

DESA

BELIZE - FINAL REPORT BY MOHAMMED A. IMAM, UN OPAS EXPERT

4 JULY 1973 - 6 DEC 1974

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From: Mohammad A. Imam
UNDP/Pakistan
P.O. Box 1051
Islamabad, Pakistan.

GOVERNMENT OF PAKISTAN

~~PRESIDENTIAL SECRETARIAT~~

PLANNING DIVISION

RECORDS CONTROL

SECRETARY

2 JAN 1975

TE 432/1

Beli

BRNO(2)

Islamabad, dated the

Put 6 Dec 1974

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Subject:- Final Report of my Mission
to Belize

Dear Mr Heerden,

Enclosed herewith are two copies of the final report in connection with my mission to Belize. This report consists of the following :-

- a) A chronological order of the work executed under my supervision
- b) A summary of work done
- c) A paper pertaining to a plan on Belize Electric System with due regard to security of supply
- d) Enclosures having various memorandum and papers issued by me to the Manager of the Expansion Project and others in connection with the work
- e) Copies of letters written to Mr J.J.C. Bradbury, Technical Advisor Energy Section requesting his comments on technical matters

I have mentioned various maps pertaining to the expansion project of the Belize Electric System Plan. The Office of the Manager Expansion Project of the Belize Electricity Board has copies of these maps. Since I don't have any I am unable to send them. If the Government of Belize so likes it can have them by asking the Manager of the Expansion Project.

You will also note that there are a number of documents which I have enclosed which are on the subject of the training of linemen/climbers. These documents give an idea of the work of training imparted.

Due attention was given by me to train a local engineer Mr. Fernando Coye on the job. Moreover, an engineering student in his final year of engineering Mr James Waight was also trained on the job during his summer holidays of 1973.

The abovementioned description of my mission to Belize is by no means exhaustive. It highlights the work which I was able to do during my assignment in Belize.

With regards,

Sincerely,

M. A. Imam

Mohammad A. Imam

Enclosures:

Mr Jan van Heerden
Chief Physical Resources Projects Section
United Nations
New York N.Y. 10017

1 copy - Adib/Bradbury

RECEIVED

10 DEC 1974

PRPS/ELAIP/OTC

Chronological Order of the Execution
of Work Done Under My Supervision.

- (1) During April, May, June and July 1973 the existing 1.v. system in Belize City (King's Park Area, Ex-servicemen Area, Neal Pen Road, Caesar Road and Fabers Road) were surveyed. The loadings of the distribution transformers and the 1.v. feeders emanating from them were noted during the peak load demand, voltage readings were taken in order to identify low voltage conditions and where they existed.
- (2) Also during the period June, July and August 1973 ten men were trained for linemen/climber jobs for doing the construction work.
- (3) In August plans were prepared for the areas for the improvement of the distribution systems. This involved both low voltage and high voltage (6600V) lines.
- (4) During the period September, October and November materials started arriving for the construction work and the men were deployed to load, transport, unload and store them.
- (5) On November 15 construction work started in the district of Corozal and on December 12 in Belize City. Concrete poles arrived in Belize on November 24.
- (6) The period November 24 to December 11 lapsed because the polecat was not available in Belize City nor transportation for starting the work. The work in the district was given priority as a matter of policy.
- (7) Work started on 12th December when transport was made available. Instead of waiting for polecat which was not available work was started and nineteen concrete poles were installed manually in Belize. It was a hazardous and difficult work for men because of the heavy weight of the concrete poles.
- (8) During the period 12 December 1973 to end of March the following was the progress of work :
 - (a) More than 1.5 miles of 1.v. lines completed (i.e. 37.5% of year-one programme).
 - (b) 75 1.v. poles installed out of an estimated 160 1.v. to be installed during year-one programme. (Nineteen h.t. poles with insulators and crossarms installed at Neal Pen Road.
 - (c) Fifty service connections completed in King's Park area and work on service connections continues in Ex-servicemen area. (This is time consuming work).

- (d) Three spans of 6600 volt line constructed and energized together with a 50 KVA transformer at Nargusta St., and l.v. line constructed in Lake Independence area in order to serve this new area.
- (e) A 50 KVA transformer installed and energized at Neal Pen Road in order to serve Ex-servicemen area and Krall Road.

(9) During April the following was the progress of work:

- (a) Work continued on construction of Neal Pen Road h.t. line up to 8.4.74.
- (b) Work started on W/H line on 10.4.74 after requisition for materials was made on 9.4.74.
- (c) First section of W/H line was completed on 26.4.74 in eleven working days.

(10) During May the following was the progress of work:

- (a) Nine poles were removed from their location and realigned in order to leave 100' of road reserve on W/H.
- (b) Second section of the W/H line was completed on 17.5.74.

(11) During June the progress of work was as follows:

- (a) By 4 June four out of a total of nine sections of the Western Highway (W/H) line changeover from 6.6 KV to 2.2 KV was completed.
- (b) By 9 June one more section (Section-5) of the W/H line was completed.
- (c) By 19 June an additional section (Section-4) of the W/H line was completed. Since it was raining during the period some time was lost. A total of six sections of the line was so far completed.
- (d) After 19 June work could not progress on the remaining three sections of W/H line because of non-availability of materials like crossarms insulators etc. All such materials were exhausted.

- (e) Work was, therefore, started from 20 June on 'E' St. h.t. line in King's Park.
- (f) During the period 21 June till and of June work on h.t. line on Neal Pen Road was completed, and work started on h.t. lines at Fabers Road and Caesar Road. Altogether sixteen poles are to be installed at Fabers Road and thirteen at Caesar Road.

(12) During July (up to 20 July; I left Belize on 21 July Sunday) the progress of work was as follows:

- (a) Work on the installation of poles at Fabers Road and Caesar Road continued to progress inspite of the problem of the area being marshy, and so very difficult and polecat at times not being available due to malfunction and so needing repair.
- (b) Continued to push for preparing reductions of the improvement plans of l.v. and h.t. systems for the purpose documentation, but not much progress could be made on this due to the Survey Department not having the required materials.

Summary of Work

I - Work Pertaining to the Expansion Project:

1. Preparation of high voltage distribution system *map* of Belize City.
2. Preparation of map showing inter-connection of the city plant with the plant located at the airport
3. Preparation of map showing the high voltage distribution enroute the connection between the two power plants
4. Preparation of map of the existing low voltage distribution system in King's Park Area
5. Preparation of the plan for the improvement of the low voltage distribution in King's Park Area
6. Execution of the improvement plant of low voltage system in King's Park Area
7. Preparation of the map of the existing low voltage distribution system in Neal Pen Road Area, and Ex-service Men's Area
8. Preparation of the plan for the improvement of the low voltage distribution system in Neal Pen Road Ex-Service Men Areas
9. Execution of the improvement plan of the Neal Pen Road Ex-Service Men Areas
10. Preparation of the high voltage distribution plan for King's Park, Neal Pen Road and Ex-Service Men Areas
11. Execution of the improvement plan of the high voltage distribution in King's Park, Neal Pen Road and Ex-Service Men Areas
12. Building of the 4½ miles of Western highway line for operation at 22 KV from the existing voltage level of 6.6 KV
13. With the General Manager Inspection and testing of the concrete poles manufactured for the high voltage and low voltage lines

II - Training of Local Personnel:

Trained on the job a local engineer (Mr F. Coye) throughout the time of my appointment involving the

following :-

1. Preparation of the existing low voltage and high voltage system maps.
 2. Preparation of plans for the improvement of low voltage and high voltage distribution systems
 3. Load survey of distribution transformers
 4. Preparing plans for installation of additional distribution transformers
 5. Checking the bad voltage conditions on the low voltage distribution system and method of improving this condition
 6. Selection of the right size of conductors for the low voltage distribution system
 7. The theoretical background of selection of conductor size for high voltage power transmission on the basis of economic aspect, voltage drop, thermal loading, stability etc
 8. Supervised training of linemen and climbers for the distribution of expansion project
 9. Trained on the job Mr James Waight electrical engineer in the final year of engineering during his summer holiday of June-September 1973 on various aspects of power distribution
- III - Prepared a paper on the inter-connection of City and Airport power plants with due regard to the security of supply.

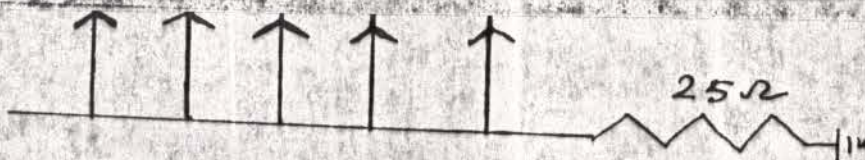
**"A PLAN FOR THE EXPANSION OF BELIZE CITY
ELECTRIC SUPPLY SYSTEM WITH DUE REGARD TO
SECURITY OF SUPPLY"**

1. The subject matter of this paper is to outline in brief the existing electric electricity system in Belize and then to present a plan for the expansion of the Belize city system with due regard to the security of supply of Belize City.
2. The five maps (being sent under a separate cover) give an idea of the existing electric supply of Belize and particularly of Belize City.
- 3.. Map No.1 shows the installed capacities in the country. Belize city (including the city plant and Ladyville Plant some twelve miles away from the city) has an installed capacity of 11,190KW, Belmopan the capital 1011KW, and the district towns of Orange Walk, Corozal, San Ignacio, Stann Creek have installed capacities ranging from 400 to 500KW each. The two coral island resorts of San Pedro and Caye Caulker have installed capacities of 125KW and 90KW.
4. The population of Belize city is approximately 40,000 and of the district towns between 2,200 to 4,200.
5. The largest system is that of Belize city. It accounted for 82% of the total electrical energy consumed (25.63 mkwh) and 64% of the total number of consumers (12,630) in the entire country ~~existing~~ in 1972. Belize City has more installed capacity than the present peak load. The two 2960KW diesel units at Ladyville plant were installed in 1971 a unit of 1600KW in 1968 another of 1300KW in 1964. Three smaller units of 830KW each were installed in 1957. The dependable capacity of Belize city is approximately 4000 KW whereas the peak demand is 6000 KW.
6. Map No.2 shows the Belize city system showing the two power plants and their connections. The city plant is connected with the Ladyville plant by two 6,600 volts lines which are also used as primary distribution lines in the city and along their way outside the city. These connections are approximately twelve and fourteen miles in length.
7. Map No.3 shows that part of the two connections which in the city area are used as primary distribution lines and on a reduced scale also shows the connection along the western highway, serving distribution transformers enroute. Map No.3 also shows three other primary radial distribution feeders in the city coming out of the city plant. These feeders have lengths varying from 0.98 to 2.12 miles. Map No.3 also shows distribution transformers, their location and sizes in the city and on the western highway.
8. Map Nos. 4(a) and 4(b) show one of the connections on the northern highway between the city plant and Ladyville plant including the locations and sizes of distribution transformers. There are 178 distribution transformers in Belize city totalling a capacity of 10,441KVA.
9. Although the two new units at Ladyville have 2960KW capacity each, presently only one unit is used at a time, and only up to 2,200KW because the two connections together are inadequate to transmit more than 1100KW to the city. The airport area where the Ladyville plant is located does not have a demand of more than 1100KW. The problem is to transmit more power to the city where the demand is much more than can be taken of by the city plant alone.
10. The Caribbean Development Bank has agreed to provide loan for a five year development programme estimated to cost US\$1,910,400 to the extent of 80%. The remaining 20% has to be provided by the Belize Electricity Board from its own internal generation of funds.

The city plant and Ladyville plant together with two substations is of top priority in the year-one and year-two construction programmes. A plan titled "Single Line Schematic Diagram of Interconnections Between Ladyville & Belize City Generating Stations", enclosed herewith has been prepared for the construction of the two 22kv connections.

12. The basic problem with this plan is that with the outage of one of the two 22kv connections between Ladyville plant and the two substations a firm flow of only 3MVA from Ladyville is possible through the remaining 22kv connection and the 3MVA substation transformer to the city. As already mentioned earlier the present capability of the city plant is 4000kw whereas the peak demand is 6000kw. So the city is dependent on its power requirements to the Ladyville plant.
13. In case of temporary outage of one of the 22kv connections this will not be a serious problem but in case of an extended forced outage or outage for maintenance purpose load shedding will be unavoidable in the city.
14. In view of this I have prepared a plan (plan #13 enclosed herewith) which assures security of supply to the city in the event of the outage of any one of the 22kv connections. This is obtained by forming a loop of 22kv from the Ladyville plant through the two 22kv/6.6kv substations in the city. The sites of the proposed substations are shown in both maps #2 & 3. In this plan the 22kv connection from Ladyville plant to the substations as well as the 22kv connection between the substations have circuit breakers normally closed and arranged to trip only that part of the 22kv section of the loop which develops a fault. This should assure a secure uninterrupted supply to the two city substations in case of a fault in any one section of the 22kv connections. With the outage of any one of the 22kv connections between Ladyville plant either substations, the two substations could still get a flow of up to 5MVA. If the flow from Ladyville at the time of a fault on the 22kv line is more than 5MVA the remaining energised 5MVA transformer at Ladyville could be temporarily overloaded. The overload could then be eliminated by increased generation at the city plant. This, security of supply from Ladyville to the substations up to 5MVA is assured.
15. In the plan the city plant is also connected through underground cables to the substations (a distance of approximately one mile to each substation) having enough firm capability of transmitting all the mva available at the city plant through either of the connections between the city plant and the substations. Provision of such a firm capability would assure enough var flow and, therefore, voltages support for Belize City in case of the outage of one of the 22kv connections between Ladyville and the substations. It would be even more useful when the capacity of Ladyville plant is increased in order to take care of the additional future demand by a third 2960kw diesel unit since the city plant is not suitable for expansion because of its vulnerability to flooding during tropical storms and because of space limitation.
16. I have also produced a plan for the primary feeders which is as follows:
(a) From map #3 it is clear that feeders 1, 2 & 4 are best supplied from the city plant bus and so they are left undisturbed. (b) The primary feeder on the western highway which presently forms a connection between the two generating plants is split at a point near the Cemetery Road sub-

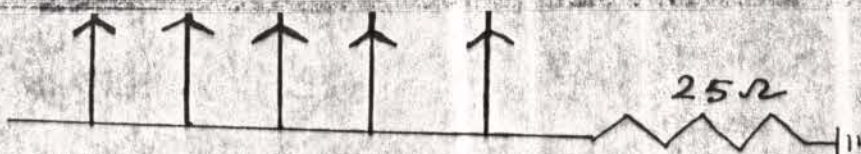
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... close to the Cemetery Road substation. Therefore, it is disconnected from the city plant bus and connected to the 6.6kv Cemetery Road substation bus. The other section of the existing western highway primary feeder from the Cemetery Road substation to Ladyville plant is connected on the 22kv side of the 2200/6.6kv transformers at Ladyville and Cemetery Road substations. This section is already built up to a distance of nine miles for 22kv operation and only four and a half miles of this section will have to be rebuilt for 22kv operation. Thus this section becomes a 22kv connection between the Ladyville plant and the Cemetery Road substation. It would also serve as a primary feeder feeding distribution transformers enroute by making it a 3 & 4 wire 22kv/12.7kv connection and installing 13kv/220-110V distribution transformers. (c) The primary feeder (airport feeder) presently supplying the northern part of the city and also serving both as a connection between the two plants and as a primary feeder enroute is broken at a point near the Pallotine Convent substation and connected to the 6.6kv Pallotine substation bus in order to serve the northern part of the city while being disconnected from the city plant 6.6kv bus. Its part from Pallotine substation onward to Ladyville plant is reconstructed for 3 phase 4 wire 22kv/12.7kv operation and connected to the 22kv side of the Pallotine substation and Ladyville plant 22kv/6.6kv transformers.

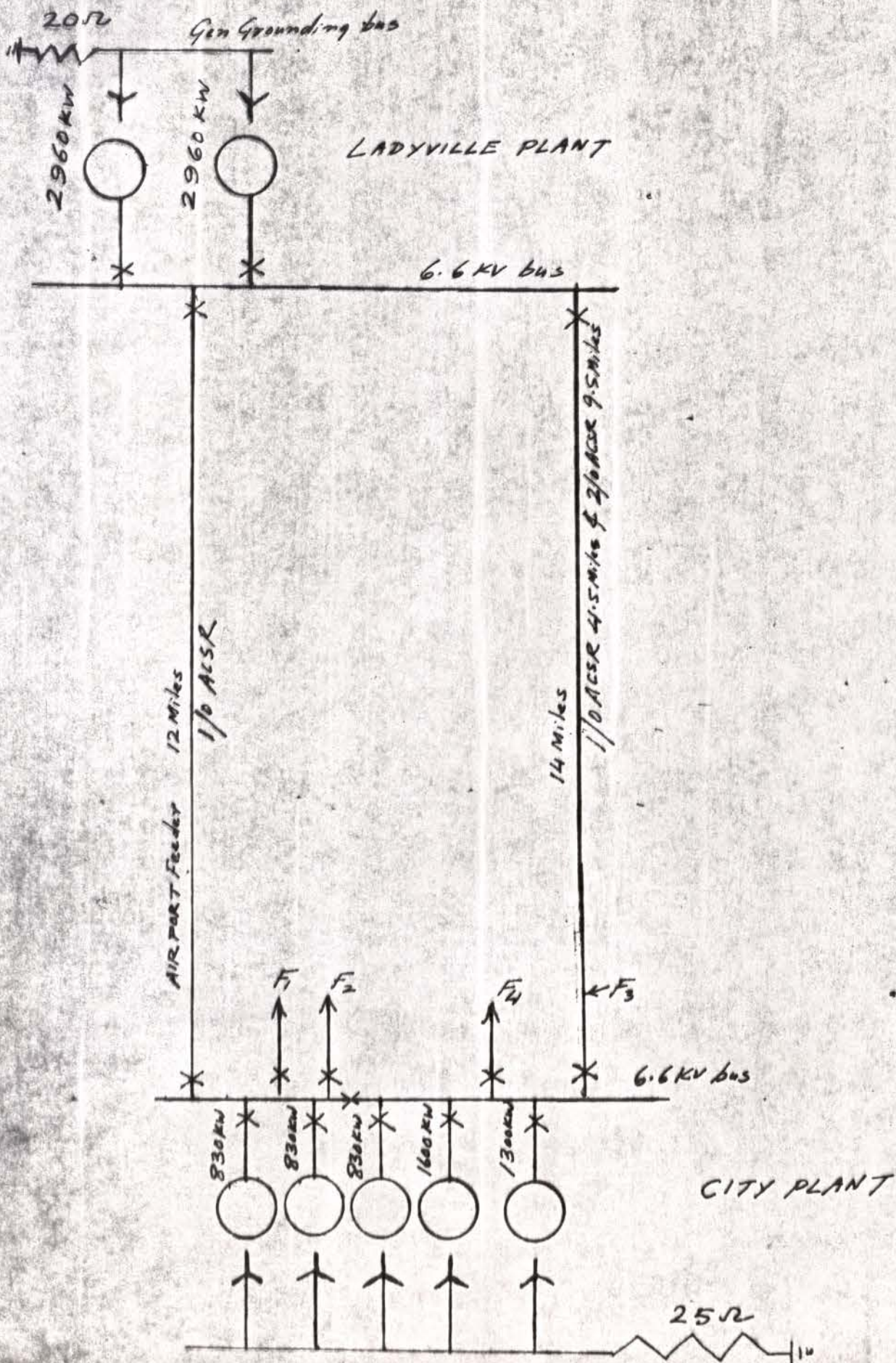
17. According to the above mentioned plan all primary feeders become radical. The primary feeders #1, 2 and 4 remain as they are today. These parts of the two existing 6.6kv connections between the plants which are located in the city become two independent 6.6kv radical feeders each coming out of the two substations, whereas the parts outside the city after being rebuilt for 22kv/13kv 3 phase 4 wire operation become connections between the substations and the Ladyville plant which also serve 13kv/220-110 volt distribution transformers enroute.
18. Presently there are 2-2960kw diesel units at Ladyville. With the growth of demand in Belize City addition of a third 2960kw diesel unit has been planned at Ladyville as shown in the plant titled "Single Line Schematic Diagram of Interconnection Between Ladyville & Belize City Generating Stations". With the addition of the third unit the total capacity of Ladyville plant will be about 9000kw and, therefore, a flow exceeding 5MVA can be obtained provided the 22kv connections and transformer substations are of adequate capability. However, as already stated in paragraphs 12 and 13 the above-mentioned plan has not assured a secure supply of more than 3MVA for Ladyville to Belize City. Therefore, a plan for a secure flow of up to 5MVA from Ladyville to Belize City has been prepared and already been outlined in paragraph 14.
19. I have prepared two plans in order to ensure adequate capability of transmission up to a maximum of 9MVA to Belize City. These plans are shown as Plan No.2 and Plan No.3 in schematic form and are enclosed herewith. Plan No.2 would bank two of the existing 5MVA transformers and add a 10MVA transformer at Ladyville and a 3MVA transformer would be added and banked at Cemetery Road substation. In case of the outage of one of the 22kv connections voltage to consumers could exceed 10% below the checked voltage which is unacceptable. But in case such outages are rare it could be tolerated. The steady state stability limit in case of the outage of one circuit is more than 9MVA (theoretical limit 14MVA) and the thermal limit of each of the 22KV connections 15MVA.

cont'd



20. It is apparent that the size of the conductor (2/0 ACSR) chosen is too small specially from the point of view of future requirements. A larger size of conductor would have resulted in maintaining better voltage during an outage and would have been more economical as well.
21. An improvement on Plan No.2 is Plan No.3 which adds to Plan No.1 one 5MVA transformer at Ladyville, one 3MVA transformer at Pallotine substation (one at each of the substations) and a third 22kv connection. This would ensure better voltage and stability in case of the outage of one of the 22kv connections.
22. The plan titled "Single Line Schematic Diagram of Interconnections Between Ladyville and Belize City Generating Stations" also shows two additional 22kv connections with transformers on the city end of the 22kv connections. This additional interconnection is meant for the expansion of Ladyville plant beyond the unit and the plan is too /third sketchy.
23. I have not attempted to prepare a plan for the expansion of Ladyville plant beyond the third unit since this is rather far into the future, and a site other than Ladyville might be more suitable for further expansion.

SCHEMATIC DIAGRAM
OF THE EXISTING BELIZE SYSTEM
SHOWING INTERCONNECTION BETWEEN
TWO POWER PLANTS



FROM: Mohammed A. Imam
U.N. OPAS Expert
P.O. Box 430
Belize City
BELIZE, C.A.

8th April, 1974

Dear Mr. Singh,

Thanks for your letter BZE/72/001-689 of 3 April, 1974.

Here is the report of work done under my supervision covering the period 12 April, 1973 till 15 March, 1974.

- (1) During April, May, June and July 1973 the existing l.v. system in Belize City (King's Park Area, Ex-servicemen Area, Neal Pen Road, Caesar Road and Fabers Road) were surveyed. The loadings of the distribution transformers and the l.v. feeders emanating from them were noted during the peak load demand, voltage readings were taken in order to identify low voltage conditions and where they existed.
- (2) In August plans were prepared for the areas for the improvement of the distribution systems. This involved both low voltage and high voltage (6600V) lines.
- (3) During the period June, July and August 1973 ten men were trained for linemen/climber jobs for doing the construction work.
- (4) During the period September, October and November materials started arriving for the construction work and the men were deployed to load, transport, unload and store them.
- (5) On November 15 construction work started in the district of Corozal and on December 12 in Belize City. Concrete poles arrived in Belize on November 24.
- (6) The period November 24 to December 11 lapsed because the polecat was not available in Belize City nor transportation for starting the work. The work in the district was given priority as a matter of policy.
- (7) Work started on 12th December when transport was made available. Instead of waiting for polecat which was not available work was started and nineteen concrete poles were installed manually in Belize. It was a hazardous and difficult work for men because of the heavy weight of the concrete poles.

(8) To date progress of work is as follows:

- (a) More than 1.5 miles of l.v. lines completed (i.e. 37.5% of year-one programme).
- (b) 75 l.v. poles installed out of an estimated 160 l.v. to be installed during year-one programme. (x2)
- (c) Fifty service connections completed in King's Park area and work on service connections continues in Ex-servicemen area. (This is time consuming work).
- (d) Three spans of 6600 volt line constructed and energized together with a 50 KVA transformer at Nargusta St., and l.v. line constructed in Lake Independence area in order to serve this new area.
- (e) A 50 KVA transformer installed and energized at Neal Pen Road in order to serve Ex-servicemen area and Krall Road.

(9) Future programme

- 1. More work for improvement of supply to be done in King's Park area, in Ex-servicemen area and in Neal Pen Road.
- 2. 6600 volt line to be constructed in Neal Pen Road, Fabers Road, Caesar Road, King's Park area.
- 3. Construction work for change over of 4.5 miles of western highway line from 6600 volt to 22,000 volt operation remains to be done after men do more h.t. construction as mentioned in (2) above, and gain experience in handling h.t. construction faster, so that the western highway line is completed within a short span of time which is necessary in order to avoid least interruption of service to Belize City and to consumers enroute.

With regards.

Very truly yours,

(Mohammed A. Imam)

Mr. Krishan G. Singh,
Resident Representative, UNDP for Belize
Alameda Roosevelt 2823
Apartado Postal 1114, San Salvador
EL SALVADOR.

MAI/cah

UNITED NATIONS



NATIONS UNIES

POSTAL ADDRESS—ADRESSE POSTALE: UNITED NATIONS, N.Y. 10017
CABLE ADDRESS—ADRESSE TELEGRAPHIQUE: UNATIONS NEWYORK

REFERENCE: TE 432/21 BRHO (2)

9 April 1974

Dear Mr. Imam,

Thank you very much for your letter of 29 March 1974 attaching copy of the material you sent to Mr. Bradbury.

We have read with great interest the schematic diagram "Single Line Schematic Diagram of Interconnections between Ladyville and Belize City Generating Stations" and the paper prepared by you.

We appreciate greatly your sending it to us and keeping us informed of your activities.

Yours sincerely,

for Cecilia C. Heerden
Jan van Heerden, Chief
Physical Resources Projects Section
Europe, Latin America and Inter-
Regional Projects Branch, OTC

Mr. Mohammed A. Imam
U.N. OPAS Expert
P.O. Box 430
Belize City
Belize, C.A.

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CABLE ADDRESS—ADRESSE TELEGRAPHIQUE: UNATIONS NEWYORK

REFERENCE:

26 March 1974

Dear Mr. Imam,

Thank you for your letter of 15 March and for the various enclosures which you sent. It is clear from these that you are making a substantial contribution to the work of the Electricity Board, particularly in the field of distribution reinforcement.

I was also interested to learn that you have given considerable attention to the training of overhead linesmen and wholeheartedly agree that an understanding of the basic principles of electricity will help them in the efficient carrying out of their work.

I understand that the various publications which you requested have now begun to arrive in Belize and, although they have been somewhat delayed, I am sure that they will form a most useful set of reference material.

With best wishes,

Yours sincerely,

A handwritten signature in dark ink, appearing to read "J. J. C. Bradbury".

J. J. C. Bradbury
Technical Adviser
Energy Section
Resources and Transport Division

Mr. Mohammed A. Imam
Transmission Engineer
Belize Electricity Board
P.O. Box 430
Belize City
Belize, Central America

cc. Mr. J. H. van Heerden

UNITED NATIONS



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CABLE ADDRESS—ADRESSE TELEGRAPHIQUE: UNATIONS NEWYORK

REFERENCE: TE 432/21 BRHO(2)

30 August 1973

Dear Mr. Imam,

Thank you for your letter of 21 August and for the diagram which you enclosed on the Neal's Pen Road area. I was pleased to learn that the comments contained in my last letter on the King's Park area were of some use to you in your reinforcement planning.

I do not have any specific comments concerning the Neal's Pen Road area, which seems to be reasonable straightforward.

I was glad to learn from your letter that your counterpart engineer is preparing the necessary specifications for reinforcement equipment and I am sure that his close association with your work will be of immense benefit to him.

With every good wish,

Yours sincerely,

A handwritten signature in dark ink, appearing to read "J. J. C. Bradbury".

J. J. C. Bradbury
Technical Adviser
Energy Section

Resources and Transport Division

Mr. M. A. Imam
(OPAS Expert)
Belize Electricity Board
P.O. Box 327, Belize City
Central America

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CABLE ADDRESS—ADRESSE TELEGRAPHIQUE: UNATIONS NEWYORK

REFERENCE: TE 432/21 BRHO(2)

3 August 1973

Dear Mr. Imam,

Thank you for your letter of 26 July and for the drawing which you enclosed showing the distribution network for the King's Park area of Belize.

It is, of course, extremely difficult to make any worthwhile comments on a distribution reinforcement scheme without having seen the local topographic conditions. However, from a first examination of your plan, I have one or two comments which I hope may be of some use to you in your work.

The proposed transfer of a 50 KVA transformer from St. Thomas Street to the intersection of Third and Peter Streets should help considerably in feeding that part of the network. The southern part of this area is apparently badly in need of reinforcement since the voltage readings shown on your plan are far from satisfactory. You have mentioned in your letter that there is a proposal to improve this situation by the installation of an additional 50 KVA transformer at the junction of Guadelupe and St. Peter Streets. It occurs to me that this transformer could be sited more advantageously at the junction of Dunn and St. Peter Streets. Such an arrangement would leave distances of two blocks between Joseph Street, the new Dunn Street transformer, the new Third Street transformer and Sixth Street.

On the question of the construction of distribution mains to serve the area of Thirteenth, Seventh, F, B and D Streets, I assume that you would contemplate installing a new transformer somewhere near the junction of Thirteenth and D Streets. If this were, in fact, planned the high tension supply could come either from Sixth Street or from Baymen Avenue. If a connection was made to both high tension supplies, then you would be able to form a high tension ring covering Seay, St. Joseph, St. Thomas, Sixth, D, Fourteenth Streets and Baymen Avenue.

Mr. Mohammed A. Imam
(U.N. OPAS Expert)
Belize Electricity Board
P.O. Box 327, Belize City
Belize, Central America



- 2 -

I am glad to know that all is going well with your mission and that you are making good progress with training a counterpart. I look forward to receiving your reinforcement plan for the Neal's Pen Road area in due course.

With best wishes,

Yours sincerely,

A handwritten signature in dark ink, appearing to read "J. J. C. Bradbury", written in a cursive style.

J. J. C. Bradbury

Technical Adviser

Energy Section

Resources and Transport Division

FROM: Mohammed A. Imam
U.N. OPAS Expert
P.O. Box 430
Belize City
BELIZE, C.A.

14th May, 1974

Dear Mr. Bradbury,

I had sent to you a letter dated 28 March, 1974, along with a paper titled "A Plan for the Expansion of Belize City Electric Supply System with due regard to Security of Supply" and had requested your comments.

I had also sent under a separate cover five maps pertaining to the abovementioned paper. Both of them went by registered air mail.

I am waiting for your comments and am wondering if your reply did not get lost in the mail.

With regards.

Very truly yours,

Mohammed A. Imam

Mr. J.J.C. Bradbury
Technical Adviser Energy Section
Resources and Transport Division
United Nations N.Y. 10017 U.S.A.

MAI/cah

FROM: Mohammed A. Imam
U.N. OPAS Expert
P.O. Box 430
Belize City
BELIZE, C.A.

28th March, 1974

Dear Mr. Bradbury,

Enclosed herewith are five maps which I prepared after my arrival in Belize since no such maps existed before.

They pertain to the electric system of the Belize Electricity Board in the country and particularly in Belize City and are up to date.

Under a separate cover I am sending you a paper called "A Plan for the Expansion of Belize Electric Supply System with Due Regard to Security of Supply".

The five maps will be necessary in order to study the above-mentioned paper.

With regards.

Very truly yours,

(Mohammed A. Imam)

Mr. J.J.C. Bradbury
Technical Adviser
Energy Section
Resources and Transport Division
United Nations, N.Y. 10017, U.S.A.

enclosures

MAI/cah

FROM: Mohammed A. Imam
U.N. OPAS Expert
P.O. Box 430
Belize City
BELIZE, C.A.

28th March, 1974

Dear Mr. Bradbury,

I would like you to study the schematic diagram titled "Single Line Schematic Diagram of Interconnections Between Ladyville and Belize City Generating Stations" which is enclosed with this letter.

After studying the diagram which shows the expansion plan of Belize City supply system I decided to prepare a paper which could outline plans for assuring a reliable electric supply system for Belize City. Such a paper titled "A Plan for the Expansion of Belize City Electric Supply System with due Regard to Security of Supply" is enclosed herewith. One diagram shows the existing system and the other three (Plans Nos. 1, 2 & 3) show the expansion programme.

Five maps pertaining to the subject are being sent to you under separate cover.

I will appreciate your comments on my plan.

With regards.

Very truly yours,

(Mohammed A. Imam)

Mr. J.J.C. Bradbury
Technical Adviser
Energy Section
Resources and Transport Division
United Nations, N.Y. 10017, U.S.A.

enclosures

MAI/csh

FROM: Mohammed A. Imam,
U.N. OPAS Expert,
P.O. Box 430,
Belize City,
BELIZE, C.A.

15th March, 1974

Dear Mr. Bradbury,

In my letter of 20th August, 1973, I had mentioned that specifications were being prepared for the construction requirement of the expansion programme of Neal Pen Road and King's Park Areas.

Since then considerable work has been done. I will here summarise the work since I came to Belize on 12 April, 1973.

- (1) During April, May, June and July 1973 the existing l.v. system in Belize City (King's Park Area, Ex-servicemen Area, Neal Pen Road, Caesar Road and Fabers Road) were surveyed. The loadings of the distribution transformers and the l.v. feeders emanating from them were noted during the peak load demand, voltage readings were taken in order to identify load voltage conditions and where they existed.
- (2) In August plans were prepared for the areas for the improvement of the distribution systems. This involved both low voltage and high voltage (6600V) lines.

During August and September 1973 requirement for materials were specified for the construction of the distribution system e.g. number of poles, transformers, conductors, insulators etc.
- (3) During the period June, July and August 1973 ten men were trained for linemen/climber jobs for doing the construction work.
- (4) During the period September, October and November materials started arriving for the construction work and the men were deployed to load, transport, unload and store them.
- (5) On November 15 construction work started in the district of Corozal and on December 12 in Belize City. Concrete poles arrived in Belize on November 24.

However, the period November 24 to December 11 lapsed because the polecat was not available in Belize City nor transportation for starting the work. The work in the district was given priority as a matter of policy.

My notes of 5th March, 1974, addressed to the Manager of the project summarises the progress of work in Belize City for which I have been made responsible by the Manager. A copy of the note is enclosed herewith.

I am also enclosing eight of my notes addressed to the Manager of the project and to the Assistant Transmission Engineer, and two reports, one on the progress of the work during August 1973 and another on the training of linemen. Of the many other notes these have been selected to let you have some idea of the kind of work which I have been doing here. They are by no means exhaustive and do not document the various odd jobs which I have to do here which are necessary in order to assure that the progress of the work is not held up.

I will appreciate if you could pass on the enclosed papers to Mr. Jan Van Heerden Chief Physical Resources Projects Section Europe, Latin America & Inter-Regional Projects Branch, OTC for his perusal as well after you are through with them and would welcome your comments.

With regards.

Very truly yours,

(Mohammed A. Imam)

Mr. J.J. C. Bradbury
Technical Adviser
Energy Section
Resources & Transport Division
United Nations, N.Y. 10017, U.S.A.

c.c. Mr. Jan Van Heerden
Chief Physical Resources Projects Section
Europe, Latin America, and Inter-Regional
Projects Branch, OTC
United Nations, N.Y. 10017, U.S.A.

enclosures

HAI/cah

Belize City
Belize

FROM: Mohammed A. Imam,
OPAS Expert
Belize Electricity Board
P.O. Box 327, Belize City
BELIZE, CENTRAL AMERICA

Aug
20st April, 1973.

Dear Mr. Bradbury,

Thanks for your letter of 3rd August. I appreciate very much the comments you have made and I have modified the plan of Kings Park Area in the light of your comments except for one regarding the installation of a transformer near the junction of Thirteenth and 'D' Streets.

The consumers in the area have low demands having a single phase 110V supply which can be presently taken care of from the Baymen Avenue 50KVA and Sixth Street 50KVA transformers. But at a later stage with the growth in power demand due to new consumers to be connected we will install a transformer as you have commented and close the H.V. ring.

Enclosed herewith are the plans of Neal's Pen Road Area which are self explanatory. I will appreciate your comments on these plans.

At the moment specifications are being prepared for the construction requirement of the expansion programme of the Neal's Pen Road Area and later of the Kings Park Area. After this is over I have to prepare an expansion programme of the electric supply system in the districts outside Belize.

With regards.

Very truly yours,

(M. A. Imam)

Mr. J.J.C. Bradbury,
Technical Adviser,
Energy Section,
Resources & Transport Division,
United Nations, New York.

BELIZE CITY

26th July, 1973.

FROM: Mohammed A. Imam,
(U.N. OPAS Expert),
Belize Electricity Board,
P.O. Box 327, Belize City,
BELIZE, CENTRAL AMERICA.

Dear Mr. Bradbury,

Thanks for your letter Ref. TE 432/21 BRHO(2) dated the 18th July, 1973. Enclosed herewith is the reinforcement plan of the distribution system of a part of Belize City called the King's Park Area.

Presently I am working on the preparation of the reinforcement plan of the distribution system of what is called Neal's Pen Road area. I will send the plan of that area as soon as it is completed.

A perusal of the plan of the King's Park area will show that the existing voltage condition is rather bad at various places. The reinforcement plan calls for relocating a 50KVA distribution transformer for St. Thomas Street to the intersection of Third Street and St. Peter Street, and connecting it to 6.6KV by extending the overhead 6.6KV line at 6th Street through an underground cable. This would centralize the distribution transformer location in respect of the existing secondary mains. Moreover, a 50KVA transformer has to be installed at the intersection of Guadalupe Street and St. Peter Street and connected to the existing 6.6KV overhead line at St. Joseph Street through an underground cable. This reinforcement is necessary for improving the bad voltage condition existing in that area. The bad voltage points have been shown on the plan encircled.

A new 50KVA transformer has to be installed at the intersection of 18th Street and E Street essentially in order to take care of the additional power demand of new residential consumers in that area.

A new 50KVA transformer has to be installed at the termination of 8th Street and the existing house to house service connection in that area has to be completely eliminated by constructing distribution mains on 11th Street and I Street.

The existing house to house service connection has also to be eliminated by constructing distribution mains on 13th, F, B, D and 7th Streets. This would not only improve the voltage at the consumer premises, but would also result in a standard construction practice of serving consumers.

I will appreciate your comments on the plan which I am sending to you.

In so far as training of the local counterpart is concerned, I have been training him by associating him in making the plans from the very start of my work here.

With regards.

Very truly yours,

(Mohammed A. Imam)

Mr. J.J.C. Bradbury,
Technical Adviser,
Energy Section,
Resources and Transport Division,
United Nations, N.Y. 10017, U.S.A.

enclosure

MAI/cah

**FROM: Mohammed A. Imam,
(U.N. OPAS Expert),
Belize Electricity Board,
P.O. Box 327, Belize City,
BELIZE, CENTRAL AMERICA.**

4th July, 1973.

Dear Mr. Bradbury,

Thanks for your letter of 10 May, 1973, and the Seminar Reports on Rural Electrification which I found very useful.

Regarding the various reports on rural electrification which have been prepared by the Economic Commission for Europe and by the ECAFE, I have prepared a list of the reports which I want to have and written a letter to the Sales and Circulation Section of the United Nations, New York. A copy of the letter together with the list of the reports required is enclosed with this letter.

I hope you will arrange to get these reports for me free of cost from the Sales and Circulation Section since they are required in connection with the work here.

About the report on the progress of my work here, I intend to send you the plan for the improvement of the low voltage system of a part of Belize City called the King's Park Area, which I have recently completed. One of the most serious problems here in Belize City is the bad voltage at the consumers' premises. Voltage as bad as 95V instead of the lowest declared voltage of 110V exist. The problem is largely due to unduly long secondary lines.

Right now after completing the plan of the King's Park Area, I am working on another area called Noal's Pen Road which is also very bad from the point of view of low voltage.

In doing the work, I am trying to impart to the local engineer as much training as I can keeping in mind the fact that my job essentially is to train the local engineer to take over the job of planning the transmission and distribution system as soon as possible.

With regards.

Very truly yours,

(Mohammed A. Imam)

Mr. J.J.C. Bradbury,
Technical Adviser,
Energy Section,
Resources & Transport Division,
United Nations, New York, N.Y. 10017.
encl.
MAI/cah