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Bhutan Electricity Authority

Royal Government of Bhutan

Thimphu : Bhutan

ANNUAL REPORT 2017-2018

MESSAGE FROM THE CHAIRMAN

It is a special honour and privilege for me to present the 12th Annual Report of the Bhutan Electricity Authority for the fiscal year 2017-2018.

BEA plays a critical role in regulating hydropower sector. It has come a long way and have undertaken a number of new initiatives to further strengthen the regulatory capacity of BEA.

In order to ensure that the roles and responsibilities of BEA remain relevant with the changing times and growing complexities of the energy sector, the Organizational Development exercise was carried out for the first time for the BEA Secretariat by engaging a consultant from Royal Institute of Management. While some of the OD recommendations have already been implemented, certain legal and policy related issues require further deliberation with relevant stakeholders and can be considered for implementation in a phased manner based on the relevance, need and applicability in the coming years.

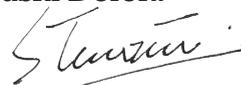
BEA in collaboration with the Ministry of Works and Human Settlement has successfully implemented the Internal House Wiring Regulations through

its agencies: District Engineers and Thromde Engineers so as to ensure that our homes are safe from electrical hazards at all times.

During the year, BEA also carried out review of its licensing processes and I am happy to inform that our licensing processes are at par with international standards adopted by developed countries such as United States and Norway. With an aim to determine power distribution reliability standards, BEA has been collecting outage data for the last few years and we are confident that an appropriate reliability standard will be developed in the next fiscal year.

Lastly, I would like to extend my deepest appreciations to our former Economic Affairs Minister, Lyonpo Lekey Dorji for his providing unwavering support and guidance to the Authority Members and BEA secretariat and to all the stakeholders for extending continuous support and cooperation to BEA.

Tashi Delek.



(Sonam Tenzin)
Chairman

FROM THE CEO'S DESK

It is an honor for me to present the 12th Annual Report of the Bhutan Electricity Authority for the fiscal year 2016-2017.

I am very pleased to report here that BEA has been able to carry out many activities in the current fiscal year. Indeed, BEA has been able to collaborate with the Ministry of Work and Human Settlement for implementation of the Internal House Wiring Regulation that will facilitate better electrical safety in our homes. In order to raise the electrical safety awareness level, the BEA has been carrying out safety awareness workshop to general public every year. During the current fiscal year, the safety awareness workshop was carried out in the Trashiyangtse and Gelephu, in addition to broadcasting the safety messages in the Bhutan Broadcasting Service.

A detailed study on power distribution interruptions was carried out with view to determine power distribution reliability standard for BPC. Further, a review on international licensing practices of power sector carried out concluded that our licensing practices are

similar to that of developed countries such as United States. BEA were able to publish the following two reports containing valuable information for the public: i) Comparative study on electricity tariff in the region and ii) Various causes leading to the cost overrun of hydropower projects around the world. With the growing complexity in the electricity industry, the Organizational Development exercise for the BEA Secretariat was carried out to ensure that the role and responsibilities of BEA remain relevant.

All these activities of BEA would not have been possible without the kind support of His Excellency Tengye Lyonpo and timely guidance by the Authority Members. We are therefore very grateful to them. We are also thankful to our Licensees, government agencies and stakeholders for their generous support and continuous co-operation.

Tashi Delek



(Samdrup K Thinley)
Chief Executive Officer

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1. AUTHORITY

As per Section 8 of the Electricity Act of Bhutan, the Authority should consist of a Chairman, minimum of three members and a Chief Executive Officer as the member secretary. All the Authority Members are appointed by the Hon'ble Minister of Ministry of Economic Affairs in accordance with Section 8.1 of the Electricity Act of Bhutan.

The Authority members are constituted from various organizations of the Royal Government and private sector. Following are the current Members of the Bhutan Electricity Authority.



MR. SONAM TENZIN (CHAIRMAN)

Mr. Sonam Tenzin, Director, Department of Trade, Ministry of Economic Affairs was appointed as the Chairman of Bhutan Electricity Authority on 6th December 2015 for a period of four years.

DASHO UGYEN TSHECHUP DORJI (MEMBER)

Dasho Ugyen Tshechup Dorji, Vice Chairman, Singye Group of companies was appointed as the Member of Bhutan Electricity Authority on 20th May 2016 for a period of four years.



MR. MEWANG GYELTSHEN (MEMBER)

Mr. Mewang Gyeltshen, Director, Department of Renewable Energy, Ministry of Economic Affairs was appointed as the Member of Bhutan Electricity Authority on 6th December 2017 for the period of four years.

MR. TASHI GYALPO (MEMBER)

Mr. Tashi Gyalpo, Attorney-At-Law, Bhutan Legal Eagles, Thimphu, was appointed as Member of Bhutan Electricity Authority on 24th March 2017 for the period of four years. Mr. Tashi Gyalpo also served as the Member of Bhutan Electricity Authority in the past during his tenure with the Office of Attorney General.



MR. NORBU DHENDUP (MEMBER)

Mr. Norbu Dhendup, Chief, I&CG Division, Ministry of Finance, was appointed as Member of Bhutan Electricity Authority on 30th December 2015 for a period of four years.



MR. SAMDRUP K THINLEY (MEMBER SECRETARY)

Mr. Samdrup K Thinley was appointed as the Chief Executive Officer of Bhutan Electricity Authority for a period of five (5) years with effect from 1st September 2018. The Chief Executive Officer is also the ex-officio Member Secretary of the BEA.



2. FUNCTION OF THE AUTHORITY

The Section 11.1 of the Electricity Act of Bhutan 2001, mandates the BEA with the following functions:

- i) To develop regulations, standards, codes, principles and procedures, which include, but are not limited to the following:
 - a) Performance standards, including minimum technical and safety requirements for construction, operation and maintenance of generation, transmission and distribution facilities;
 - b) Tariff-setting, including tariffs for generation not regulated by power purchase agreement, transmission, distribution and retail sale. These regulations should also comprise terms and conditions for connection fees and investment contribution from customers, and for provision of access to the transmission grid and distribution networks;
 - c) Subsidies to entities carrying out non-economic viable electricity supply based on the policies and planning executed by the Minister;
 - d) Requirements for Licensees' reporting, accounting and issuance of information to the Authority;
 - e) System operation, including dispatch of generation; and
 - f) Levies, charges or royalties to be paid by Licensees.
- ii) To process applications and issue, modify and revoke licenses for generation, transmission, system operation, export, import, distribution and sale of electricity;
- iii) To monitor the performance of Licensees and their compliance with provision of this Act, regulations, standards, codes, licenses and contracts approved by the Authority and concession agreements entered into between the Minister and Licensees;
- iv) To determine, or approve tariffs proposed by the Licensees, and review existing tariffs;

- v) To prescribe and collect fees, charges or royalties from Licensees;
- vi) To impose any fines, sanctions or penalties for any breach of provisions of this Act, regulations, standards, codes, licenses or contracts to be approved by the Authority, and concession agreements entered into between Licensees and the Government;
- vii) To establish a dispute resolution process and settle disputes between Licensees and between Licensees and customers relating to the enforcement of this Act, regulations, codes, standards and licenses issued under this Act, contracts approved by the Authority and concession agreements entered into between the Minister and Licensees, or otherwise any other arrangement for settlement of disputes which are not determined by the mentioned legal instruments; and
- viii) Any other duties or responsibilities delegated by the Minister.

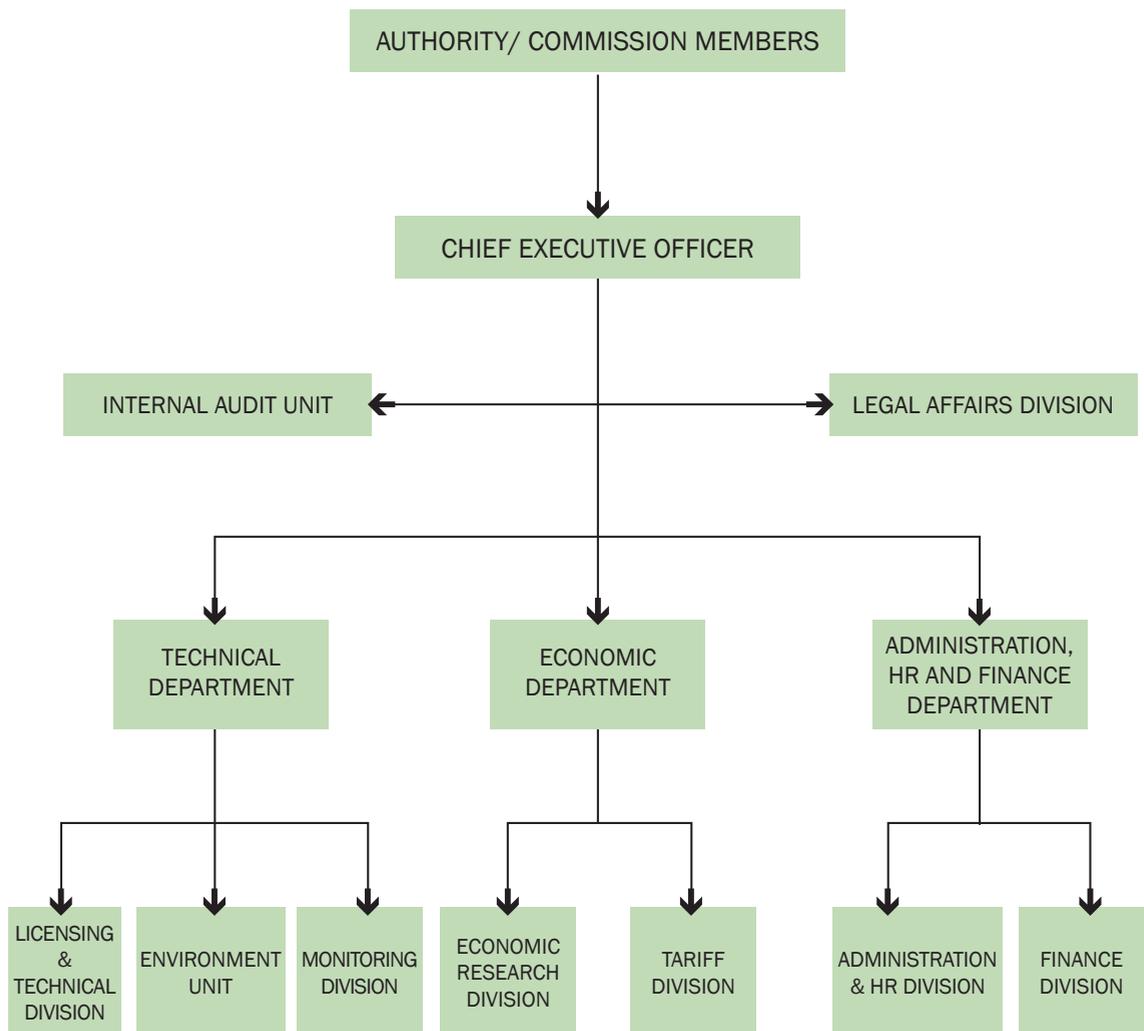
As per the section 11.2 of the Electricity Act, the Authority, in the performance of his functions, is required to:

- a) Ensure the reliability, quality, security and efficiency of electricity supply;
- b) Encourage competition in electricity generation, transmission and supply;
- c) Ensure non-discriminatory access to the transmission and distribution system;
- d) Ensure a fair balance of the interests of the public, customers and participants in the electricity sector;
- e) Facilitate the development of generation, transmission and distribution of electricity throughout the country; and
- f) Ensure the protection of the natural resources, the environment and other public interests affected by the development of electricity supply.

3. THE SECRETARIAT

The Secretariat is headed by the Chief Executive Officer (CEO) who is responsible for overall functioning of the Secretariat. BEA has been granted an autonomous status by the Royal Government of Bhutan on 30th November 2009 and accordingly the employees of the Secretariat were delinked from the Civil Service with effective 1st January 2010.

During the 22nd Authority Meeting of the BEA held on 14th July 2010, the following Organogram of the Secretariat was approved which is functional today.



3.1 Manpower Strength

The staff strength of BEA prior to becoming a fully autonomy was 14 numbers. Subsequent upon grant of full autonomy the Secretariat started recruiting staff to fill the various post in accordance with the approved staff strength to be able to discharge the roles and responsibilities enshrined in the Electricity Act. The staff number of BEA staffs has increased to 37 numbers as of June 2017.

Sl. No.	Division	Number
1	CEO Office	2
2	Monitoring Division	5
3	Licensing & Technical Division	7
	Environment Unit	2
4	Tariff Division	3
5	Economic & Research Division	3
6	Adm.& HR Division	11
7	Finance Division	3
8	Legal Division	1
Total		37

3.2 Human Resource Development

To develop capacity and skills of BEA employees, the employees attended various trainings, conference and study tours. The short-term trainings were mainly focused in the field of (a) economic and finance to understand the electricity tariff determination aspects and financial evaluation of electricity infrastructures; (b) technical regulations to uplift the technical knowledge in the aspect of regulations; and (c) human resource management course.

Country	Training/Conference/Study tour	Period	No. of participants
Nepal	Supporting Energy Security in South Asia	6-8 Nov 2017	2
Thailand	Essential of Performance Management for Leader	13-20 Nov 2017	1
Thailand	Financial Software Management	20-24 Nov 2017	1
Thailand	Advance Level Assessment /Evaluation of Large Hydropower Projects	22-27 Jan 2018	3

Thailand	Research Methodology, Data Analysis and Interpretation	24 March - 3 April 2018	2
Thailand	Research Methodology and Qualitative & Quantitative Data Analysis	24 March - 4 April 2018	2
Thailand	Distribution System Analysis & Improvement and Reliability Evaluation of Composite Power System	7-15 May 2018	2
Vietnam/Lao	Asean Power Grid Summit 2018 (APG 2018)	21-23 May 2018	2
India	Study Tour to WBERC, WBSLDC, WBSEDCL and ERLDC	28 May 2018 - 1 June 2018	3

3.3 Revenue and Expenditure

As authorized by the Electricity Act of Bhutan, the budget for BEA activities are funded through the collection of annual license fees, tariff review applications fee and hydropower project construction license fee from the licensees.

3.3.1 Revenue

License and other fees collected during two consecutive years of 2015-2016 and 2016-2017 as follows.

SL No.	Name of company	Particulars of receipt	Financial year (in Ngultrum)	
			2016-17	2017-18
1	Bhutan Power Corporation Limited (BPC)	Annual Licence fee	15,715,800	16,289,500
2	Druk Green Power Corporation Limited (DGPC)	Annual Licence fee	14,800,000	14,800,000
3	Dagachhu Hydro Energy Limited	Licence Application fee for operation of 126 MW	1,260,000	1,260,000
4	Royal Government of Bhutan (Department of Revenue Custom)	Proceeds from sale of disposable asset	883,500	642,200
5	Financial Institution (Bhutan National Bank)	Interest from Investments		2,280,000
Total Amount			32,659,300	35,271,700

3.3.2 Expenditure

The Hon'ble Tengye Lyonpo, upon recommendation by the Authority, approves the annual budget of the BEA Secretariat in accordance to authority provided to him by the Electricity Act of Bhutan. Following are the expenditures incurred during the last two years.

SL. No.	Object Code	Particulars	Expenditure (Nu. In millions)	
			2016-17	2017-18
1	1.01	Pay & Allowance	15.515	13.033
2	11.01	Travel - In -Country	1.083	1.212
3	11.02	Travel-Outside Country	2.344	2.022
4	12.01	Utilities: Tel. Fax, Internet	0.349	0.400
5	12.02	Utilities: Telegram, Postage etc.	0.007	0.013
6	12.03	Utilities: Elect. Water etc	0.060	0.088
7	13.01	Rental: Building	1.038	1.176
8	14.01	OS: Printing, Publications	0.594	0.811
9	14.06	S7M: Uniform, Kits, Linens	-	0.036
10	14.08	S&M: Others (News Magazine)	0.029	0.015
11	15.01	MOP: Building	0.009	0.029
12	15.02	MOP: Vehicle	0.672	0.763
13	15.05	MOP: Equipment	0.036	0.043
14	15.07	MOP: Computers	0.028	0.026
15	17.01	Operating Exp-Advertising	0.305	0.622
16	17.02	Taxes, Duties, Royalties, Handling &B/ Charges	0.009	0.061
17	17.08	Op. Exp-In - Country Meetings & Celebration	0.960	1.112
18	18.01	Hospitality & Entertainment	0.083	0.098
19	24.01	Subscription to International organization.(SAFIR)	0.528	0.588
20	24.03	Contribution - Provident Fund	0.938	0.987
21	25.01	Retirement Benefit	-	0.343
TOTAL CURRENT EXPENDITURE			21.588	23.435
1	45.01	Training: HR Development	1.918	1.979
2	53.01	Purchase of Vehicle	4.000	-
3	54.01	Furniture	0.240	0.177
4	54.02	Office equipment	0.289	0.188
5	54.03	Computer and peripherals	0.339	0.550
6	55.01	Professional Services	-	1.190
TOTAL CAPITAL EXPENDITURE			4.868	4.085
TOTAL EXPENDITURE INCURRED			26.456	27.520
TOTAL APPROVED BUDGET			31.021	31.438

4. ACHIEVEMENTS AS PER THE OPERATIONAL PLAN

4.1 Implementation Progress of Internal House Wiring Regulation 2016

BEA developed and issued Internal House Wiring Regulation last year in accordance to section 87 of the Electricity Act of Bhutan 2001. The regulation is expected to ensure electrical safety through standard electrical home-wiring throughout the country especially to those new residential houses. In order to ensure effective implementation of the regulation throughout the country, BEA collaborated with the Ministry of Works and Human Settlement (MoWHS) in notifying the Dzongkhag Administrations and Thromde (Municipal) Offices. The Ministry of Works and Human Settlement notified their agencies for the implementation of the regulation vide Circular no. MoWHS/SEC/30/18/860 dated 12th January 2018.

In addition to such effort, BEA also carried out “Awareness Workshop” to the hardware vendors on 9th January 2018, to educate them on the importance of quality electrical products for electrical safety at homes. The news was even featured in the Kuensel edition of 11th January 2018. The officials from the Bhutan Standards Bureau attended to share information on the approved brands for the electrical materials to the vendors.

BEA went further even to present the importance of Internal House Wiring Regulation to the Construction Association of Bhutan on 10th October 2017 to ultimately educate contractors on the importance of safety and standard of electrical home-wiring. Printed several copies of the Internal House Wiring Regulation and freely distributed to Gewog offices, Dzongkhag offices and Electricity Supply Division offices of the BPC for effective implementation.

4.2 Monitoring of the Bhutan Power System Operator

In the year 2014, the BEA issued license to BPC for the power system operation of the country as the Bhutan Power System Operator (BPSO). Subsequently, in the year 2015, checklist in line with the Grid Code Regulation 2008 of BEA was

developed for monitoring the BPSO. Accordingly, during the year, BEA carried out the monitoring of BPSO on power system operation in 4th December 2017 as per the checklist. From the technical monitoring of BPSO, BEA observed that the BPSO is complying with the checklist. It was also observed that BPSO did not have to develop safety procedures as per section 6.13.4 of Grid Code Regulation 2008 since they do not carry out any remote operation of the power system. BPSO only instructs the concerned licensees to undertake the action. In addition, the licensees have their own safety procedures including establishing and maintaining necessary isolation and earthing when work or test are carried out. BEA also visited Western Load Dispatch Center (WLDC) at Malbase substation, Phuentsholing and noted that all the necessary facilities are installed.

4.3 Compliance auditing on the Electricity Services Divisions (ESDs)

BEA conducted electrical safety audit in the Electricity Services Divisions (ESDs) of Bumthang, Trashigang, Pemagatshel, Samdrupjongkhar, Dagana, Wangdue, Punakha, Paro, Thimphu and Phuentsholing under BPC.

SI	Name of Electricity Service Division office	Date of Safety audit
1	ESD, Bumthang	3rd November 2017
2	ESD, Trashigang	7th November 2017
3	ESD, Pemagatshel	9th November 2017
4	ESD, Samdrupjongkhar	13th November 2017
5	ESD, Dagana	15th December 2017
6	ESD, Wangdue	30th January 2018
7	ESD, Punakha	1st February 2018
8	ESD, Paro	14th March 2018
9	ESD, Thimphu	16th March 2018
10	ESD, Phuentsholing	19th March 2018

The follow-up electrical safety audits were carried out to verify whether the corrective actions were taken based on the findings from earlier electrical safety audits of BEA. The common findings from the audited ESD offices were as follows:

- i) Some of the ESD offices of BPC have hot line testers but no proximity alarm, although as a safety measure the each ESD office must have at least one number of proximity alarm;

- ii) The transformers that were installed during the time of Department of Power (DoP) needs to be provided with the anti-climbing devices or fencings as 3 meters ground clearance have not been able to be maintained;
- iii) Some of the writings on danger plates provided on the overhead electric poles and transformer fencings were found to be faded;
- iv) Safety pocket manuals were not distributed to some of the field staff in the audited ESD offices which have ready information on safety clearances;
- v) The electric poles along the feeder lines were found to be rusted in some of the audited ESD offices;
- vi) The electrical safety trainings to the contractors were not being conducted as required by the Safety Code 2008; and
- vii) The employees working in the service centers needs to upscale their safety ethics.

After, the auditing, the compliance order pertaining to all the ten audited ESD offices was sent to BPC on 3rd May 2018 for rectification. BPC was asked to submit their corrective action under taken within six (6) months. The action taken reports is expected to receive in November 2018.

4.4 Public Safety Awareness

As per Section 13 of Safety Regulation 2008, BEA is required to promote electrical safety awareness to employees of the licensee as well as to general public to minimize the risks and hazards associated with the operation of electric power plant and equipment. During the fiscal year, BEA successfully completed the electrical safety awareness education to the public and students of Trashiyangtse on 6th November 2017 and of Gelephu on 13th December 2017. The public turnout was 196 from two gewogs in Trashiyangtse and 173 from two gewogs in Gelephu. The electrical students from Jigme Wangchuk Power Training Institute (JWPTI) in Gelephu also attended the presentation.



Figure1: Student participants for electrical safety awareness



Figure 2: Lunch for students



Figure 3: Public participants for the electrical safety awareness



Figure 4: Lunch for public

Similarly, the electrical safety awareness was conducted in Sarpang on 13th December 2017. The CEO of BEA graced the opening ceremony of the electrical safety awareness campaign held at JWPTI multipurpose hall, where the audience were briefed on the importance of conducting the electrical safety awareness. The session was attended by the Director of JWPTI, officials of BPC, Gups (Local Government Head) and the general public of Dekiling and Samtenling Gewog under Sarpang Dzongkhag. The field staff of ESD Gelephu, BPC also took part in the session. During this session, the general public were provided the opportunity to clarify on electrical safety related issues. The general public actively participated in the workshop. BEA served refreshment and lunch to all the participants. A total number of 173 people had attended the electrical safety awareness campaign in Sarpang, participated by BPC field staff and the students of JWPTI. The Workshop also educated the participant on the provisions of the Electricity Act of Bhutan 2001, and Safety Regulation 2008 and Safety Code 2008 of BEA.



Figure 5: CEO of BEA addressing the public on electrical safety



Figure 6: Public Participants from Dekiling and Samtenling Gewog



Figure 7: Question Answer session



Figure 8: Lunch for public



Figure 9: BPC field staffs and the students of JWPTI

In addition to the above activities on electrical safety awareness, BEA also reviewed the past accident reports and developed two numbers of professional audiovisual electrical safety messages that were aired in the BBS Television for two months to minimize such electrical accidents. The same safety video messages were also sent to the local television cable operators for coverage specifically in five Dzongkhags of Trashigang, Samdrupjongkhar, Trashiyangtse, Pemagatshel and Lhuentse. The safety video messages mainly contained electrical safety aspect relating to felling of tree near the power infrastructures and carrying of ladder and wooden poles under the power lines.

In addition, electrical safety messages, containing the following safety measures, were also aired in BBS radio with view to reduce the electrical accidents in remote places, particularly in far-flung places where there is no television coverage in three languages (Lhotsham, Tshangla and Dzongkha):

- a) Not to undertake any work or activity near the electric overhead power line and infrastructure without prior approval from the relevant Authorities;
- b) Safe hoisting of prayer flags near the electric power line;
- c) Safely cutting down the tree branches for feeding the cattle near the overhead electric power lines;
- d) Preventing children to play and climb on the substations and on electric poles.

4.5 Serious Safety Incidents

The Licensees are required to report to BEA on all serious safety incidents as per Safety Regulation 2008. BEA conducted the investigation of the following safety incidents based on the seriousness in nature of accident occurred in the infrastructure of BPC and DGPC.

a. Electrical accident at Tshemtsho, Rubesa, Wangduephodrang

The fatal accident occurred on 19th June 2017 when an employee of BPC was replacing the blownout drop-out (DO) fuse of the 33kV pole structure. The incident might have occurred when the employee's hand accidentally contacted the live wire of the gang operated switch (GO) just above the DO fuse. The investigation was carried out by BEA on 4th July 2017 and

concluded that there was not enough clearance between the GO switch unit and the DO fuse. The findings of the incident were discussed in the technical committee meeting of BEA and subsequently, for not maintaining standards, the BPC was made to pay fine of Ngultrum three hundred thirty one thousand ninety four (Nu. 331,094) only. The fine collected from BPC was deposited in the RGOB revenue account.

b. Electrical accident at Kilikhar substation, Mongar

The non-fatal electrical accident occurred on 8th August 2017 at Kilikhar substation when the employee of BPC was disconnecting jumper of the B-phase, the victim suffered from burns due to flash over voltage twice. The investigation of this accident was carried out by BEA from 16th-18th August 2017. The investigation concluded that the load break switch (LBS) at Zunglen-end which was supposed to be kept open was not done at the time of the maintenance works. The findings of the incident were discussed in the technical committee meeting of BEA and subsequently BPC was made to pay a fine of Ngultrum Three Hundred Four Thousand and Two Hundred Ninety (Nu. 304,290). The fine collected from BPC was deposited in the RGOB revenue account.

c. Electrical accident at RBP Camp, Zawakha, Wangduephodrang

The fatal accident occurred on 11th August 2017 when four police personnel were pushing and pulling the trolley wheel ladder to maintain the street lamps in Zawakha police compound. The trolley wheels got stuck in the pool floor drain cover. So, while pulling the trolley wheels out of the drain cover, the trolley wheel ladder fell and contacted the nearby 11kV overhead line leading to the death of two police personnel and injuring the other two. The investigation of this accident carried out by BEA on 12th August 2017 concluded the following:

- i) that the overhead conductor clearances were maintained as per the requirements of BEA;
- ii) The work was not carried out on the 11kV lines but on the street lamps that are within the compound of RBP, therefore, there was not safety lapses on BPC.

d. Electrical accident at Tala Hydropower Plant

The fatal accident occurred on 20th January 2018 where two employees of DGPC died when the bypass pipe across the spherical main inlet valve (MIV) burst-open. BEA carried out the investigation of this accident on 26th & 27th January 2018 and concluded that failure of bypass pipe was resulted owing to design inadequacy of the material thickness of bypass pipe during the time of commissioning of Tala Power Plant. DGPC had already replaced the bypass pipes with adequate design of thickness before the onset of 2018 monsoon as rectification measures.

4.6 Review of Hydropower Construction License in line with the EAB 2001

The BEA has issued the following hydropower construction license with license conditions for the construction of:

- i) 1200 MW Punatsangchu-I Hydropower Plant to Punatsangchu-I Hydroelectric Project Authority (PHPA-I);
- ii) 1020 MW Punatsangchhu-II Hydropower Plant to Punatsangchu-II Hydroelectric Project Authority (PHPA-II);
- iii) 720 MW Mangdechu Hydropower Plant to Mangdechu Hydroelectric Project Authority (MHPA);
- iv) 118 MW Nikachhu Hydropower Plant to Tangsibji Hydroelectric Energy Limited (THyE); and
- v) 600 MW Kholongchu Hydropower Plant to Kholongchu Hydroelectric Energy Limited (KHEL).

It has been about a decade since the issuance of first hydropower construction license by BEA. Therefore, in the year 2017 to 2018 fiscal year, BEA considered to review the hydropower construction licenses as one of its operational plan to validate the contemporariness of license condition within the provisions of the Electricity Act. Therefore, relevant provisions of the Electricity Act pertaining to the hydropower licensing as well as the hydropower licensing practices of other countries around the world were reviewed.

Every provision of the Electricity Act pertaining to hydropower licensing aspect were

interpreted based on the practical understanding of the hydropower project sites in the current context. It has been noted that Electricity Act require license application to be evaluated from the perspectives of engineering, environmental, social and financial considerations. Further, while awarding a license, the benefits has to normally exceed the negative consequences of the proposed project. As such, the license issued by the BEA is expected to contain license conditions relating to engineering quality (standard) and safety; protection of natural resources and environmental mitigation measures; conservation of historical and cultural sites; benefits from the proposed project to social development of communities and country; and the financial regulation of proposed project to control unnecessary escalation of the project cost as the domestic tariff is based on cost-plus approach that is not determined by the market. Accordingly, BEA is expected to carry out compliance monitoring of construction of hydropower project as per the provisions of the Electricity Act.

BEA also conducted research on the hydropower licensing practices of other countries around the world such as United States of America (US), Norway, Canada, Australia New Zealand, Nepal, Tanzania, South Africa and Uganda. It is observed that hydropower licensing around the globe is implemented in much more stringent manner especially in the developed countries. In fact, hydropower projects development in US and Norway are very similar to Bhutan, assessing from the engineering, economic and environment considerations - requiring engineering details, cost estimate, social impacts and environmental impacts to ensure they are best adapted to comprehensive plans, and the economic benefits of proposed projects are larger than the cost. After issuance of license, American and Norwegian hydropower project developments are monitored from quality and safety aspect, in social and environmental areas, and from the project cost aspect, much in a same way to Bhutan. Interestingly, in developed countries even when the electricity generation tariff determinations are market driven, the hydropower project construction are still monitored from the project cost aspect. Such global practice clearly displays that we have to monitor the hydropower construction cost more rigorously. US also witness very robust inter-agencies coordination in hydropower licensing. For example, US environmental agencies – the Council of Environment Quality, and the Environment Protection Agency – closely coordinate with the electricity regulator (the Federal Energy

Regulatory Commission) in environmental and social areas. The Council of Environment Quality advises the government on environmental policies and plans for sustainable developmental activities, while Environment Protection Agency establishes and enforces standards on air, water and noise pollution, solid waste, and environmental radiations. In fact, in US, fifteen agencies, coming together, executed inter-agency agreement to coordinate and cooperate for issuance of hydropower license by the electricity regulator- that Bhutan should endeavor for such strong coordination with the relevant agencies. The Canadian (in British Columbia province), Australian (in Tasmanian province), and New Zealand also evaluates dam construction projects from the perspectives of engineering, environment, and finance and accordingly monitors for compliance. Even the least developed countries such as Nepal, Tanzania, Uganda and South Africa, evaluates the hydropower projects from the aspect of engineering, environment and project cost. Therefore, with much higher confidence, the research concludes that, largely, the hydropower licensing practices around the world involves evaluation and monitoring in the areas of (i) engineering; (ii) social and environmental considerations; and (iii) project cost and financing. As such, the review reaffirms that existing hydropower license condition issued by BEA, encompassing adequate provisions in engineering quality (standard) and safety; protection of natural resources; mitigation of environmental impacts; compensation to affected public and private interest; and the cost regulation of proposed project are favorably all in line with the global practices. The study also reconfirms that after the issuance of license conditions, monitoring of hydropower project construction currently carried out by BEA, are essentially as per good global practices; while collaboration with relevant national and local authorities to ensure quality construction, minimization of unnecessary project cost escalation, reforestation activities, maintenance of highways from damages and pollution, and other compensatory and mitigating measures of public and private properties will have to be continuously strengthened.

4.7 Hydropower Dam Monitoring

Although existing hydropower dams are well monitored by the DGPC, during the current fiscal year, BEA, as the regulator, considered monitoring of Chukha Hydropower Plant dam and Dagachhu Hydropower Plant Dam. Chukha dam is

the oldest dam in the country with 30 years of its operation, while the Dagachu dam is the newly commissioned one. The two dams were monitored mainly from the aspect of reservoir operation; spillway gate operation and maintenance; and dam monitoring instrumentations - that are considered fundamentally as very important aspects for the safety of dam.

The reservoir operations of both the dams were carried out safely as per their operation manual. However, lately, the Chukha dam encountered slight problem in opening some of its spillway gates to full capacity due to certain spillway gate hoisting system problem. As recommended by experts, the DGPC is currently upgrading the conventional rope drum hoisting system of Chukha dam to a hydraulic hoisting system as the latter is expected to facilitate be more reliable. The reliable operations of spillway gates in the dam are very important to ensure safe discharge of flood.

Three types of monitoring methods- namely, survey points, internal dam body movements, and seepage detection - using the different types of instruments are observed to be carried out in Chukha and Dagachu dams, to monitor the movement of the dam. It has been noted that as per the global practices, basically, these three types of monitoring approaches are expected to be adequate for monitoring the stability of the dam. The data available from these monitoring instruments revealed that there were no indications of any serious problem to the stability and the structure of the dam so far. However, in the case of Dagachu dam, the inverted pendulum has been found to be disturbed and they have been requested to restore the instrument to working condition at the earliest and report to BEA. Similarly, BEA will receive the updated report on completion of gate hoisting up-gradation of Chukha hydropower dam.

4.8 Review of Distribution Code 2008

The Distribution Code Regulation 2008 was issued by BEA in the year 2008. The Distribution Code mainly comprises of the planning and operation criteria for power distribution and power supply service standards to customers. Since it has been ten years, during the current fiscal years, BEA considered carrying out a review of the Distribution Code 2008, mainly emphasizing in

the following areas:

- i) Management of customer installation and their responsibility;
- ii) Distribution system design from power reliability and safety aspect;
- iii) Compensation aspect of electricity customers for power supply for not fulfilling minimum guarantee service level;
- iv) Power restoration duration;
- v) Regional practices on the reliability calculation; and
- vi) Other conflicting provisions, if any.

The research was conducted for five different countries namely, Australia, India, Malaysia, Sri Lanka and United Kingdom. The selection of these countries were based either on their best practices or based on their advanced power system operation and management.

The review noted that Australian provisions, in principle, are similar to Bhutan. However, they have a systematic and strategic implementing mechanism with well-defined framework. In Australia, for connection to the power distribution system, the customers are required to provide the certificate of electrical safety to ensure that the customer's electrical installation are technically safe. The guaranteed service level compensation (in Victoria province) are equated to one percent of worst served customers. The objective of guaranteed service level payment is not intended to compensate for loss suffered by the customer due to poor service, but to incentivize distribution licensee to improve the services – a very well rationalized objective of compensation for our adoption. Despite Australia being a developed country, some of its provinces do not compensate on quality of electricity supply due to infeasibility and inadequacy of voltage monitoring meters – to which Bhutan is also encountering such practical difficulties. In Australia, it has been noted that the customers are required to bear the cost of distribution line expansion that are later owned and operated by the customers themselves, which is contrary to our practices.

It was very educating to note that power system studies such as sales and demand forecasting studies, load flow studies, short circuit studies and power quality studies are carried out in Sri Lanka for effective designing of their power distribution system. Therefore, it could be very useful to include provisions in

our Distribution Code for carrying out such studies with view to enhance our distribution system design and operation.

The maximum power restoration duration (after power outage) was also reviewed. Currently, the maximum period of power supply restoration is one day in urban and two days in rural areas. In Australia, the power restoration duration varies from 12hrs to 18hrs depending on urban areas or rural. In Malaysia, restoration period ranges from 4hrs to 12 days depending on the type of faults occurred. These two developed countries do not have as treacherous terrain as ours, and probably they would have invested heavily for smart technology compared to ours. Nevertheless, the maximum power restoration duration our Distribution Code will have to be reduced depending on the type of faults.

Further, for calculating reliability indices, it has been observed that many countries include the planned maintenance outage and momentary outages in the reliability indices calculation, contrary to the provisions of our distribution code. It is felt that inclusion of planned maintenance outage and momentary outages in the reliability standard calculation would lead to the improvement of our distribution reliability.

Therefore, the current Distribution Code would be required to amend in the near future based on the above broad findings.

4.9 Reliability Standards Determination

The Distribution Code 2008 requires to calculate the following reliability indices of the distribution system annually to set annual reliability standard:

- a) System Average Interruption Duration Index (SAIDI);
- b) System Average Interruption Frequency Index (SAIFI); and
- c) Customer Average Interruption Duration Index (CAIDI).

SAIDI provides average interruption duration per consumer per year, while SAIFI provides average number of times of interruption per consumer per year. On the other hand, CAIDI provides average outage duration of a year. For calculation of reliability indices, following types of outages have to be excluded as per the Distribution Code 2008:

- i) Scheduled outages;
- ii) Momentary outages of a duration of less than three/five minutes;
- iii) Outages due to failure of grid; and
- iv) Outages beyond the control.

All other outages not included in any of the above categories are considered as negligence of BPC and are accounted for calculation of reliability indices.

The power interruption duration in the distribution system for the year 2017 is recorded to be 678,595 minutes by BPC. It has been observed that for series of years, BPC continued to have serious problems with proper recording of power interruption data. This has resulted BEA to confront with severe challenges to calculate the accurate reliability indices of the distribution system; and therefore has been unable to determine the power reliability standard. The ambiguous outage duration was as high as 336,447 minutes. Owing to this huge amount of confusing outage duration, BEA officials made visits to several district offices of BPC.

BEA acknowledges that there are severe difficulties in maintaining the power distribution reliability due to challenging topography of our country - that is, rugged terrain coupled with highly dispersed rural-settlement, leading the distribution lines to be massively long; passing mostly through thickly vegetated areas that are extremely prone to falling of branches and trees, and animals; besides power line being subjected to landslides and erosion, even not spared even by heavy rain. As a result, locating the fault especially in the bad weather condition in the distribution lines, and maintaining them have becomes very difficult and risky task, taking long time to restore the power. The situation aggravates even more in southern and central parts of Bhutan, having denser natural vegetation, experiencing heavier rain with frequent lightning. However, it is essential for BPC henceforth to accurately record power interruption data in accordance to the requirement of the Distribution Code so that BEA will be able to determine accurate reliability standard.

Considering the inadequacy of information reflected in the outage data submitted by BPC, substantial amount of the outage data of the year 2017

were categorized largely based on estimation. Therefore, reliability indices calculated may not be depicting actual scenario - involving a higher risk in reliability standard determination. Around 193,839 outage-minutes were required to be allocated under scheduled outages and 369,005 minutes of outages under 'beyond the control'. Based on the assumptions, BEA calculated the reliability indices of BPC for the year 2017 as follows:

- i) SAIDI - 10.47 hours/customer/year
- ii) SAIDI - 29.42 times/customer/year
- iii) CAIDI - 0.57 hours/times

The outage-minutes of 369,005 under 'beyond the control' of BPC, which is 54 percent of the total outage (678,595), could either be questionable to an extent or would indicate serious concern to note that Bhutan's distribution system reliability are largely outside the control of BPC. As such, gradual validation over next few years through proper data reporting has become essential. BEA will continue to implement awareness programs on data recording for relevant employees of BPC by visiting their district offices.

4.10 Relevance of Incentive Regulation in Bhutan

Based on the recommendation of the Commissioners of BEA who made an institutional visit to Australian Energy Regulator's office in Australia in March 2016, a study was conducted on the incentive mechanism comprising of Efficiency Benefit Sharing Scheme (EBSS), Service Target Performance Incentive Scheme (STPIS), Demand Management Incentive Scheme (DMIS) and the Capital Expenditure Sharing Scheme (CESS) adopted by the Australian Energy Regulator for their feasibility in Bhutan.

The Efficiency Benefit Sharing Scheme (EBSS) provides an incentive for Licensees (Transmission and Distribution) to pursue efficiency improvements in Operating expenditure (Opex) and the benefits of any increase or decrease in opex is shared approximately 30:70 between Licensees and consumers. Prior to the start of the next tariff period the opex required for Licensees is set using the building block (inspections, testing, vegetation clearances, preventive maintenance and emergencies maintenance).

The scheme encourages Licensees to become more efficient, if a Licensee can provide the required service at a lower cost than that of forecast cost set out by regulator, it benefits by keeping the difference. In particular, it will continue to earn revenue equal to the allowance but, since its costs are lower, its profit will be greater. Conversely, if a Licensee exceeds its forecasted cost it will have to incur the costs of higher expenditure.

The purpose of the Service Target Performance Incentive Scheme (STPIS) is to provide incentives for Licensee (distribution) to maintain and improve service performances. Further, the scheme encourages licensee to maintain existing levels of reliability and make improvements where customers are willing to pay for that work. This scheme comprises of four components such as:

- i) Reliability of supply
- ii) Quality of supply
- iii) Customer service
- iv) Guaranteed service level(GSL)

Under the reliability of supply, quality of supply and customer service components, a Licensee's revenue is increased (or decreased) based on changes in service performance, as assessed by the Regulator (AER). Under the GSL component, payments are made directly to customers where the service performance received by those customers is worse than a specified threshold. The maximum revenue increment or decrement (the revenue at risk) for the scheme components in aggregate for each regulatory year within the tariff period shall be 5%, that is, the sum of the s-factors associated with all parameters must lie between +5% (the upper limit) and -5% (the lower limit).

Demand Management Incentives Scheme (DMIS) is a scheme which incentivises the licensees for controlling and arranging the electricity usage by the consumers during peak demand. The scheme which provides incentives to the licensees to manage the peak demand also helps lower the tariff of the consumers. The purpose of the scheme is to provide licensees with an incentive to carry out efficient expenditure on demand side management. Since the investments done by the licensees are normally driven by the need to build an adequate network capacity to meet the reliability standards, the demand

management scheme can reduce, defer or remove the need for network investments by reducing the peak demand. The Australian Energy Regulator (AER) develops and publishes the scheme and also amends and replaces the developed scheme from time to time.

The Capital expenditure (Capex) is the cost of purchasing and installing the assets related to electricity network. The Capital Expenditure Sharing Scheme (CESS) is a mechanism that rewards licensee for under-spending on capex and penalises for over-spending capex. Under this scheme, the licensee benefits from more efficient expenditure where they earn higher profits by reducing its expenditure in the current regulatory control period. The consumers are also benefited from more efficient expenditure since 70% of under-spending is retained by the consumers. The capital expenditure sharing scheme provides the licensee with the same reward for an under-spending and same penalty for over-spending regardless of in which year they make the saving or loss. However, if capex exceeds the forecast made by AER and considered as inefficient overspending while examining, the licensee bears 100% of inefficient overspend while the consumers are protected in this case. In general, any under-spending and/or over-spending of forecasted capital expenditure is shared between the licensee and consumers in the 30:70 ratio.

It was observed that the DMIS scheme may not be applicable to Bhutan at this point of time, while STPIS could be covered with the amendment of the Distribution Code 2008. However, for the implementation of CESS and the EBSS schemes, the incentives are required to be passed-on to the employees of the utilities to motivate them, which may not be in line with the existing remuneration policy of the Royal Government of Bhutan and Druk Holding Investment (DHI). It was confirmed that all cost savings achieved by the utility companies would not be possible to be passed on to the employees, as dividends has to be declared to the share-holders.

4.11 Report on Electricity Tariff in Bhutan

A report on comparative study on Generation and End User Tariffs with the tariffs in the region were conducted during fiscal year 2016-17 The

report on Electricity Tariff in Bhutan covers the historical account of the electricity tariff developments, the roles of the various agencies, tariff determination process, principles, policies and regulations, comparison with tariffs in the region etc. which could serve as a ready reference for consumers, stakeholders and various agencies on electricity tariff. The report was uploaded on the BEA website on 21st December 2017.

4.12 Publish report on hydropower cost overrun

The research on hydropower cost overrun was carried out to understand the global trend in hydropower construction and, the roles and responsibilities of hydropower regulatory agencies. The study noted that hydropower cost overrun are not only occurring in Bhutan but in several countries around the world – the cost overrun sometimes being as high as 100%. Some of these projects includes 1450 MW Sardar Sarovar project of India in 2006 which witnessed a cost escalation of 513%; 1360 MW Vinstra project of Norway in 1950 with 190% cost escalation; 2400 MW Bakun project of Malaysia in 2011 with 417% cost escalation; and 300 MW Chixoy project of Guatemala in 1986 with 135% cost escalation of 136%. Similarly, 111MW Sawra Kuddu Hydroelectric project in India experienced project over run of 111% and delayed by around 96 months (more than 7 years). The cause of cost overrun and delay were mainly due to inadequate DPR studies, geological surprises, delay in handing the construction sites to the contractors and due to other corrupt practices. The 969 MW Neelum-Jhelum hydropower project in Pakistan experienced cost overrun of 491.7% mainly caused by change in design and corrupt practice in procuring construction equipment. The 842MW Muskrat Falls hydroelectric project in Canada, which is still under construction is suffering from 104% of cost overrun due to under estimation of cost and timeline. There are several other hydropower projects around the world which experienced substantial increase in the construction cost. The detail report is uploaded in the website of the BEA.

The Report on “International Comparative Assessment of construction cost overrun for electricity infrastructure”, made a comparative assessment with sixty-one (61) hydroelectric projects across the globe in 2014. The assessment

indicated that these 61 projects contributed to total cost overruns of USD 148,6 - that is cost escalation of 70.6%. Similarly, World Commission on Dams in 2000 reported that the cost overrun for hydropower dams in sub-region of Latin America, Central and South Asia on average are 53%, 108% and 138% respectively. World Commission on Dams reported that the main causes of cost overruns are due to poor development of technical and cost estimates, poor supervision, technical problem during construction, implementation issues of suppliers and contractors and change in external conditions such as economic and regulations.

Further, the roles and responsibilities of regulatory agencies around the world on the hydropower cost overrun and delay were also studied. In Norway, the development of hydropower does not require license and generation prices are also not regulated and therefore, the generation company developing the hydropower projects are solely accountable for the cost overrun. Although, certificates of compliance are required in Philippines and license are required in Uganda from their regulators for the development of hydropower projects, information on the cost overrun and time delay were not available.

This study concluded that mega hydroelectric projects are more likely to experience the cost overruns and delays as compared to small projects. The factors contributing to the cost overruns in hydropower project construction are due to inflation, change or error in design particularly in civil works because of geological surprises, engagement of ineligible contractors, strong political interference and corrupt practices. The study also indicated the regulators roles in cases of cost overrun or delays are generally limited as per their defined responsibility in the relevant laws.

4.13 Development of Tariff Review Guidelines

The Tariff Review Guideline is an internal document of BEA for using as a manual while reviewing the electricity tariff application. A draft review guidelines were therefore developed in the fiscal year 2014-2015. Upon approval of the Domestic Electricity Tariff Policy 2016, the Generation and BPC Tariff Review Guidelines were finalized mainly for transparent and efficient implementation of electricity tariff determination in BEA.

4.14 Determination of Export Energy Electrical Losses

A study on actual export energy electrical losses was carried out by BEA during the fiscal year. It was noted during the field visits that BPC has initiated installations of new advance energy meters and started replacing appropriated current transformer (CT) in almost all substations which will have the following advantages:

- a) The readings were recorded manually and such practices results in certain time difference while recording the readings at different locations. With the installation of new meters the energy readings are automatically recorded with the help GPS installed software and data can be retrieved afterwards as per the time programmed for the joint meter reading and thus minimizes the time difference error.
- b) The new meters can display in KWh instead of MWh whereby improves the accuracy of energy readings in the case of very low volume energy readings.
- c) Appropriate CT ratio in most of the transmission substations were replaced, thereby reducing the error of energy readings especially during low load condition.

The export loss percentage calculated was solely based on energy exported and energy gains/negative losses were not taken into consideration. With these limitations, it was decided continuing use of the existing 2% loss for determination of wheeling charges.

4.15 Organization Development Exercise for BEA

The BEA carried out an Organizational Development (OD) Exercise as the current structure was established in 2010. The Organizational Development exercise for the Bhutan Electricity Authority was awarded to Royal Institute of Management on dated 22nd September 2017 for a fee of Ngultrum five hundred fifty one thousand and forty (Nu. 551,040).

As part of the OD exercise, the consultant held a consultation meeting with BEA staff on 3rd and 4th January 2018. Further, the draft report of the OD exercise was presented to the Authority Members on 22nd March 2018. Upon incorporating the feedback of the Authority Members, the consultant made

final presentation to the staff of BEA on 11th April 2018. The final OD report was submitted on 20th June 2018.

The OD report has identified the following issues at the level of Electricity Act, which serves as the source of empowerment for the conduct of its key office functionaries namely the Minister, Board and the secretariat headed by the CEO, that are ambiguous and need the clarity:

- i) Purpose statement and objective
- ii) Restructuring of the electricity supply industry
- iii) Other duties and responsibilities delegated by the Minister
- iv) Powers and functions of Minister
- v) Repeated mention of clauses on land rights, water rights and environmental protection and
- vi) Tariff regulation clauses on regulation of tariff for sale of electricity to customers and non regulated power purchase agreement
- vii) Licensing regulations on environment, land and water
- viii) Rural Electrification mandate, and
- ix) Private Sector participation

The OD report has identified several issues pertaining to the BEA Secretariat. The issues identified require two levels of interventions: (i) Issues that have to be put to Minister for incorporation when amending the Electricity Act and; (ii) Issues that can be pursued by BEA under its normal operation at an appropriate time in future.

Accordingly, to align the role of BEA in achieving improved regulatory service delivery through strengthening of its autonomy, transparency and consumer protection, the OD report recommended the following.

- i) First and foremost, the BEA must ensure its autonomy and the mandates must be clarified, in particular clarity is required to sort out the duplication of roles amongst the Minister, Board and the Secretariat. It must also clarify its role of engagement with the external agencies in particular

with the Department of Hydro Power & Power Systems, DGPC & BPC.

- ii) For the Secretariat, the focus must be in three core areas of licensing, tariff and monitoring & evaluation. In addition to the role of strengthening autonomy, ensuring transparency and consumer protection, the secretariat must also ensure it is provided with the tools and resources essential for delivering on its mandate.

4.16 BEA Annual Report for the fiscal year 2016-2017

In accordance to section 75 of the Electricity Act of Bhutan 2001, BEA has to submit to the Minister a statement of the activities undertaken in the preceding financial year, within four months after the end of each financial year. Accordingly, the report in the form of annual report was submitted to Hon'ble Tengye Lyonpo and copies distributed to all ministries and relevant agencies besides the licensees.

4.17 Auditing books of accounts for the fiscal year 2016-2017

The Royal Audit Authority (RAA) deputed auditors for auditing the books of accounts of BEA from 19th February till 9th March 2018. The Auditors upon completion of the audit issued three (3) memos seeking clarification/justifications. Based on the justifications submitted to the RAA, all the memos were resolved during the audit exit meeting held on 13th March 2018.

5. OPERATIONAL PLAN FOR THE FISCAL YEAR 2018-2019

Apart from routine activities, the BEA shall undertake the following major activities.

5.1 Monitor Hydropower Plants of Druk Green Power Corporation

DGPC has fulfilled the requirements of International Organization for Standardization's (ISO) of international standard BS OHSAS 18001:2007 – Occupational Health and Safety Management System (OHSMS) and was awarded the certificate. DGPC applied for ISO certification to improve their operational performance and diversify in other functional areas of the hydropower chain. Apart from many other requirements to meet the BS OHSAS 18001:2007 standard, it may be verified to check if the applicable legal requirements like the Safety Code 2008 and Safety Regulation 2008 of BEA are taken into account or not. The provisions from the License Conditions in each power plant will also be taken into account. In this regard, BEA will visit four power plants (Kurichhu, Tala, Chukha and Basochhu) and verify compliance with the regulations, code and license conditions issued. Examine the requirements of the BS OHSAS 18001:2007 and verify its adequacy with the requirements of Safety Regulations and Safety Codes of the BEA.

5.2 Audit Safety Compliance on the ESD offices of BPC

The electrical audits in the ten (10) ESDs was carried out in last fiscal year in line with the Safety Regulations and Safety Code 2008 of BEA. Similarly, BEA will conduct electrical safety audits in the remaining nine (9) ESD offices (Trongsa, Zhemgang, Mongar, Lhuentse, Trashiyangtse, Samtse, Haa, Sarpang and Tsirang) of BPC in the current fiscal year. The auditing process is to examine that the activities carried out by BPC are in compliance with the safety regulations and to verify if the compliance orders issued in the past were adhered or not.

5.3 Conduct Public Safety Awareness

In continuation to previous year's operational plan, electrical safety awareness to the public will be carried out in the Pema Gatshel & Tsirang Dzongkhags

as per the Section 13 of Safety Regulation 2008. The past data reveal the cause of electrical accidents as lack of awareness of the danger of electricity, carelessness and negligence of the public. Therefore, BEA will conduct public safety awareness through presentations in Dzongkha language or local dialects targeting as many Gewogs as possible including school students. Further, BEA will use media like BBS TV and radio stations to broadcast the safety messages in 3 languages (Dzongkha, Sharchop & Lhotsham). Produce pamphlets carrying safety messages and distribute to all the Central Schools.

5.4 Determine fixed aggravating factors of Guidelines for Fines

BEA will determine the aggravating factors in fixed percentage as opposed to variable percentage presently adopted to bring clarity while determining the aggravating factors prescribed in the Guidelines for Fines (Punitive and Correctional). For determining this fixed percentage, BEA will review the past penalties imposed to BPC and study the impacts of the application of fixed percentage in determining the aggravating factors. The Guidelines for Fines (Punitive and Correctional) shall also be reviewed and all necessary amendments will be proposed.

5.5 Process Hydropower Construction License

5.5.1 Extend Construction License of PHPA-II

The PHPA-II was issued the Construction License for the construction of 1020 MW on 9th February 2012 for the duration of 7 years that will expire on 8th February 2019. For the issuance of construction license extension, BEA will conduct assessment of license application which would include detailed study on construction delay owing to geological problem, financial constraint, construction materials, manpower or equipments, project scheduling, time taken for decision, design changes, etc., and the mitigation of delays including the time taken, and also the cost escalation due to construction delay.

5.5.2 Extend Construction License of PHPA-I

The PHPA-I was issued the Construction License for the construction of 1200 MW in 11th November 2008 for the duration of 7 consecutive

years. The Construction License was renewed till 31st July 2019. For the issuance of construction license extension, BEA will conduct assessment of license application which would include detailed study on construction delay owing to geological problem, financial constraint, construction materials, manpower or equipments, project scheduling, time taken for decision, design changes, etc., and the mitigation of delays including the time taken, and also the cost escalation due to construction delay.

5.5.3 Extend Construction License of THyE

BEA issued construction license to THyE for the construction of 118 MW Nikachhu Hydropower Plant on 19th November 2014 for the duration of 4 years that will expire on 18th November 2018. For the issuance of construction license extension, BEA will conduct assessment of the license extension application which would include detailed study on the causes of construction delay such as geological problem, financial constraint, construction materials, manpower or equipments, project scheduling, time taken for decision, design changes, etc., and the mitigation of delays including the time taken.

5.5.4 Issue Generation License for 720 MW MHPA

BEA issued the construction license to MHPA for the construction of 720 MW Mangdechhu Hydropower Plant on 24th April 2012 for the duration of 7 consecutive years. The construction license is valid till 23rd April 2019. Since 99% of the project is complete and the commissioning date planned in November 2018, BEA will assess the license application for the operation as per Electricity Act of Bhutan 2001. The assessment will also include whether project components such as dam, HRT and Powerhouse necessary for the generation of electricity are completed through site visits.

5.6 Calculate Reliability Indices and Standards

In the previous years, only few power outage data were recorded which indicated poor data recording. Therefore, BEA conducted various awareness program to the licensee by visiting various ESDs and meeting with staff of licensee on the requirement and importance of data recording. Through this programs, BEA

noted that there was significant improvement in data recording i.e. an increase of 236,361 outage minutes in a span of four years (2014-17).

A new data-recording format was issued in December 2017 designed specifically to capture clear information on cause of the outages and the mitigation carried out to restore the power. The information from the new format will enable to validate the outage data more prudently thus making it possible to determine realistic reliability indices. Using this new format, BEA will analyze the outage data submitted for the year 2018 in accordance to the requirement of Distribution Code.

5.7 Assess Environmental Impact Management of Hydropower Project

BEA has granted hydropower construction licenses to PHPA-I, PHPA-II, MHPA, THyE and KHEL in accordance with the Electricity Act of Bhutan 2001. As per the Act, BEA has to look into environmental and social issues arising from the development of hydropower projects by the licensees although the lead agency on this matter is National Environment Commission (NEC). In this regard, BEA will integrate the mandates of BEA's license conditions and NEC's environmental clearances (ECs) to obtain accurate and quantifiable information with regard to Environmental and Social Impact (ESI) management. Through evaluation of ESI management, BEA will provide recommendations or directives to respective Licensees for further improvement or corrections. As a part of evaluation, BEA will also visit sites to verify the quality and quantity of management activities carried out by the Licensees.

5.8 Update Guidelines for Filing Tariff Application

As required by Tariff Determination Regulation (TDR) 2007, BEA developed Guidelines for Filing Tariff Application 2012 for the utility companies for filing tariff applications for the determination of electricity prices. In the later years, the Royal Government of Bhutan issued the Domestic Electricity Tariff Policy, 2016 and accordingly, BEA also issued the TDR 2016. Therefore, the Guidelines for Filing Tariff Application has to be updated according to the TDR 2016 in order to enable the utilities to submit the Investment Plan Proposal and Tariff

Applications for the tariff period 2019-2022 in the manner desired by the BEA.

5.9 Review DGPC Investment Plan for the tariff period 2019-2022

TDR 2016 requires DGPC to propose their Investment Plan for their Corporate Office, 336 MW Chukha Hydropower Plant, 60 MW Kurichhu Hydropower Plant, 64 MW Basochhu Hydropower Plant and 1020 MW Tala Hydropower Plant for the tariff period 2019-2022. Therefore, BEA will review their Investment Plan, conduct stakeholder consultation involving relevant agencies and approve their Investment Plan for the tariff period 2019-2022.

5.10 Review BPC Investment Plan for the tariff period 2019-2022

TDR requires BPC to propose their Investment Plan for their Corporate Office/ Others, Distribution System, Transmission System, System Operation and Embedded Generation programs for the tariff period 2019-2022. Therefore, BEA will review their Investment Plan, conduct stakeholder consultation involving relevant agencies and approve their Investment Plan for the tariff period 2019-2022.

5.11 Determine DGPC Generation Cost for the period 2019-22

DGPC will be proposing their tariff revision by March 2019 in line with the TDR 2016. Therefore, BEA will review their proposal, conduct public hearing/stake holder consultation and determine the DGPC generation cost of supply for the tariff period 2019-2022.

5.12 Determine BPC Cost of Supply for tariff period 2019-22

BPC will be proposing their tariff for the High Voltage (HV), Medium Voltage (MV) and Low Voltage (LV) Customers by March 2019 in line with the TDR 2016. Therefore, BEA will review their proposal, conduct public hearing/stake holder consultation and determine the tariff of HV, MV, LV and Wheeling cost of supply for the tariff period 2019-2022.

5.13 Determine MHPA Generation Cost of Supply

The 720 MW MHPA is planned to be commissioned in November 2018. As per the TDR 2016, no licensee shall levy any tariff or charges for generation, to any other person or entity without the approval of the Authority. Therefore, BEA will review MHPA's tariff proposal, conduct stakeholder consultation involving relevant agencies and determine the MHPA's cost of supply for the period 2019 - 2022.

5.14 Publish Annual Report

In accordance to section 75 of the Electricity Act of Bhutan 2001, BEA has to submit to the Minister a statement of the activities undertaken in the preceding financial year, within four months after the end of each financial year. The report in the form of annual report will be submitted to Hon'ble Tengye Lyonpo and copies distributed to all ministries and relevant agencies besides the licensees.

5.15 Audit Books of Accounts of BEA by RAA for the fiscal year 2017-2018

The books of account of BEA for the fiscal year 2016-2017 were audited by Royal Audit Authority (RAA). BEA took appropriate actions and resolved all memos. BEA also expects the auditing of books of accounts for the fiscal year 2017-2018 in mid-January 2019.

5.16 Conduct Training Need Analysis for BEA Secretariat

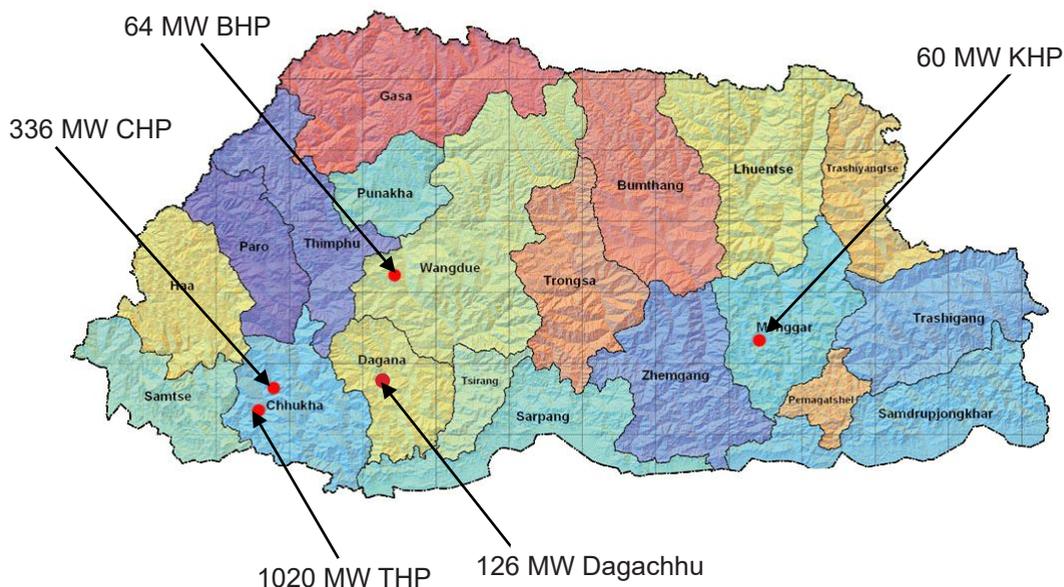
In the fiscal year 2017-18, BEA carried out an Organizational Development (OD) exercise by engaging a consultant from Royal Institute of Management. One of the findings from the OD exercise was the need to develop skill and capacity of the BEA Secretariat. Accordingly, it is planned to conduct training need analysis for the BEA Secretariat for this fiscal year.

6. LICENSED HYDRO POWER PLANTS IN OPERATION

The following hydropower plants are under operation and are licensed by BEA. The year of commercial operation, date of license issued, validity of license, capacity and location of the plants are as shown below:

SL.	Name of Plant	Year of Operation	Date of License	Validity of License
1	Chukha Hydropower Plant (CHP)	1998	1 Jan 2009	27 March 2037
2	Kurichu Hydropower Plant (KHP)	2002	1 Jan 2009	27 March 2037
3	Basochu Hydropower Plant (BHP)	2005	1 Jan 2009	27 March 2037
4	Tala Hydropower Plant (THP)	2007	1 April 2009	31 March 2039
5	Dagachhu Hydropower Plant	2015	20 Feb 2015	19 Feb 2045

Licensed Hydro-Power projects in Operation

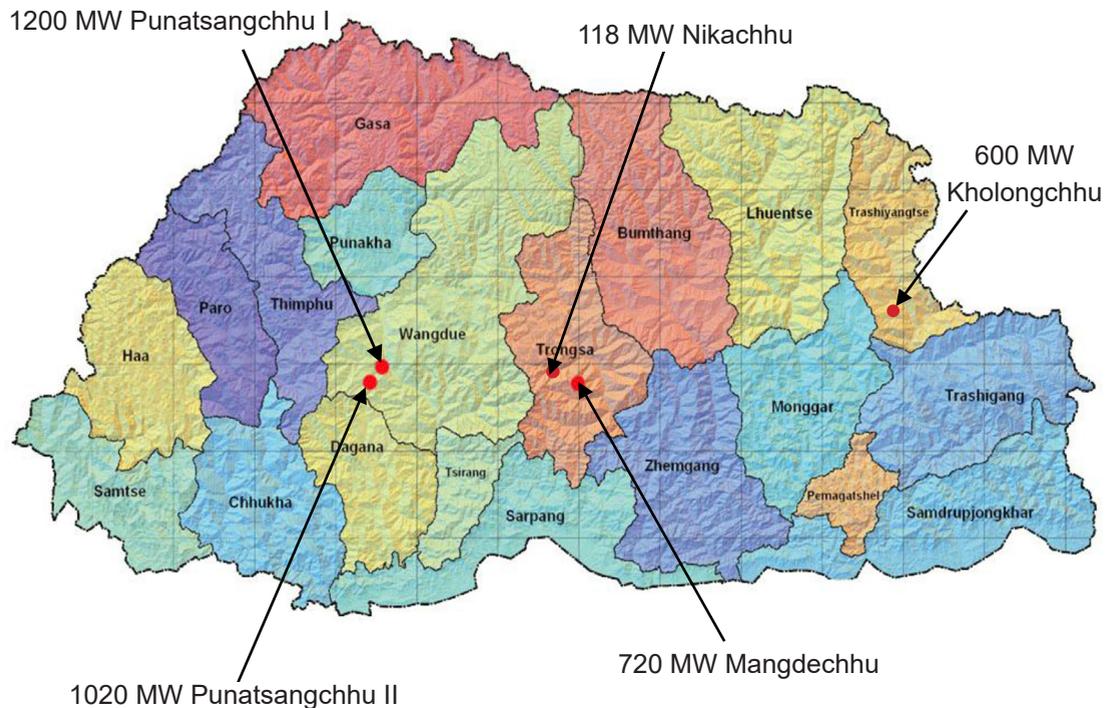


7. LICENSED HYDROPOWER PROJECTS UNDER CONSTRUCTION

The following hydropower plants are under operation and are licensed by BEA. The year of commercial operation, date of license issued, validity of license, capacity and location of the plants are as shown below:

SL.	Name of Plant	Date of License	Validity of License
1	Punatsangchhu-I Hydropower Project	11 Nov 2008	31 July 2019
2	Punatsangchhu-II Hydropower Project	9 Feb 2012	8 Feb 2019
3	Mangdechhu Hydropower Project	24 April 2012	23 April 2019
4	Nikachhu Hydropower Project	19 Nov 2014	19 Aug 2018
5	Kholongchhu Hydropower Project	14 July 2015	1 Jan 2022

Licensed Hydro-Power projects under construction



8. LICENSED SMALL, WIND MINI AND MICRO HYDROPOWER PLANTS

BPC has three (3) small hydro plant, one (1) wind power plant, nine (9) mini hydels and seven (7) micro-hydropower plants with a total generating capacity of 8.52 MW. These hydro plants are located in the following Dzongkhags as shown in the map below:



<p>Small Hydropower plant</p> <ol style="list-style-type: none"> 5X250 kW Gidakom mini hydel 3X500 kW Chumey mini hydel 2X1100 kW Ranjung 	<p>Wind power plant</p> <ol style="list-style-type: none"> 12X300 kW wind power plant
<p>Mini Hydropower plant</p> <ol style="list-style-type: none"> 4X90 kW Thimphu mini hydel 3X100 kW Hesothangkha mini hydel 2X100 kW Darachu mini hydel 2X100 kW Changchey mini hydel 2X100 kW Tingtibi mini hydel 2X100 kW Rongchu mini hydel 2X60 kW Gangzur mini hydel 3X130 kW Khanlanzi mini hydel 3X250 kW Chenary mini hydel 	<p>Micro Hydropower plant</p> <ol style="list-style-type: none"> 1X40 kW Rukubji micro hydel 1X30 kW Tangsibji micro hydel 1X50 kW Sherubling micro hydel 1X30 kW Kuengarabten micro hydel 1X30 kW Tamshing micro hydel 1X50 kW Ura Micro hydel 1X20 kW Kelkhar micro hydel

9. APPROVED TARIFF FOR THE PERIOD 2017- 2019

After the approval of the Tariff Determination Regulation 2016, the BEA directed the DGPC and BPC to submit their tariff applications for the tariff period 2016-2019 as per the new Regulation. Accordingly, the Licensees submitted their proposals on 29th April 2016.

Upon completion of the application screening, the BEA uploaded the BPC tariff applications on the BEA website on 4th May 2016 for public viewing. Along with the notification of the receipt of the application, BEA has also announced the date of the public hearing as 9th June 2016.

The public hearing was conducted on 9th June 2016 and during the public hearing session the DGPC and BPC made presentation to the general public on their tariff revision proposal while the Secretary General of Association of Bhutan Industries also made presentation expressing their views on the tariff revision proposal. After the presentation, the public and the licensee were informed to provide their written comments to the Bhutan Electricity Authority within 30th June 2016.

Taking into consideration the feedbacks from licensees, the consumers and internal review carried out by the BEA Secretariat, the Bhutan Electricity Authority approved the DGPC generation cost and BPC cost of supply for the tariff period 2016-2019 as follows.

S.N	Customer category	DGPC generation tariff (Nu/KWh)	BPC cost of supply (Nu/KWh)	Total Cost of supply (Nu/KWh)
1	Low Voltage (LV)	1.59	4.22	5.81
2	Medium Voltage (MV)	1.59	3.79	5.38
3	High Voltage (HV)	1.59	0.64	2.23
4	Wheeling	-	0.195	0.195

The Royal Government of Bhutan has decided to utilize part of the revenue to be earned through the sale of royalty energy to subsidize the LV and MV consumers. The total subsidy allocation was about Nu. 1772.75 million per year that would enable to maintain the same level of tariff for LV block I, 3% annual

increase for other LV blocks and 6.5% annual increase for MV consumers.

Accordingly, the RGOB therefore provided per unit subsidy to LV and MV consumers to various blocks as follows.

Customer Category	RGoB subsidy per unit (Nu.)		
	1 st January 2017 to 30 th June 2017	1 st July 2017 to 30 th June 2018	1 st July 2018 to 30 th June 2019
Low Voltage			
LV Block I (Rural) 0 - 100 kWh	5.81	5.81	5.81
LV Block I (Others) 0-100 kWh	4.53	4.53	4.53
LV Block II (All) >100 - 300 kWh	3.29	3.21	3.13
LV Block III (All) >300 kWh	2.48	2.38	2.28
LV bulk	2.02	1.91	1.79
Medium Voltage	1.77	1.53	1.29

With the subsidy injection by Royal Government of Bhutan to the LV and MV, the new electricity tariffs for the various categories of LV, MV and HV consumers and Wheeling charges are as follows.

Customer Category	Unit	Previous Tariff 2015/2016	1 st January 2017 to 30 th June 2017	1 st July 2017 to 30 th June 2018	1 st July 2018 to 30 th June 2019
Low Voltage (LV)					
LV Block I (Rural) 0 - 100 kWh	Nu./kWh	0	0	0	0
LV Block I (Others) 0 - 100 kWh	Nu./kWh	1.28	1.28	1.28	1.28
LV Block II (All) >100 - 300 kWh	Nu./kWh	2.45	2.52	2.60	2.68
LV Block III (All) >300+ kWh	Nu./kWh	3.23	3.33	3.43	3.53
LV bulk	Nu./kWh	3.68	3.79	3.90	4.02
Medium Voltage (MV)					
Energy charge	Nu./kWh	2.43	2.00	2.07	2.16
Demand Charge	Nu./kVA/month	235	250	275	300
High Voltage (HV)					
Energy charge	Nu./kWh		1.59	1.59	1.59
Demand Charge	Nu./kVA/month		262	262	262
Wheeling charges	Nu./kWh		0.195	0.195	0.195

10. GLOSSARY

BEA :	Bhutan Electricity Authority
BBS :	Bhutan Broadcasting Service Corporation
BPC :	Bhutan Power Corporation
DGPC :	Druk Green Power Corporation
ESD :	Electricity Service Division
MHPA :	Mangdechhu Hydroelectric Project Authority
MW :	Mega Watt
PHPA-I :	Punatsangchu-I Hydroelectric Project Authority
PHPA-II :	Punatsangchu-II Hydroelectric Project Authority
THyE :	Tangsibji Hydro Energy Limited