenes – Alfalfal, owned by AES Gener S.A. The minimum vertical distances for the crossing of overhead transmission lines, of a different kV are presented in the following chart:

Chart 1-10 Minimum Vertical Distances for the Crossings of Overhead Transmission Lines of a Different kV

Transmission Line 23 KV	Distance to Tower*	Vertical Distance (m)	
		Transmission Line of 110 kV	Transmission Line of 220 kV
Crossing with Line of 12 kV	< de 50 (m)	2.22	2.86
Crossing with Line of 12 kV	< 50 (m) y > 100 (m)	3.37	3.01

Note: * It refers to the distance between the crossing point and the nearest structure to the superior line/line above.

Source: NSEG 6 En 71 Art. 31.

For the calculation of these distances /clearance, the line above will include its maximum arrow; with the highest conductor temperature considered in the Project, and the "Creep" effect over 10 years at the direction of conductors; the line below will be considered to be de-energized for the calculation of its minimum arrow.
The distances previously indicated, will increase according to pylon location at the worksite and to instructions indicated in article 31, topic 2 of NSEG 6 En 71.

2.4.2 Crossings with Different Infrastructure Types

The projected lines present crossings and interferences with other existing installations, among which it is important to point out roads and rivers.
The 110 kV line that will be established between S/S Maitenes and S/S Alfalfal, presents the following crossings, between the specified Tower structures:

- Tower 24 and Tower 25, Alfalfal Road (Route G-345).
- Tower 25 and Tower 26, Alfalfal Road (Route G-345).
- Tower 32 and Tower 33, Alfalfal Road (Route G-345) and medium voltage line (AES Gener S.A.).
- Tower 34 and Tower 35, Alfalfal Road (Route G-345).
- Tower 36 and Tower 37, Alfalfal Road (Route G-345).
- Tower 37 and Tower 38, with medium voltage line (AES Gener S.A.).
- Tower 39 and Tower 40, Alfalfal Road (Route G-345).
- Tower 45 and Tower 46, Alfalfal Road (Route G-345).
- Tower 46 and Tower 47, Alfalfal Road (Route G-345) and with Colorado River.

On the other hand, the following elements will present crossings: the line that will be established between Alfalfal II Power Plant and S/S Alfalfal of 220 kV:

- Tower 15 and Tower 16, Alfalfal Road (Route G-345).
- Tower 19 and Tower 20, Alfalfal Road (Route G-345).
- Tower 20 and Tower 21, with medium voltage line (AES Gener S.A.).
- Tower 22 and Tower 23, Alfalfal Road (Route G-345) and with medium voltage line (AES Gener S.A.).
- Tower 31 and Tower 32, Colorado River

The diagrams with these crossings are presented on Appendix 1, where one can confirm the fulfillment of NSEG 5 En 71 regulations: "High-Voltage Current Installations" and NSEG 6 En 71 regulation: "Crossings and Parallel Positioning of Electric Lines."

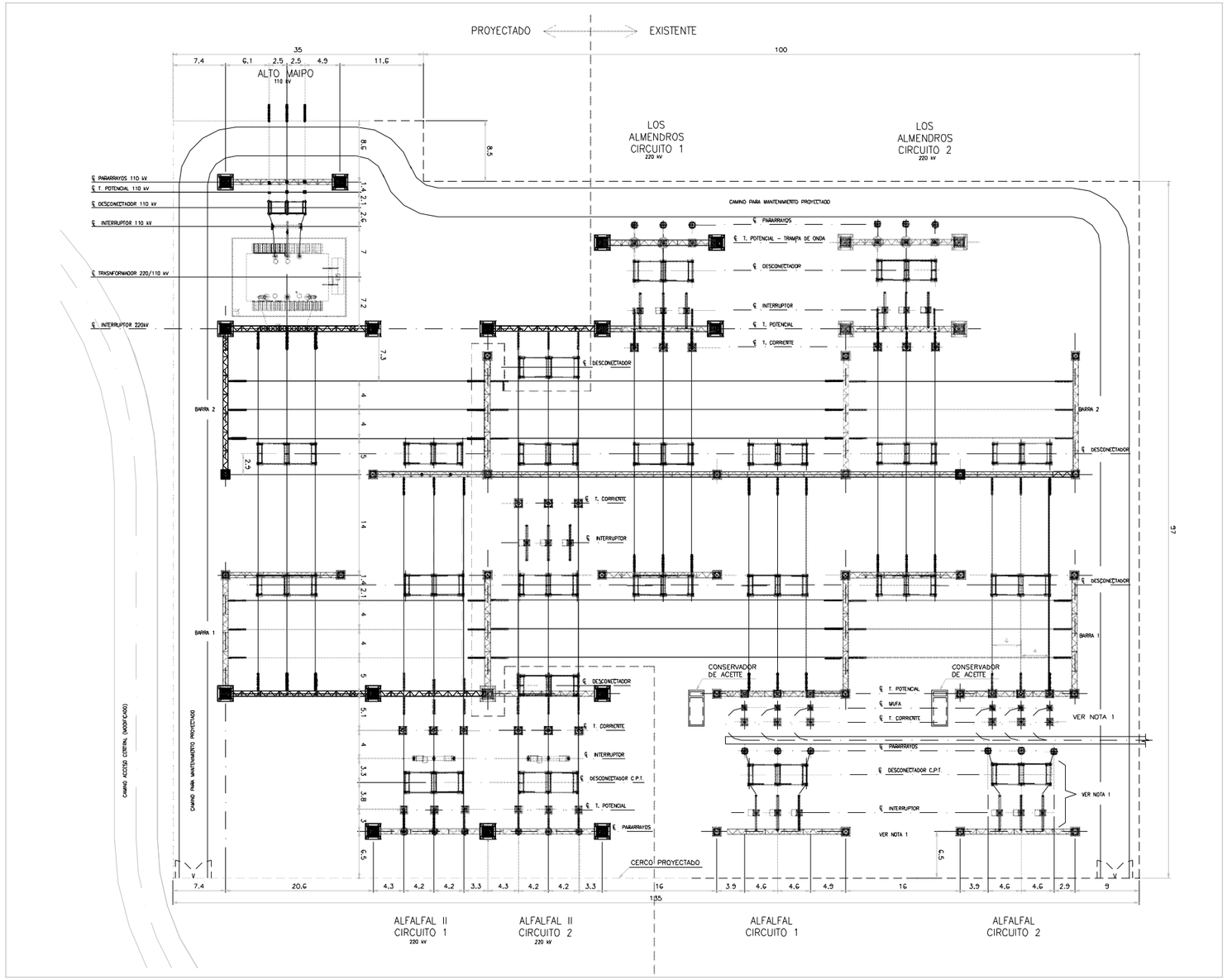
2.5 Parallel Positioning with other Overhead Lines

Parallel Positioning with the lines established between Alfalfal II Power Plant and S/S Alfalfal, and between S/S Maitenes and S/S Alfalfal with other lines, and between both lines, correspond to components connected in parallel, between lines owned by the company. By all means, the Project will fulfill the restrictions established by NSEG 6 En 71 regulations.

2.6 Description of the Segments Related to S/S Alfalfal Expansion

Alfalfal Substation will be expanded considering 3 fragments of 220 kV, one fragment of 110 kV and a power three-phase transformer of 110/220 kV and 300 MVA (OFAF). The following diagram presents the location of transformers considering the existing fragments.

Chart 1-7 Expansion layout - S/S Alfalfal



Source: AES Gener S.A.

The description of each adjustment on S/S Alfalfal is presented as follows:

- **220 kV Equipment**

The adding up of three fragments of 220kV is included, these fragments will be similar to the existing ones and each one will have the following high voltage equipment:

- 220 kV circuit
- Two disconnectors or isolator switches of 220 kV with ground connection, (only for the line fragments).
- Three transformers of power measuring (one per phase).
- Three transformers for current measuring (one per phase, only in line fragments), and
- Three lightning arresters (one per phase).

- **110 kV Fragment Equipment**

- 110 kV circuit
- 110 kV disconnector with ground connection,
- three transformers for measuring voltage (one per phase),
- three lightning arresters (one per phase), and
- One transformer of 110kV/220 kV of 300 MVA.

The high voltage gear will be the common used for these type of voltages, with isolating elements of higher leakage distance than the standard, as the substation is located at 1,300 msnm.

In addition, it is necessary to expand the substation structures to have room for new equipment, including concrete foundations, wire extension on cable duct and undergrounding grid, as well as overhead grid, expansion of perimeter fence, stringing of new control cables and supervision equipment, measurement, protection and control; this equipment will be mounted at the existing control building of Alfalfal Power Plant (next to S/S Alfalfal).

The 110kV/220kV transformer will have as key characteristics the following:

- Power: 180/230/300 MVA
- Cooling System: ONAN / ONAF 1 / ONAF 2
- Tension Power: 220/110 /12 kV
- Phases: three
- Frequency: 50 Hz
- Connectors: Y and d

- Transformer taps/ primary 1 5
- Maneuver impulse: 460 (220), 275 (110), 34 (12) kV peak value
- Atmospheric impulse: 1050 (220), 650 (110), 125 (12) kV peak value

The values within brackets correspond to the rated voltages of coils.

- Transportation weight 140,000 kg.
- Weight of oil 65,000 kg.
- Total weight 232,000 kg.

The transformer will be mounted in a concrete base with perimeter dike and a well to prevent possible oil spillage; this well will be of embedded concrete with the adequate capacity according to what has been established in D.S. Nº 148/03.

In addition, a fire wall will be built (to delay the action of fire) to protect the rest of the facilities against fire.

3 DESCRIPTION OF CONSTRUCTION PHASE

There follows the description of construction activities for the new lines, which are presented separately from S/S Alfalfal expansion operations:

It is also described for the whole project the characteristics of service roads, transportation, accommodation, catering, equipment and machinery, consumption services and supply sources, work schedule, wastewater treatment, waste management and security conditions.

The project will not require the fitting out and authorization of new worksite areas, because it will make use of the worksite facilities 4: Aucayes, under the PHAM Project, i.e. offices, canteens, workshops, warehouses as well as storing supplies and waste material rooms, among others. Likewise, the Project will also make use of the facilities located at Alfalfal Power Plant area. These sites will be provided with the necessary equipment to comply with D.S. N° 594/00 regulation.

3.1 Line Construction Activities

The construction of the projected lines includes the activities listed as follows and described next:

- Worksite definition.
- Reassessment of line structure.
- Removal and cleanup of structure assemblies.
- Ground movement /excavations
- Construction of foundations.
- Landfill and compaction (for levelling construction sites).

- Assembly
- Approval of strip restriction (if necessary).
- Stringing and tensioning of conductors.
- Finishings.
- Testing and start-up.
- Demobilization

3.1.1 Worksite Definition

The construction activities of new lines will be carried out at different worksites, which in this case correspond to the sites where the construction operations will be executed, i.e. the Tower location areas.

The worksite will have an extension somewhat superior to 3 kms, calculated between the reassessment, which is the initial activity and the assembly of structures.

The construction phase includes different worksites (reassessment, excavations, and landfill, among others), where the different teams will work in sequence, according to the progression of the different construction phases. The worksite details are presented according to activity in the following chart:

Chart 1-11 Worksites for the construction of projected lines.

Activity	Worksites
Structure reassessment	1
Excavations	3
Foundations	1
Landfill	2
Towers installation and assembly	2
Approval of restriction strip	1
Stringing and tensioning of conductor	2
Testing	1
Start-up	1

Source: AES Gener S.A.

3.1.2 Reassessment of line Structures

The reassessment of structures is the initial activity for the construction of the projected lines and aims to define the location on site of each structure through pylons that point out the Tower center, the line axis and the perpendicular axis to the line axis. The axis will be signaled at least with two pylons at each side of the main pylons.
The team in charge of the Project revision is made up of a Topographer and two Project Supervisors and will be provided with a vehicle for the transportation of personnel within worksites. The vehicle will remain at the site surroundings during the development of activities, bearing in mind the

contingency of an accident.

3.1.3 Site Clearance: removal of structure assemblies

Once the construction site for foundations has been identified, there follows the site clearance for the assembly of structures. Previous to this activity, it is necessary to rescue the vegetable species, mainly bushes, which will be transplanted at the Tower surroundings (look at procedure in Appendix 2). It is important to point out that this action will not harm natural species under protection.

3.1.4 Ground Movement

During the construction phase of the Project, there will be no relevant ground movements. Only the necessary excavations will be carried out for new structure foundations and for the fixing of ground meshes.

Estimations suggest a total amount of 1,300 m3 of excavated material, for the foundations and line ground meshes; approximately 50% of the material will be reused for the foundations landfill, the rest of the material, compact and uniform, will be distributed along the site surroundings, so as not to alter the original land topography, as well as the existing vegetation species.

The excavations will require 8 people and 1 Foreman for each worksite. The worksites at the lines will be provided permanently with a vehicle for executing the supervisions on site.

3.1.5 Construction of Foundations

The Tower foundations of the new line will be separate from each structure outrigger. The suspension Towers foundation, for each outrigger will be around 1.4 mts deep and its base will be of approx. 1.0*10 mts for the tranche structures, which will be established between Alfalfal II Power Plant and S/S Alfalfal; and of 1.5 mts deep and an approx. base of 1.1*1.1 mts at the tranche, which will be developed between S/S Maitenes and S/S Alfalfal.

The largest foundation (anchoring Tower) will be around 2.4 mts deep and its base of approx. 1.7*1.7 mts at the tranche between Alfalfal II Power Plant and S/S Alfalfal, and will be of 2.5 mts deep and a 1.8*1.8 mts base at the tranche between S/S Maitenes – S/S Alfalfal.

Considering the installation operations on flat ground, the intervened area at the base of each Tower will reach 12*12 mts, considering the temporary pile of material from the excavation, later to be used as landfill for the foundation, while the remaining material will be delivered, compact and homogeneous at the worksite surroundings.

Estimations indicate the construction of three foundation types: reinforced concrete footing, concrete block anchors and galvanized concrete steel. By the end of the foundations construction, the area will keep its original conditions and will be free of waste material.

i) Reinforced Concrete Footings Foundation-Type

These foundations have been considered for easy access places, soft soils excavations or soils showing meteorized rocks. The foundations will be carried out making an excavation of adequate dimensions; a concrete footing foundation-type will be constructed at the excavation bottom, this will have the same dimensions of the plant excavation, from which a reinforced concrete pedestal rises, projected in 20 to 60 cms, depending on the soil topography over the adjacent area. A galvanized steel shape will be inserted within de pedestal, from which the Tower will subsequently connect.

The following activities will be performed to construct the mentioned foundations:

- Lean concrete base
- Steel frame assembly
- Formwork
- Assembly of the first Tower platform
- Topographers and related staff verify the exact position of the foundation
- Use of concrete.

Once excavations have been completed and/or the material excavated adjusted, at those places where the detail design specifies, there follows the lean concrete base, which consists of a thin coating of concrete of low shrinkage, to seal the base of leaks and or protect the foundations base.

The total volume of concrete to be employed per foundation will be of 2.9 m3 for suspension structures and of 6.5 m3 at the outriggers and finishings for both line tranches. According to the progress achieved during the installation of foundations, of approx. 6 Towers per week, a cement mixer truck will have to make 5 weekly trips at the most. In very special cases, it could be necessary to prepare concrete, with mixer trucks, with mixture previously prepared. In this case, the floor will be protected with a plastic cover in order to avoid any marks of spillage. In addition, all materials used will be returned to the site installation area to avoid any mixture remains on the floor.

The type of foundation chosen will enable the pre-assembly of frameworks for suspension structures, at workshops. This activity will be limited on site, whenever it may be possible, so as to mount the framework by means of a portal crane in a truck that will transport it. This will enable the building of a unique metal mold that can easily be assembled on site. All of these activities aim to decrease the number of personnel at worksites.

The concrete will be acquired at certified plants of the Region, to be sent in cement mixers (trucks).

ii) Concrete Block Anchors Foundation-Type

The trusses on wall foundations will consist on clearing the site of loose material until reaching the "healthy" rock in each Tower outrigger.

Once the clearing site is performed, there follows the drilling for the anchored bars, which will be of 3 to 6 mts deep, in the rock, depending on rock quality and Tower type, the drilling activities will be carried out by a mechanic method based on compressed air.

After the drilling, comes the assembly of bars which will be coated with a mixture of low shrinkage concrete.

After the bars have been assembled, a rebar will be mounted at the superior endpoints of bars and a formwork; the concrete will be poured to join the elements of the rock with the Tower anchored bar.

In those places where there exists a natural roof cover, sensitive to erosion along the years, because of construction of foundations, there are a number of measures considered to stabilize and renew the site to bring it into conditions similar to those before construction.

iii) Galvanized Concrete Steel Foundation-type

Contractors can utilize grid -type foundations for places of very difficult access; AES Gener should previously approve the places in which there is the need to employ these foundations as well as their design.

Basically, the grid replaces the concrete footing and concrete pedestal for a galvanized steel structure, so as to replace the concrete in places of difficult access.

3.1.6 Landfill Compactions

Compact landfills are required at Tower foundations: suspension, anchoring and finishings as well as for excavations for the grounding grid. This activity includes the removal of the formwork from the foundation.

The compaction team should have 8 workers, one Front Loader and one Tanker Truck. In order to remove formworks, a Carpenter and an Assistant are required.

After compaction, the remaining landfill material is spread over the surrounding area of the Towers.

3.1.7 Assembly

Structure assembly of new lines will be usually performed, with the support of mechanical equipment.

A total amount of 450 tons of structure will be assembled. On the other hand, the mounting of the insulator chains, will be carried out with the help of mechanical equipment (hoist).

720 insulator chains will need to be assembled at projected high voltage lines at a frequency of 40 chains per day. A team of two Installation Specialists, three Assistants and two Pre-Assembly Specialists is required.

3.1.8 Restriction Strip Authorization

The Project estimates for this tranche, the authorization of a restriction strip of 30 and 40 mts (between S/S Maitenes and S/S Alfalfal for the first measurement and between this and the last and Alfalfal II Power Plant, for the second). This will consist in a controlled pruning and under forestry criteria. This proceeding and estimations are detailed on Appendix 2. This pruning will consider the minimum distances indicated in article 111, Regulation SEG NSEG 5 En 71."

In addition, and with the purpose of protecting and preserving the natural characteristics of the area covered by the Project, there are a number of measures considered in relation to construction activities and management criteria of existing resources, which are presented on Appendix 2.

3.1.9 Stringing and Tensioning of Conductors

The planning of Engineering Works implies an average progress of 4 kms per week for the stringing of conductors and the overhead cable of new lines. This operation requires 12 workers, especially during the stringing of conductors.

3.1.10 Finishings

This activity includes line inspection to detect any detail requiring repair, as well as to verify that the line is free of any problems so as to be energized.

3.1.11 Testing and Start-Up

Once all construction and works on site have been completed, testing required to verify the correct operation of new lines will take place.

3.1.12 Demobilization

Once construction activities have been completed, all waste will be cleaned as well as minor elements remaining near structures and worksites, which had not been removed during the execution of the Project (look at waste management, section 3.10, and pages 1-38). The rest of wires and steel will be available for commercialization or otherwise they will be transported to a certified dumping site, together with the construction waste that cannot be re-used for their final use.

The Technical Inspection and Supervision (TIS) will supervise that the Contractor removes the rest of material from the construction site.

3.2 S/S Alfalfal Expansion Activities

The expansion of S/S Alfalfal will be performed after the construction initiation of both lines; once the construction of expansion operations is completed, both projected lines will be connected.

Likewise, S/S Alfalfal expansion includes the following:

- Reassessment
- Construction of foundations
- Assembly of structures and equipment
- Finishings
- Testing and Start-Up
- Demobilization

In this case, workers will use the premises at Alfalfal Power Plant.

3.2.1 Reassessment

The reassessment aims to define the location of each new equipment at the substation, defining also each of the fragments that composes it. The reassessment of structure foundations and equipment of

the substation will be performed with a Topographer and 2 Building Supervisors.

3.2.2 Foundation Construction

The structure foundations for the expansion of S/S Alfalfal will be of concrete-footing (look at description, section 3.1.5i, pages 1-29) and of adequate dimensions for the different structures; the proceeding for the construction of these foundations will be similar to what has been described for the concrete footing foundations of lines; manual methods will be mainly employed, whenever it is possible.

3.2.3 Structure and Equipment Assembly

The assembly of structures and equipment at S/S Alfalfal will be carried out with the support of mechanic equipment, such as cranes, front loaders and others; a crane of medium-sized ton will be used with the only exception of the mounting of the 110/220 kV transformer, which requires a high-ton crane, because of its size.

During the first phase, the whole expansion structure will be assembled, followed by high voltage cables and their respective insulators, but without connecting them to the existing ones. To connect the new structures and equipment with the existing ones, the substation area will be de-energized to avoid accidental hazards due to electrocution.

Subsequently, follows the assembly of equipment, low voltage conductors for supervision, control and protection; the equipment will be gauged and adjusted.
Finally, the expansion area of the substation, once completed, will be electrically connected to the existing systems.

3.2.4 Finishings

This activity includes the inspection of the substation to detect if there is any detail that requires repair, as well as to guarantee it is free of any obstacles for its powering.

3.2.5 Testing and Start-Up

Once the whole project has been completed, there follows the testing required to guarantee the right functioning of substation lines.

3.2.6 Demobilization

Once all Works have been completed at the substation and having checked its correct operation (read above), we will continue with site cleaning, removing all waste and minor elements that might have been left near the structures.

The Technical Project Supervisor (TPS) will manage and control that the Contractor remove the construction waste.

3.3 Service Roads

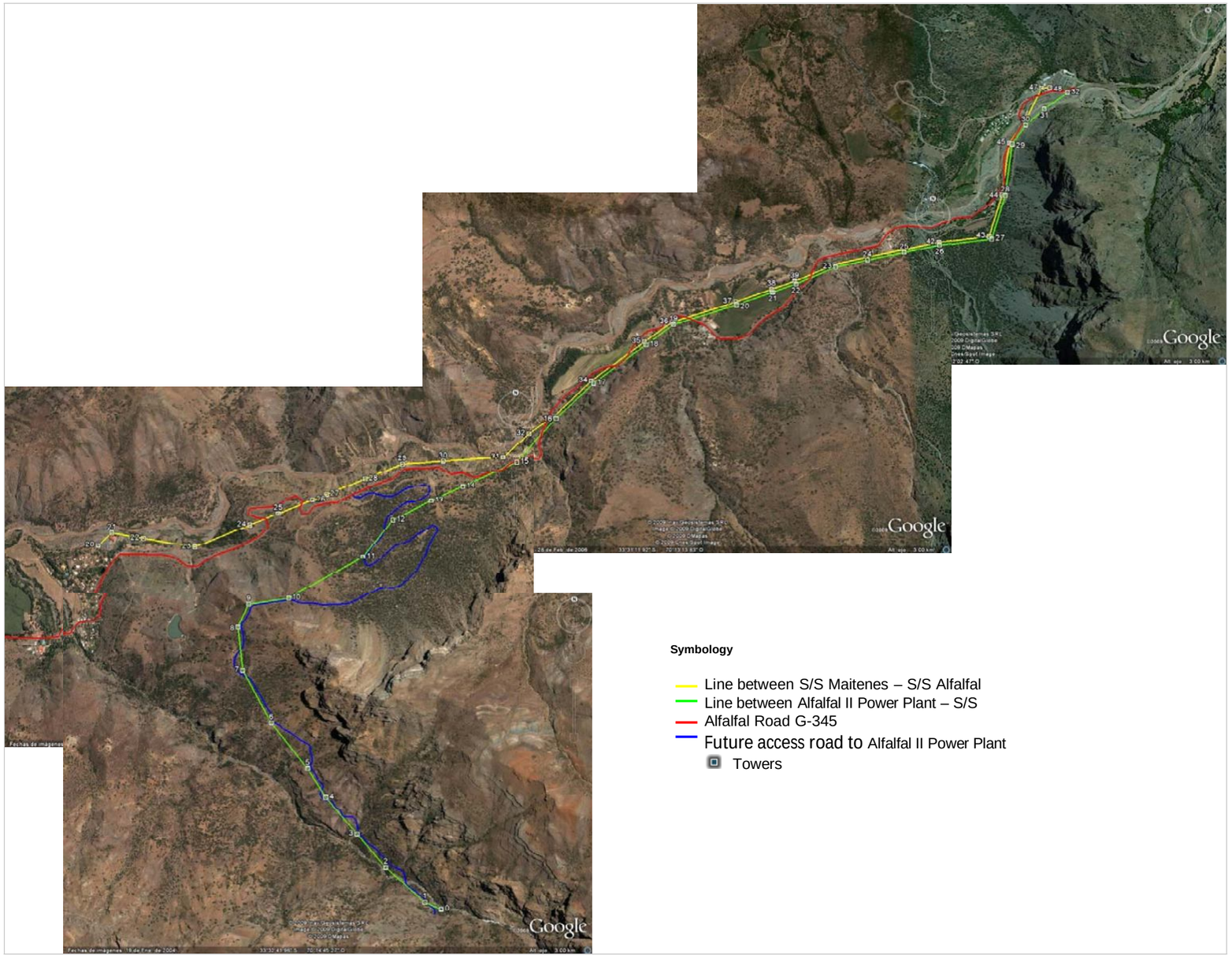
During the construction phase of new lines and S/S Alfalfal expansion, structures will be accessed

through the main roads, i.e. Route G-345 and later by the access road to Alfalfal II Power Plant. Diagram 1-8 shows the proximity to the Towers designed by the Project with respect to public roads formerly mentioned.

If it is not possible to access the projected site for the construction of structures, through the roads formerly mentioned, mainly Route G-345, and the future access road to Alfalfal II Power Plant, the transportation of structure and other material will be carried out by animal-drawn process, using the existing traces, and avoiding by this way the opening of new paths and roads in the area.

The planning of the Project involves a team in charge of the permanent removing and cleaning of all waste or wrapping bits and pieces of wires, insulators and hardware.

Diagram 1-8 Roads and Access paths to the Towers



Source: In-house elaboration based on Google Earth.

3.4Tranportation

This Project considers two transportation procedures: the first is from the contractor´s warehouse to the stock-pile area, located at Alfalfal Power Plant premises. The transportation will be performed through the main roads of the existing network, preferably with 28 ton trucks.

Subsequently follows a second transportation method, the in-house transportation, a programmed and coordinated process towards worksites, so as to circulate mainly through access roads directly to structures. (Route G-345 and future road to Alfalfal II Power Plant).

The following chart summarizes the total traffic flow associated to the Project construction phase, bearing in mind the new lines and expansion of S/S Alfalfal.

Chart 1-12 Project Flow at G-25 and G-345 Roads. Critical day. *(one way direction road)

Type of vehicle		Daily flow	Schedule flow	Schedule flow rounded (trucks)
Trucks	Structures and conductors**	22	2.2	3
	Concrete transport truck	1	0.1	1
	Wet cycle	1	0.1	1
Buses***		4	4	4
Vans		4	4	4

Note: the critical day corresponds to the day when the complete structure and connectors are transported altogether from San Antonio harbor to the stock-pile area of Alfalfal Power Plant.

**Semi-trailer trucks of 28 tons capacity are employed for the transportation of structure and conductors.

*** Both buses and vans remain at the premises during working time, so they only carry out one-way trip during the morning and one back in the afternoon.

Source: Ambitrans
Ingenieros Consultores Ltda.

The circulation of trucks will comply with the statement on the Exemption Decree N° 130 (Special Decree) established by San José de Maipo Municipality.

3.5 Accommodation & Catering

As worksites are close to Santiago, the contractor´s personnel will travel every evening from the worksite to Santiago, so there will be no need of in house accommodation for personnel at worksites.
Meals will be prepared in shifts at the Camp 4 canteen of PHAM Project (located at UTM E: 384,850 and: N: 6.289.400, datum PSAD56); likewise whenever it is necessary, the canteen, located at Alfalfal Power Plant, will be used (located at UTM E: 388,710 y N: 6.292.000, datum PSAD56).

3.6 Equipment and Machinery

The main equipment and machinery employed in the construction of new lines and S/S Alfalfal expansion includes: buses for the transportation of personnel, vans for inspections onsite, as well as for waste transportation, trucks for supplies, compressors and concrete-crushing machines for excavations, a concrete mixer, hoists and brakes for conductor stringing, front loader for the movement of debris, backhoe excavator for soft and accessible soils and finally, minor equipment such as blades, spikes, pulleys, hoists and smaller tools.

The following chart shows estimation on the number of equipment and machinery to be employed for the Project construction and assembly

Chart 1-13 Type and number of machinery to be employed during the construction phase.

Activity	Machinery	Number
General	Buses	4
	Vans	3
	Trucks	3
Excavations	Backhoe excavator	1
	Compressors	2
	Concrete-crushing	10
Concrete	Cement mixer (truck)	1
	Compressor	1
Landfills	Compressor	2
	Backhoe excavator	1
Conductor stringing	Hoist and brake	1

Source: AES Gener S.A.

It is important to point out that during the Project construction phase, the maintenance of machinery will not be carried out within the construction area or at worksites, since these will be regularly performed outside the worksite at a repair center. If there was the need of repairing a machine on site, because of an unforeseen situation, this will be done, avoiding any type of oil, lime and fuel spillage; if there was waste spillage, these will be controlled with sand, which will be transported to the area from Camp 4 (PHAM Project) or from Alfalfal Power Plant premises, (depending on the proximity to the damaged area). The contaminated sand, wiping cloth and pieces will be transported to certified places (yard-waste management of hazardous-waste, area at Camp 4 of PHAM Project) and subsequently removed by specialized companies.

3.7 Consumables and Supply Sources

3.7.1 Water

i) Drinking Water

Water supply will be delivered differently according to the location of the worksite. In fact, personnel working at S/S Alfalfal will obtain drinking water from the same Plant. On the other hand, personnel located at the lines worksites, will be daily provided with drinking water in sealed containers coming from the premises of Alfalfal Power Plant. For both cases, the water quality will comply with what has been established in NChN°409.

ii) Water for industrial use

During the construction phase, water for industrial use will be employed, mainly for concrete preparation at worksites, so there will be an estimated consumption of 6 m^3/day when there is need of preparing concrete.

The transportation of industrial water will be carried out with a tanker truck with 208 lts capacity, which will be transported from Camp 4 (PHAM Project) or from Alfalfal Power Plant facilities (depending on the worksite closeness to one of these facilities). Once the tank water has been used, it will be returned to its original place or transported to a different worksite that requires water.

3.7.2 Fuel

All vehicles (including vans, buses and trucks) will be supplied with fuel at places with inhabitants and at the service stations that are closest to the engineering works.

For the operation of heavy-machinery, the required fuel will be transported by authorized distributors and stored in tanks at Camp 4 (PHAM Project). The storing and management will be according to what has been established by D.S. N° 160/08.

3.7.3 Other Consumption Issues

It will also be necessary to have formworks, concrete, rebars, among others, which will be provided by the contractor.

In the case of equipment imported, all proceedings will comply with all stated requirements in Res.EX N°1,825.

3.8 Schedule

All activities related to Project construction will be carried out from Monday to Saturday during the day, from 8 to 6 (in the afternoon), with the exception of the 4 ton trucks circulation, which will be until 2:00 in the afternoon on Saturdays.

3.9 Waste Water Treatment

Worksites will have enough chemical toilets according to the number of workers. The removal and cleaning-up of chemical toilets will be performed by authorized companies. Likewise the workers at S/S Alfalfal expansion will use the sanitary facilities at Alfalfal Power Plant. In both cases the number of lavatories and washbasins will comply with articles 23 and 24 S.D. Nº 594/00.

3.10 Waste Management

The waste generated during the Project construction, will be divided into three main types: domestic waste or organic waste, construction and vegetation waste (associated to the pruning at specific areas and pruning seasons). The management of each type of waste is presented as follows, according to the place where it has been generated.

3.10.1 Waste Generated by the Construction of Projected Lines.

Domestic or organic waste corresponds mainly to packs, paper and cardboard. These will be kept temporary in polythene bags at the interior of a container marked with the categorization "domestic garbage". These bags will be transferred from the worksites to the yard-waste management at Camp 4 facilities of PHAM Project, where they will be eventually removed by the Municipality and transported to the respective sanitary filling.

The construction waste consists mainly of wood, packing and metal remains. These will be divided according to their recycling potential. The waste will be transported to Camp 4 of PHAM Project. The elements that can be recycled will be piled up separately and packed for their subsequent use at the Project. The rest will be transferred to a sanitary filling, certified for these purposes.

Vegetation waste is made up of the remaining elements of pruning. This material will be cut into pieces or grinded and placed into the marine storing sector of PHAM Project, to be used as material for the soil development of this sector.

Minimum amounts of hazardous-waste will be generated at worksites. The waste will be daily transported to the yard-waste management for hazardous material at Camp 4 of PHAM Project. The waste will be managed and subsequently transported according to the requirements stated by D.S. Nº 148/03. These are mainly waste oils, diesel and lime.

3.10.2 Waste Generated by the Expansion of S/S Alfalfal

Mainly domestic or organic waste will be generated at S/S Alfalfal due to the activities performed during the Project construction. Waste will be temporary stored in-house, until removed by the Municipality. The construction waste generated will originate from equipment packing; if this cannot be reused, waste will be transferred to the wood piling sector of Camp 4 (PHAM Project).

3.11 Safety Conditions

AES Gener S.A. will regularly control all engineering works, installations and construction activities that the Project includes and will state in its agreement the Contractor´s responsibility to comply with the safety and risk prevention regulations. In addition, the agreement with the Contractor will include all required clauses to guarantee the observation and compliance of legal and statutory regulations on Occupational Safety & Health, which will also be applicable for potential Subcontractors.

Among the control and risk prevention measures, the following requirements, included in the contract, have been defined for the Contractor:

- Maintain a Risk Prevention Expert at the worksite.
- Maintain a permanent communication system between the Contractor´s Operations Center and the workers, at the worksites and its vehicles, by means of a mobile equipment and or/or radio (for the sectors with no mobile phone signal), with the purpose of promptly answering in the event of any accident or unforeseen incident occurs, involving workers and/or Project infrastructure, as well as third-parties.
- Establish at the Contractors Operations Base an adequate place to provide first aid assistance and maintain an efficient transportation system in case of accidents at the worksites.
- Safety personnel should perform regular inspections on site.
- Contractors should have a Safety Program and Emergency Plans.
- Contractors should maintain a logbook on accident control and environmental issues for the registration of events, discoveries and important situations.

AES Gener S..A will guarantee, as part of the contract, that companies executing the Project construction, should continuously comply with labor safety practices. These are established in the Contractor's Handbook, as well as documents related to safety issues for the line construction and project, when voltage is handled and energized. The detail of each of these is presented on Appendix 3 and section 4 of Chapter 6.

4 DESCRIPTION PHASE: OPERATION AND / OR MAINTENANCE

4.1 Description of Maintenance Activities

The maintenance of electric lines, generally considers preventive type of actions, corrective and programmed as well as corrective proceedings against failure, as it is explained in the following paragraphs. These actions are of very low frequency and will be developed for both lines.

The staff that performs maintenance activities will be adequately trained for their work by an induction on their specific field, as well as on those fields of environmental relevance which are part of the evaluation process of this Project.

S/S Alfalfal expansion maintenance will be carried out completely, together with the rest of the installation maintenance of the substation, and which basically consists of insulators cleaning; these insulators are part of energized fragments and also of possible adjustments of high-voltage equipment.

4.1.1 Basic Preventive Maintenance

The basic or minor preventive maintenance of electric lines, considers the cleaning of insulators, measuring, minor adjustments and painting maintenance, among others.

This activity does not require large equipment, occasionally, hand tools and distance-measuring equipment (such as the thermal-visor). The frequency of this maintenance varies but it is usually performed once a year.

4.1.2 Programmed Corrective Maintenance

This maintenance is of minor importance and based on anomalies detected during the inspection of the basic preventive maintenance and on situations where difficulties cannot be solved during the basic maintenance process.

4.1.3 Maintenance against Failure

Consists of the fixing of installations after failure occurs, which generally relates to the replacement of broken insulators, caused by atmospheric discharges or by third-parties. This influences the right flow of the service, which can be of diverse importance, according to the anomaly produced, with a short term planning after the failure.

4.1.4 Emergency Repairs (not programmed, due to attacks or natural causes – natural disasters)

Implies, repairs after major and unforeseen damage occurs, generally located in a Tower. The repair activities can require major equipment, more personnel and more experienced staff (3 teams of 4 people), without harming third-party property and at a limited area surrounding the Tower.

With respect to the possible fall of a Tower, it is important to point out the following:

- If the fall occurs during Tower construction, there will be action emergency teams available, who will make use of the tools and equipment at the worksites, to repair fallen Towers. There is no fire hazard since the Towers are not energized, nor possibility of damaging buildings because of the requirements on minimum distance, stated by the electric legislation in force.
- In case of Towers falling during line operation, the incident would be in charge of AES Gener S.A. Maintenance Department and of the possible contractors available for the corrective maintenance. Likewise, as in the case of Tower construction, there is no probability of damaging buildings because of the requirements on minimum distance, stated by the electric legislation in force.

4.1.5 Maintenance of Vegetation

The maintenance of the line restriction strip will consist of a controlled pruning and will be done under forestry criteria, with respect to trees and bushes that have sprouted again and whose height is over the stature stated by Regulation NSEG 5. En71. The detail on this proceeding, together with the areas to be pruned is presented on Appendix 2.

It is important to point out that there will be neither fire employed for the restriction strip maintenance, nor for the reduction of vegetable waste generated by this activity.

The frequency of this type of maintenance will depend on the growing speed of species which are within the restriction strip.

4.2 Waste Management

Waste generated during the operation of the Project, will be separated in two main types: construction waste and vegetable waste (associated to the pruning within green areas and during pruning season.); each of these have been described in section 3.10).
Each time a proceeding that generates waste is performed, mainly due to the maintenance of new lines, the waste will be transported to the yard-waste management at Alfalfal Power Plant (attached to S/S of the same name) on the same day. The waste will be classified and piled up according to their type.

The management of each waste type is the same as indicated on section 3.10, nevertheless it is emphasized that the waste will be transported to the yard-waste management of Alfalfal Power Plant.

During this phase there will be no hazardous-waste generated.

4.3 Safety Conditions

AES Gener S.A. has safety manuals for this kind of activities, which are strictly followed. They are introduced in detail in Appendix 3, section 4 of Chapter 6.

5 DESCRIPTION OF THE CLOSING AND OR INTERRUPTION OF PROJECT PHASE

The closing or interruption of the Project is not part of the evaluations; it is possible for the Project to extend its useful life through the maintenance and restoring of equipment.

6 DESCRIPTION OF ATMOSPHERIC EMISSIONS AND DISCHARGES INTO THE ENVIRONMENT

6.1 Construction Phase

6.1.1 *Emissions into the Environment*

During the construction phase of the Project, there will be very little atmospheric emissions into the environment, which will mainly correspond to particulate matter (MP_{10}) and engine combustion gases, produced during excavation activities, ground movements and vehicles circulation, among others. These emissions will be temporary of small amount and in-house.

According to the information presented on Appendix 6, the emissions of particulate matter, caused by the mentioned activities will be less than 10 tons/year.

To control these emissions and avoid dust suspension near inhabited places (Los Maitenes Area and Alfalfal), the transportation of the necessary material for the Project, will be with the truck freight division covered with a piece of cloth, so as to avoid the spreading of dust into the air and the falling of solid material over the ground. Chapter 6, section 3 details other measures considered to mitigate small emissions of particulate matter and gases generated by the Project.

6.1.2 Noise Emissions

During the construction phase, noise emissions will be produced, caused by the activities developed at the worksites (equipment and machinery operation). It is important to point out that these emissions will be specified according to the time (daytime hours) and generally distant from inhabited places.

Depending on the worksite under operation, it is estimated that the machinery altogether will emit at the most 84 dB(A) from a distance of 15 mts. This corresponds to the excavation phase, considering the worst possible circumstances, i.e. all the equipment operating simultaneously.

For those workers exposed to high noise levels, there will be hearing protection devices and all security equipment required, according to regulations in force.

6.1.3 Liquid Effluents

Chemical toilets will be mounted at worksites, which will comply with requirements stated in articles 23 and 24 - D.S. Nº 594/00. These toilets will also be maintained and removed by a specialized and certified company in charge of performing these types of activities; the company will also keep a record on maintenance activities at these facilities. The Health SEREMI (representative of government in a Region) will be notified in time, about the name of the company who has been granted the contract for chemical toilets services.

During construction phase, there will be no liquid waste generated at Alfalfal substation.

6.1.4 Solid Waste

The waste generated at the Project worksites will be daily transported to Camp 4 of PHAM Project. The waste that will be placed at this yard is: domestic or organic to domestic, as well as construction waste.

It is important to point out that hazardous-waste will be generated in very small amounts at worksites; these will be daily transported (if there was) to the hazardous yard of waste management, at Camp 4, where waste will be stocked up according to the requirements stated by D.S. Nº 148/03.

The maintenance of light vehicles will be performed at certified repair centers. In the case of heavy equipment, employed during the Project construction phase, there will be no maintenance carried out at worksites.

The following chart shows the type and amount of solid waste generated.

Chart 1-14 Solid Waste Generated by the Project. Construction Phase.

Waste material type	Waste material name	Amount	Management & temporary site availability	Management & final recycling facilities
Non-hazardous	Domestic or organic waste	▪ 80 kgs/day at worksites	Yard-waste management Camp 4 (PHAM Project).	Gathered by the Municipality and transported to the respective dumping site.
		▪ 35 kgs/day at S/S Alfalfal	Yard-waste management Alfalfal Power Plant	
Non-hazardous	Construction waste (Wood and other waste material such as insulator-packing, and hardware store products)	3,000 kgs/phase	Yard-waste management Camp 4 (PHAM Project).	Company authorized and certified, devoted to the recycling of waste material.
Non-hazardous	Construction waste material (metallic)	600 kgs/phase	Yard-waste management Camp 4 (PHAM Project).	Company authorized and certified, devoted to the recycling of waste material.
Hazardous	Waste oil; diesel and lime waste	20 l/month	Yard-waste (hazardous) management Camp 4 (PHAM Project).	Company authorized and certified, devoted to the management of waste material.

Source: AES Gener S.A.

6.2 Operations Phase

During the operation phase, the major emissions correspond to electromagnetic fields, generated by the normal operation of the line, as well as to specific and temporary solid waste generation associated to maintenance processes.

6.2.1 Electromagnetic Wave Emissions

The Project estimates a 30 m restriction strip and 40 mts width, depending on the tensioning of conductors, stated by the law, which protects sensitive agents from electromagnetic waves, emitted by the Project. In this particular case, there are no towns or isolated houses (i.e., people) surrounding the line, who can receive the effect from these fields.

Appendix 4 shows the calculation report on electromagnetic fields, estimated for this Project.

6.2.2 Solid Waste

During the maintenance activities of the line, solid waste will be generated. This will be transferred to Alfalfal Power Plant yard-waste management. There is no hazardous waste expected during this phase.

The maintenance of vehicles employed during this phase will continue at authorized repair centers of neighboring cities.

Chart 1-15 Solid waste generated by the Project. Operations phase.

Waste material type	Waste material name	Amount	Management & temporary site availability	Management & final recycling facilities
Non-hazardous	Construction waste (wood and other waste material such as insulator-packing, and hardware store products (replaced during maintenance).	50 kg/year	Facilities for Alfalfal Power Plant waste management	Company authorized and certified, devoted to the recycling of waste material.
Non-hazardous	Construction waste material (metallic, such as metal packing tapes, hardware and connected insulators.	20 kg/year		Company authorized and certified, devoted to the recycling of waste material

Source: AES Gener S.A.