एसजेवीएन लिमिटेड

मिनी-रत्न शिड्यूल'A' पीएसयू

निगमित पर्यावरण विभाग

ISO 9001:2015 Certified DCO20201106

कार्यालय: मुख्य महाप्रबंधक,
निगमित पर्यावरण विभाग,
शक्ति सदन, शनान,
जिला शिमला, हिमाचल प्रदेश -171006
टेलीफोन न.: 0177-2660180
ईमेल: sjvn.ced@sjvn.nic.in

संख्या: SJVN/CHQ/ENV/F21/2023-38 दिनांक: 31/05/2023

सेवा में,

सदस्य सचिव,

राज्य स्तरीय पर्यावरण प्रभाव आकलन प्राधिकरण,

पर्यावरण, विज्ञान और प्रौद्योगिकी विभाग, हिमाचल प्रदेश सरकार,

पर्यावरण भवन, यूएस क्लब के पास, शिमला - 171001

Email: membersecyhpseiaa@yahoo.in, dc.rana04@nic.in, dbt-hp@nic.in

Sub: Six Monthly Monitoring Report on Compliance to Environmental Aspects (For period October, 2022 - March, 2023) i.r.o Corporate Office Complex at Shanan, Shimla.

Ref: Environment Clearance No. HPSEIAA/2011/90-3068, December 30, 2011

Sir,

Kind reference is invited to above referred endorsement vide which Corporate Office Complex of SJVN at Shanan, Shimla is granted Environment Clearance. Further, it is stipulated to submit six-monthly status report on implementation of the conditions of Environment Clearance. Therefore, Six-Monthly Monitoring Report on compliance to Environmental Aspects (for the period October 2022 - March 2023) is submitted for your kind information, please.

संलग्नक: यथोपरि।

सधन्यवाद,

भवदीय,
एसजेवीएन लिमिटेड के लिए,

(कार्यकारी निर्देशक)

प्रतिलिपि (केवल ईमेल के माध्यम से):

1. Member Secretary, H.P. State Pollution Control Board, Him Parivesh, Phase-III, New Shimla-171009, E-mail: mspcb-hp@nic.in

COMPLIANCE REPORT FOR ADHERENCE TO SJVN ENVIRONMENT POLICY AND ENVIRONMENT AND FOREST CLEARANCE CONDITIONS

((1st October 2022 to 31st March 2023))

A)	**Name of Project**	**SJVN Ltd. Corporate Office Complex**
	Type of Project	**Office Building**
	Location	**Shanan, Shimla**
	EC Letter No.	HPSEIAA/2011/90-3068 dated 30/12/2011
	Contact Address	
	a) Concerned Project Head/HoD	Head of Department, Corporate Facility Management Department, SJVN Ltd. Corporate Headquarters, Shanan, Shimla-171006; Contact No. 0177-2660157
	b) Concerned Environment Division (Corporate)	Head (Environment), SJVN Corporate Headquarters, Shanan, Shimla, HP, PIN 171006 Contact No. 0177-2660180

B)	**Condition imposed by the Ministry of Environment & Forests, GoI while granting Environment Clearance Vide letter no. HPSEIAA/2011/90-3068 dated 30/12/2011**	
S. No.	**Conditions Imposed**	**Compliance Status**
Part A	**Specific Conditions**	
I-Construction Phase:		
1	"Consent to Establish" shall be obtained from H.P. State Pollution Control Board under Water (Prevention and Control of Pollution) Act 1974 and Air (Prevention and Control of Pollution) Act 1981 a copy of same shall be submitted to State Environment Impact Assessment Authority (SEIAA) before start of any construction work at the site.	Consent to Operate has been renewed by HPPCB dt. and valid up to 31.03.2024. Also consent to Establish has been renewed by SPCB valid up to 31.03.2024. (**Annexure-1**)
2	Provisions shall be made for the housing of labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.	Provision for the housing of labor within the site with all necessary infrastructure and facilities was made by the Contractor in the form of temporary structures during the construction in SJVN.
3	All required sanitary and hygienic measures should be taken before, during and after the completion of project.	All required sanitary and hygienic measures have been taken care before, during and after the completion of project.
4	A First Aid Room will be provided in the project both during construction and operation phase of the project.	A First Aid Room has been provided during construction of office block. In operation phase,

		Medical room has been provided at ground floor of office building with facility of resident doctor.
5	Adequate drinking water, fuel and sanitary facilities should be provided for construction workers at the site. Provisions should be made for mobile toilets. The safe disposal of waste water and solid wastes generated during the construction activities should be ensured.	All the necessary action has been taken care during construction work.
6	All the top soil excavated during construction activities should be stored for use in horticulture/landscape development within the project site.	All the top soil excavated during construction activities had been stored and utilized in horticulture/landscape developments within the project site.
7	Disposal of muck including excavated material during construction phase should not create any adverse effects on the neighboring communities and disposed off taking the necessary precautions for general safety and health aspects of public, only in approved sites with the approval of competent authority.	SJVN is disposing the muck on approved dumping site of MC as various construction works are in progress at CHQ campus. The permission for dumping of debris/C&D waste was granted to SJVN by MC, Shimla vide letter no-2023-474 dated 14.03.2023 (**Copy attached Annexure-2**) At following approved dumping sites: 1) Dumping site situated near SWM Project Bharyal Totu, Shimla.
8	Soil and ground water samples shall be got tested from authorized agency to ascertain that there is no threat to ground water quality by leaching of heavy metals and other toxic contaminants.	The Construction of Office Complex does not employ usage of heavy metals and the chances of leaching into aquifer is negligible. However, the samples taken from site and ground water have been sent to NABL accredited laboratory. **(Report Enclosed –Annexure 3)**
9	Any hazardous waste generated during construction phase should be disposed off as per applicable rules and norms with necessary approvals of the competent authority.	No such hazardous waste generated during construction phase.
10	Diesel generator sets during construction phase should have acoustic enclosures and should conform to Environment (Protection) Act, 1986 and Rules framed there under for air and noise emission standards. Low Sulphur diesel type should be used.	Acoustic Enclosures Diesel generators were used during construction phase.

11	The diesel required for operating DG sets shall be stored in underground tanks and if required, clearance from Chief Controller of Explosives shall be taken.	No underground tanks were required
12	Vehicles/equipment deployed during construction phase should be in good conditions and should conform to applicable air and noise emission standards, should have vehicle pollution check certificate and should be operated only during non-peaking hours.	It is ensured that all the vehicles used for construction activities are having valid Pollution under Check (PUC) certificates. The vehicles without valid Pollution under Check (PUC) certificate are not permitted at project site.
13	Ambient noise levels should conform to residential standards both during day and night. Only limited necessary construction should be done during night time. Fortnightly monitoring of ambient air quality (SPM, SO2 and NOx) and equivalent noise levels should be ensured during construction phase should be closely monitored during construction phase so as to conform to the stipulated standards fixed by the competent authority.	▪ The silent type DG set with acoustic enclosures has been installed at project site. ▪ All vehicles entering to the site were with valid PUC certificate. ▪ All machinery used at the site were new and periodic maintenance of the machinery insured. ▪ Water sprinkling is carried out through tanker water regularly at site for dust suppression.
14	Storm water control and its re-uses for various applications as per guidelines.	Storm water from terraces and other open areas is collected through rainwater down take pipes connected to a Rain Water Harvesting System having a capacity of 50000 liters.
15	Boundary wall shall be constructed in such a manner as not to be obstructing the flow of storm water. Necessary arrangement shall be made for the drainage of surrounding area.	Weep holes are provided in the boundary wall to release hydrostatic pressure or water pressure on the wall.
16	Water demand during construction should be reduced by use of pre-mixed concrete, curing agents and other best practices and technologies available.	Water demand during construction was reduced by use of pre-mixed concrete, curing agents and other best practices referred.
17	Permission to draw ground water shall be obtained from the competent authority prior to construction/operation of the project.	Recommendation to draw ground water through 4 no. bore well is provided by I&PH, GoHP, copy of letter

		submitted to SEIAA/S&T Department, GoHP (**Copy attached Annexure-4**).
18	Opaque wall should meet perspective requirement as per Energy Conservation Building Code which is proposed to be mandatory for all air-conditioned spaces while it is aspirational for non-air-conditioned spaces by use of appropriate thermal insulation material to fulfil requirement.	Opaque wall meets the requirement as per Energy Conservation Building Code
19	Regular supervision of the above and other measures for monitoring should be place all though the Construction phase, so as to avoid disturbance to the surroundings.	Being ensured through regular supervision.
20	The proponent shall be liable for action under the Environment (Protection) Act, 1986 for the violation of any provision of the said Act.	Noted.
II-Operational Phase:		
1	The installation of the Effluent Treatment Plant/ Sewage Treatment Plant (STP) should be certified by an independent expert and a report in this regard should be submitted to the Director, Department of Environment, Science & Technology before the project is commissioned for operation. Treated effluent emanating from STP shall be recycled/reused to the maximum extent possible. Treatment of 100% grey water by decentralized treatment should be done. Discharge of unused treated effluent shall conform to the prescribed norms and standards. Necessary measures should be made to mitigate the odour problem from STP.	STP based on MBBR technology is installed at Office Complex. The effectiveness of its functioning is ensured through Annual Maintenance Contract.
2	The solid waste generated should be properly collected and segregated. Wet garbage should be composted and dry/inert solid waste should be disposed of to the approved sites for land filling after recovering recyclable materials.	1) Kitchen Bio-waste Composter was installed for conversion of Solid waste to organic manure. The Organic manure is then used for horticulture work in SJVN Corporate office Complex. 2) Office waste is disposed through Municipal Corporation.

3	Diesel power generating sets proposed as source of backup power for elevators and common area illumination during operation phase should be enclosed type and conform to rules made under the Environment (Protection) Act, 1986. The height of stack of DG sets should be equal to the height needed for the combined capacity of all proposed DG sets. The proponent shall be required to use low Sulphur diesel. The location of the DG sets may be decided in consultation with the competent authority.	Two Nos. Diesel Generators Sets are using in SJVN Complex having capacity of 1010kVA and 500kVA which are properly fitted inside the sound proof enclosures & DG sets are CPCB II compliant environment friendly and are placed at safe location.
4	Noise should be controlled to ensure that it does not exceed the prescribed standards. During night time the noise levels measured at the boundary of the building shall be restricted to the permissible levels to comply with the prevalent regulations.	Building is used during day time & noise restricted to the permissible levels to comply with the prevalent regulations and No Noise generated during Night time.
5	The green belt of the adequate width and density preferably with local species along the periphery of the plot shall be raised so as to provide protection against particulates and noise.	Complied.
6	Weep holes in the compound walls shall be provided to ensure natural drainage of rain water in the catchment area during the monsoon periods.	Weep holes are provided in all compound walls in SJVN Corporate office Complex to release hydrostatic pressure or water pressure on the wall.
7	Rain water harvesting for roof run-off and surface run-off, as per plan submitted should be implemented. Before recharging the surface run off, pre treatment must be done to remove suspended matter, oil and grease. The bore well for rainwater recharging should be kept at least 5 mtrs above the highest ground water table.	Rain water Harvesting System of 50 KLD is installed in SJVN Complex with VPMF (Variable Pore Micro Filtration) technology
8	The ground water level and its quality should be monitored regularly in consultation with Central Ground Water Authority.	Agreed. Extraction is minuscule. However, Testing of sample/level is undergoing.
9	Traffic congestion near the entry and exit points from the roads adjoining the proposed project site must be avoided. Parking should be fully internalized as per norms prescribed by the Competent Authority and no public space should be used for this purpose.	Agreed. The traffic circulation plan and the parking plan proposed are as per bye laws with further scope of additional parking for future requirement. Parking will be completely internalized and no public spaces will be utilized. Care is being taken to ensure that there is zero traffic congestion at the entry and exit point through Security at Main Gate.

10	Energy conservation measures like installation of CFLs/TFLs for the lighting the surrounding area/outside areas the building should be integral part of the project design and should be in place before project commissioning. Used CFLs/TFLs should be properly collected and disposed off/sent for recycling as per the prevailing guidelines/rules of the regulatory authority to avoid mercury contamination. Use of solar panels may be done to the possible extent.	T-5 & LED Lamps are installed in SJVN Complex for Energy Conservation. The lights/Lamps will be disposed in line with E-Waste rules 2016. SJVN Limited has installed a roof top solar Photo Voltaic Plant of 120 kW capacity to cater the power supply requirement in the building. The Power generated from solar PV plant is supplied directly to the distribution panels and consumed within the building and excess power is fed to the Grid.
11	Adequate steps should be taken to prevent odour problem from solid waste processing site and STP.	STP System is running efficiently and same is ensured by executing AMC having preventive maintenance.
12	Sprinkling of water etc.be used for air pollution control during construction phase so as to avoid disturbance to the surroundings.	Sprinkling of water is being used for air pollution control. The test report of sample of ambient air is attached as (**Annexure-3**)

Part B General Conditions:

Sr. No.	**Conditions**	**Status**
1	The environmental safe guards contained/given in the proposal for management of environmental pollution should be implemented in letter and spirit.	Proponent is committed to comply the EC conditions and required mitigation norms in letter and spirit.
2	Bimonthly environment monitoring reports should be submitted to the State Environment Impact Assessment Authority and Ministry of Environment & Forests Regional Office at Chandigarh.	Agreed.

3	Officials from the State Environment Impact Assessment Authority, Regional Office of MoEF, monitoring the implementation of environment, Science & Technology GoHP who would be monitoring the implementation of environmental safeguards should be given full cooperation, facilities and documents/data by the project proponents during their inspection. A complete set of all the documents submitted to the State Authority should be forwarded to the Regional Office of MoEF, Chandigarh.	Full Co-operation ensured.
4	In the case of any change (s) in the scope of the project, the project would require a fresh appraisal by this Authority.	Agreed.
5	The SEIAA reserves the right to add additional safeguard measures subsequently, if found necessary, and to take action including revoking of the environment clearance under the provisions of the Environment (Protection) Act, 1986, to ensure effective implementation of the suggested safe guards and measures in a time bound and satisfactory manner.	Agreed.
6	All other statutory clearances shall be obtained, as applicable by the project proponents.	Agreed.
7	These stipulations would be enforced among others under the provisions of Water (Prevention and Control of Pollution) Act, 1974, the Air (Prevention and Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, the Public Liability (Insurance) Act, 1991 and Environment Impact Assessment Notification, 2006.	Noted
8	Environmental Clearance is subject to final order of the Hon'ble Supreme Court of India in the matter of Goa Foundation Vs. Union of India in Writ Petition (Civil) No. 460 of 2004 as may be applicable to this project.	Noted
9	Any appeal against this environmental clearance shall lie with the National Environment Appellate Authority, if preferred, within a period of 30 days as prescribed under Section 11 of the National Environment Appellate Act, 1997.	No such appeal made/reported
Part C	**Special Conditions:**	

S. No.	Conditions	Status
1	Construction shall be carried out strictly as per the norms prescribed by the State Government as regards the number of storey's and FAR.	Complied
2	Proponent shall make provision of a small dispensary in the area open to public as well or upgrade the nearest existing facility in consultation with State Government.	The office complex falls in urban area of Shimla town. There is an excellent medical facility in the nearby vicinity, Tenzin Hospital (Panthaghati) and Public Health Centre (Chotta Shimla). Further, there are numerous healthcare facilities/clinics within these limits and preferred by locals. Office Complex runs a medical facility in its complex catering official staff, contract staff, etc.
3	Roof Area at least to the extent of 60% should be used to harvest solar energy by installing efficient Solar Panels.	SJVN Limited has installed a roof top solar Photo Voltaic Plant of 120 kW capacity to cater the power supply requirement in the building. The Power generated from solar PV plant is supplied directly to the distribution panels and consumed within the building and excess power is fed to the Grid.
4	Before undertaking construction, proponent shall ensure availability of water from IPH department or M.C. Shimla.	Complied. **(Copy attached Annexure-4)**

5	The Project Proponent shall submit returns/details of recyclable wastes, and other solid wastes which shall be generated from the process to the Authority regularly.	i) Solid waste generated from SJVN Corporate Head Quarters is converted in to manure by Bio-composting machine and the end product is used as a fertilizer in horticulture. ii) Old records generated from SJVN Corporate Head Quarters is recycled and reused in office building for which MoU has been signed with S.R associates Solan and recycled material is reused in the form of office file, envelope, covering bag. The Certificate of Appreciation was also awarded to SJVN limited during the FY 2018-19 by Australia's Deputy High Commissioner to India, New Delhi for recycling of office waste paper and thereby conserving the natural resources**..**
6	The Project Proponent shall obtain No Objection Certificate for ground water use/ installation of tube well from Central Ground Water Authority/IPH Department.	NOC Attached **(Copy attached Annexure-4)**
7	Proponent shall ensure the energy efficiency sheet by maximum possible use of renewable sources of energy. The solar lights, CFL, LED lights shall be used to reduce the requirement of the energy and shall apply all possible techniques to reduce the energy consumption.	Being Complied CFL & LED Lights installed in the building which are energy efficient. Energy Audit report of building is **enclosed as Annexure-5.**
8	Project Proponent shall ensure that there are proper arrangements for management of occupational health and safety in accordance with the law as required for machinery safety, personnel safety and health care, fire & explosion safety.	Ensured during construction phase. SJVN Corporate Office Complex has adopted Quality Management System during operation stage **(Copy attached Annexure-6)** and a Quality manual incorporating Risk Management

9	The Project Proponents shall ensure that the planning of the proposed project is done in a manner that vehicular traffic flow in the public areas and roads is not restricted and dedicated parking for the complex users and visitors as well is provided.	Agreed. There will be no traffic congestion near the entry and exit points from the roads adjoining the project site. Parking will be fully internalized and no public space should be utilized.
10	The project Proponent shall obtain all the requisite approvals/clearance/NOCs as may be applicable to the Project from the competent authorities under different Acts/Rules/Regulation/Order/Directions etc.	Agreed. The construction has been started only after taking the NOC from Forest Deptt/Local bodies/Local Authorities. Consent to Establish and Consent to Operate has also been obtained from HSPCB; Copy of the same is enclosed **Annexure-1**
11	The construction material such as grit/bajri, sand shall be obtained from authorized dealers/suppliers only and no illegal mining etc. shall be caused.	Agreed. Construction material has been obtained from authorized dealers/suppliers only and no illegal mining etc. has been allowed.
12	The Project Proponent shall consult the local office of the Department of Forests or any other such authorized agency, university, institution for types of trees to be planted for development of the green belt around the Project site.	Complied.
13	Keeping in view the labour to be employed during the construction phase arrangements to maintain hygienic conditions in the labour camps such as temporary toilets, fuel facility etc. shall be made for which provision shall be made by the proponent.	Being Complied
14	The Sewage Treatment Plant shall be designed and installed based on MBBR technology concurrent with the construction of the project as per the requirement.	1) STP of 90 KLD having approved technology patented by Thermax is installed. 2) Effluent from STP is used for horticulture works of SJVN Corporate Office Complex. 3) Effluent Parameters are monitored monthly through AMC from M/s Micromeg Enterprises Pvt. Ltd.

15	The Municipal Solid Waste which shall be generated by the Project during the construction and operational stage shall be managed as per provisions of Municipal Solid Waste (Management & Handling) Rules, 2000 under Environment (Protection) Act, 1986. Promoters shall tie-up with local authority or shall make provisions of its own for solid waste.	1) Kitchen Bio-waste Composter was installed for conversion of Solid waste to organic manure. The Organic manure is then used for horticulture work in SJVN Corporate office Complex. 2) Office waste is disposed through Municipal Corporation.
16	Water sprinkling techniques shall be used during the construction phase to minimize the dust in air.	Water sprinkling was carried out through water tanker regularly at site for dust suppression.
17	The DG sets shall be provided with proper exhaust muffler and stack height. DG set and other fugitive emission sources shall be more than 10-15 feet above room level. Norms prescribed for DG Sets in the Environment Protection Rules, 1986 shall be complied with.	DG sets has been provided with proper exhaust muffler and stack height and Norms prescribed for DG Sets in the Environment Protection Rules, 1986 are complied.
18	Institutional responsibility would vest with promoters for maintaining and operating the environmental services such as Sewage treatment Solid Waste, treatment and disposal.	Complied
19	The muck generated during construction shall be disposed off in scientific only in the designated dumping sites manner by providing proper and adequate retaining structures.	SJVN is disposing the muck on approved dumping site of MC as various construction works are in progress at CHQ campus. The permission for dumping of debris/C&D waste was granted to SJVN by MC, Shimla vide letter no-2023-474 dated 14.03.2023 (**Copy attached Annexure-2**) At following approved dumping sites: 1) Dumping site situated near SWM Project Bharyal Totu, Shimla.
20	Boundary wall shall be raised using plants/hedge species and concrete or iron structures should be avoided.	Complied
21	Visitors parking within premises shall be ensured and provision shall be made accordingly. Parking of visitors should not done on public road.	Provision for Stack Parking for approx. 200 cars has been provided in Proposed Guest House including

		Parking Block in SJVN Corporate Complex and the Construction work is in progress.
22	All designing shall be done based on IS-1893 (Zone-V) considering the seismicity of the project area.	SJVN Corporate Head Quarters was constructed based on IS-1893 considering the seismicity of the project area.
Additional conditions laid by the SEIAA in its 10th meeting held on 22nd November 2011 shall be strictly complied		
1	The Proponents shall principally be responsible for creating a public utility like playground or parking as a part of their corporate social responsibility by utilizing all the debris and construction waste.	The debris/construction waste from the Office Complex was disposed at approved sites of Municipal Corporation (MC), Shimla, after remitting the dumping charges. These earmarked sites also caters to construction wastes from other construction sites from Shimla town. Hence, the sites may get restored by MC through its long-term development plans.
2	The proponents shall make adequate arrangement for the safe disposal of E-waste and CFLs.	Complied
3	The Proponents shall use stones/sloping roof to provide hill architectural façade to the complex.	Complied
4	The Proponents shall provide dual plumbing system in the building.	Provision of dual plumbing system has been made in SJVN Corporate Head Quarters
5	The Proponents shall submit data on environment/carbon footprint to Department of Environment, Science & Technology.	The Office Complex has been designed on Green building concept. This complex has installed solar techniques for water heating and feeding electricity. The kitchen waste is treated by composting unit and compost is used to feed complex greenbelt. Further, the liquid waste is treated with MBBR-STP with zero discharge. The residue is used as manure and liquid is used to water greenbelt. The complex has undergone Energy Audit. Hence, the Office Complex has very low environment footprint. SJVN Limited has installed a roof top solar Photo Voltaic

		Plant of 120 kW capacity to cater the power supply requirement in the building. The Power generated from solar PV plant is supplied directly to the distribution panels and consumed within the building and excess power is fed to the Grid. 40 KW solar water heating system also provided to cater heating water requirements at the complex.
6	The proponents shall submit six monthly status report on implementation of the conditions of environmental clearances, among others to the Department of Environment, Science & Technology.	Being Complied. Last six-monthly compliance report was submitted on 23.11.2022.

C)	**Conditions imposed by the Ministry of Environment & Forests, GoI while granting forest clearance vide letter no. NA, sated NA for NA ha forest land.**	
	Conditions imposed	**Compliance Status**
S.N.	**Not Applicable**	

H.P.STATE POLLUTION CONTROL BOARD

HIM PARIVESH, PHASE-III, NEW SHIMLA-171009.

Website:- http://hppcb.nic.in

HPSPCB No : 178 **Date: 29/03/2022**

Industry Registration ID: *21118* **Application No :** *5161725*

To,

Sjvnl Ltd Corporate Office Complex
Shakti Sadan, SJVN Ltd., Corporate Office Complex, Shnan, Shimla, 171006
Shimla
Shimla
171006

Subject: Renewal of 'Consent to Establish' u/s 25/26 of Water (Prevention & Control of Pollution) Act, 1974 and u/s 21 of Air (Prevention & Control of Pollution) Act, 1981.

With reference to your application for obtaining Renewal of 'Consent to Establish' u/s 25/26 of Water (Prevention & Control of Pollution) Act, 1974 and u/s 21 of Air (Prevention & Control of Pollution) Act, 1981, you are hereby, authorized to Establish an industrial unit subject to the Terms and Conditions as mentioned in this Consent letter.

1.Particulars of Consent to Establish under Water Act, 1974 and Air Act, 1981 granted to the industry

Consent No.	*CTE/BOTH/RENEW/RO/2022/5161725*
Date of issue :	*01/04/2022*
Date of expiry :	*31/03/2024*
Certificate Type :	*RENEW*
Previous CTE No. & Validity :	

2. Particulars of the Industry

Name & Designation of the Applicant	*SUNIL CHOUDHARY, (HOD CFMD)*
Address of Industrial premises	*Sjvnl Ltd Corporate Office Complex, Shakti Sadan, SJVN Ltd., Corporate Office Complex, Shnan, Shimla, 171006, Shimla,Shimla-171006*
Category of Industry	*Orange*
Type of Industry	*2999-Miscellaneous (Orange)*
Scale of the Industry	*Small*
Office District	*Shimla*
Capacity	
Products (Name with quantity per day)	

Name of Products	Unit	Quantity	Intermediate Product	Principal Use
Guest House cumParking Blok	Number/Year	1	41Roomswith66N osToilets	To serve the official Employees
Auditorium Cum Parking Block	Number/Year	1	Auditorium with 400person settingcapacityhav ing10 toilets	To serve the official Employees

Details of the Effluent Treatment Plant

Type of Effluent	Capacity(KLD)	Quantity(KLD)
STP	NA	NA

Mode of Disposal

Description	Quantity(in KLD)	Method of Treatment	Method of Disposal
Domestic	NA	STP	Irrigation/Gardening

Quantity of fuel required (in TPD) and capacity of boilers/ Furnace/Thermo heater etc.

Type	No.of Boiler/'Heater/ Evaporator/In cinerator/DG Set/Other	Capacity	Type of Boiler/'Heaters /Evaporators/I ncinerator/DG Sets/Others	Type of Fuel	Fuel consumption rate in MT/hour or KL/hour or M3 /hour
DG Sets	N.A.	N.A.	N.A.	N.A.	N.A.

APOORV DEVGAN
Digitally signed by APOORV DEVGAN
Date: 2022.03.29 18:48:08 +05'30'

Apoorv Devgan, IAS
Member Secretary
For & on behalf of
(H. P. State Pollution Control Board)

Endst. No.:

Copy To:-

1. The Regional Officer, HPSPCB, Shimla for information and to ensure the operation of the unit as per consent conditions & with adequate pollution control devices.

APOORV DEVGAN

Digitally signed by APOORV DEVGAN
Date: 2022.03.29 18:48:19 +05'30'

Apoorv Devgan, IAS
Member Secretary
For & on behalf of
(H. P. State Pollution Control Board)

TERMS AND CONDITIONS

A. SPECIFIC CONDITIONS

1. This Consent to Establish is only for the purpose and under the provision of Water Act, 1974 and Air Act, 1981 as the case may be, and will not construed as substitute for mandatory clearances required for the project under any other law/regulation/direction/order and the applicant shall obtain any such mandatory clearance before taking any steps to establish industry/ industrial plant, operation or process or any treatment and disposal system or an extension or addition thereto.

2. Nothing in this Consent shall be deemed to neither preclude the institution of any legal action nor relieve the applicant from any responsibilities, liabilities or penalties to which the applicant is or may be subjected to under this or any other Act.

3. The unit shall apply for further extension in the validity of the Consent to Establish, at least two months before the expiry of this 'Consent to Establish', if applicable.

   or

   The unit shall obtain prior Consent to Operate from the State Board, before starting operational activity and gets its completion plan approved by the Competent Authority (As applicable).

4. i) The unit shall made provisions for the compliance of Waste Management Rules i.e. Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016/ Plastic Waste Management Rules, 2016/ E-Waste (Management) Rules, 2016/Construction & Demolition Waste Management Rules, 2016 and Manufacture, Storage & Import of Hazardous Chemical Rules, 1989 and provisions made thereunder, as amended from time to time, without any adverse effect on the environment, in any manner (As Applicable)

   ii) The unit shall made provisions for the compliance Solid Waste Management Rules, 2016 and provisions made thereunder and unit shall also not practice burning activity of solid waste/waste generated from fuel within/outside premises, to avoid public nuisance.

5. This 'Consent to Establish' is for:-

   i) The emissions from all sources conforming to the norms as prescribed in Schedule-I of Environment (Protection) Rules, 1986 as amended from time to time.

   ii) Noise and Ambient Air Quality shall be maintained within Ambient Air Quality Standards for noise as specified in Schedule-III of Environment (Protection) Rules, 1986 and Noise Pollution (Regulation and Control) Rules, 2000, as amended from time to time.

   iii) The effluent (Domestic/Industrial) shall conform to the limits as prescribed in Schedule-I or Schedule-VI or Industry specific standards of Environment (Protection) Rules, 1986 as amended from time to time.

   iv) Sewage and sullage generated from the unit to be disposed-off in a properly designed septic tank system/Sewage Treatment Plant/ Public Sewer System (as applicable).

6. The unit shall install adequate pollution control devices and provide the separate energy meter and flow meter. The unit shall maintain the logbook/ record with respect to operation of pollution control devices (As applicable). The achievement of the adequacy and efficiency of the effluent treatment plant/pollution control devices/re-circulation system installed shall be the entire responsibility of the unit.

7. **CONDITIONS UNDER WATER (PREVENTION & CONTROL OF POLLUTION) ACT, 1974.**

   a) The unit shall provide terminal manhole(s) at the end of each collection system and a manhole upstream of final outlet (s) out of the premises of the industry for measurement of flow and for taking samples.

   b) The unit shall install flow meter and maintain the record regarding the daily water consumption.

c) The pollution control devices shall be interlocked with the manufacturing process of the industry (if applicable) and the authorized outlet and mode of disposal shall not be changed without the prior written permission of the Board. Unit shall not use any unauthorized out-let(s) for discharging effluents from its premises.

d) Solids, sludge, filter backwash or other pollutant removed from or resulting from treatment or control of waste waters shall be disposed-off in scientific manner.

e) The unit shall submit a detailed plan showing therein, the distribution system for conveying wastewaters.

8. **CONDITIONS UNDER AIR (PREVENTION & CONTROL OF POLLUTION) ACT, 1981.**

a) The unit shall provide canopy and stack of adequate height of the D.G sets so as to control the noise & air pollution in order to comply with the provision of notification No GSR-371 E dated 17-5-2002 or direction as issued by MOEF from time to time, under Environment (Protection) Act, 1986.

b) The unit shall ensure disposal of boiler ash/fuel ash through authorized person or within premises in a scientific manner (as the case may be) and shall maintain proper record for the same, if applicable.

c) The unit shall provide proper and adequate air pollution control arrangements for control emission from its coal/fuel handling area and emissions from handling, transportation and processing of raw material & product of the industry, as applicable.

d) The unit shall provide port-holes, platforms and/or other necessary facilities as may be required for collecting samples of emissions from any chimney, flue or duct or any other outlets as per the specifications.

Specifications of the port-holes shall be as under:-

i) The sampling ports shall be provided atleast 8 times chimney diameter downstream and 2 times upstream from the flow disturbance. For a rectangular cross section the equivalent diameter (De) shall be calculated from the following equation to determine upstream, downstream distance:-

De = 2 LW / (L+W)

Where L= length in mts. W= Width in mts.

ii) The sampling port shall be 7 to 10 cm in diameter

e) The unit shall submit a detailed plan showing therein, the distribution system for conveying wastewaters.

(i) Stack height for boiler plants

S.NO.	Boiler with Steam Generating Capacity	Stack heights
1.	*Less than 2 ton/hr.*	9 meters or 2.5 times the height of neighboring building which ever is more
2.	*More than 2 ton/hr. to 5 ton/hr.*	12 meters
3.	*More than 5 ton/hr. to 10 ton/hr*	15 meters
4.	*More than 10 ton/hr. to 15 ton/hr*	18 meters

5.	*More than 15 ton/hr. to 20 ton/hr*	21 meters
6.	*More than 20 ton/hr. to 25 ton/hr.*	24 meters
7.	*More than 25 ton/hr. to 30 ton/hr.*	27 meters
8.	*More than 30 ton/hr.*	30 meters or using the formula H = 14 Qg0.3or H = 74 (Qp)0.24 Where Qg = Quantity of SO2 in Kg/hr. Qp = Quantity of particulate matter in Ton/day.

Note : Minimum Stack height in all cases shall be 9.0 mtr. or as calculated from relevant formula whichever is more.

(ii) For industrial furnaces and kilns, the criteria for selection of stack height would be based on fuel used for the corresponding steam generation.

(iii) Stack height for diesel generating sets:

Capacity of diesel generating set	**Height of the Stack**	
0-50 KVA	Height of the building	+ 1.5 mt
50-100 KVA	-do-	+ 2.0 mt.
100-150 KVA	-do-	+ 2.5 mt.
150-200 KVA	-do-	+ 3.0 mt.
200-250 KVA	-do-	+ 3.5 mt.
250-300 KVA	-do-	+ 3.5 mt.

For higher KVA rating stack height H (in meter) shall be worked out according to the formula:

$$H = h+0.2 (KVA)0.5$$

where h = height of the building in meters where the generator set is installed.

9. The unit shall submit on-site and off-site emergency plan approved by the Chief Inspector of Factories, Himachal Pradesh (If applicable)

10. The unit shall provide real time online monitoring equipment's and provisions for the un-interrupted transfer of data as per guidelines of CPCB (if applicable).

11. The unit shall provide adequate arrangements for fighting the accidental leakages/ discharge of any air pollutant/gas/liquids from the vessels, mechanical equipment's etc. which are likely to cause environmental pollution.

12. The unit shall plant minimum three layer of trees so far possible as per plantation guide (may be download from the website http://hppcb.nic.in/plantationguide.pdf) all along the boundary of the industrial premises and check air/water/noise pollution at source.

13. Any guidelines issued by the Central Government/State Government/MoEF/CPCB/SPCB/any other authority concerned, shall be binding.

14. This 'Consent to Establish' is subject to orders on any litigation pending in any Court of Law. Any direction/order issued by any court shall be binding (if any).

15. The Board reserves the right to revoke the 'Consent to Establish' granted to the industry at any time, in case the industry is found violating the provisions of Water (Prevention & Control of Pollution) Act, 1974 and Air (Prevention & Control of Pollution) Act, 1981 as amended from time to time.

16. The unit shall comply with any other conditions laid down or directions issued in due course by the Board under the provisions of the Water (Prevention & Control of Pollution) Act, 1974 and Air (Prevention & Control of Pollution) Act, 1981.

B. OTHER CONDITIONS

1. The unit shall comply with the conditions imposed by the MoEF/State Level Environment Impact Assessment Authority/ District Level Environment Impact Assessment Authority in the environmental clearance granted to it as required under EIA notification dated 14-9-06, if applicable.
2. The issuance of this consent does not convey any property right in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Central, State or Local Laws or Regulations.
3. Stone Crusher units shall comply with the provisions of guidelines notified by the State Government vide Notification No. STE-E(3)-11/2012, dated 29-05-2014 (If Applicable).
4. Brick Kiln units shall comply with the provisions of guidelines notified by the MoEF vide Notification No. G.S.R.233.(E), dated-15-03-2018 and by the State Government vide Notification No. STE-E(5)-6/2013, dated-07-03-2014 (If Applicable).
5. Hydroelectric Projects shall install Online Real Time Monitoring System for the measurement of 15% of minimum discharge in lean season as per orders of Court/Government. The unit shall also ensure provisions for the regular and uninterrupted transfer of data from the real time online monitoring system for 15% of minimum discharge of flow to SPCB, failing which unit shall be liable for action on account of violation of the directions issued by Court/Government/SPCB in this regard (If Applicable).
6. Unit shall strictly adhere to the capacity approved by the Industries Department/ Department of Tourism & Civil Aviation/any other concerned Authority (As Applicable).
7. The unit shall not cause any nuisance/traffic hazard in vicinity of the area.
8. The unit shall ensure that there will not be significant visible dust emissions beyond the property line.
9. The unit shall obtain and submit Insurance cover as required under the Public Liability Insurance Act, 1991.
10. The unit shall put display Board indicating environmental data in the prescribed format at the main entrance gate.
11. The unit shall maintain record regarding the operation of effluent treatment plant i.e. record of quantity of chemicals and energy utilized for treatment and sludge generated from treatment so as to satisfy the Board regarding regular and proper operation of pollution control equipment.
12. Any amendments/revisions made by the Board/CPCB/MOEF in the emission/stack height standards shall be applicable to the industry from the date of such amendments/revisions.

C. SPECIAL CONDITIONS

1) The unit shall carry out composting of biodegradable waste by providing pit composting/ vermin composting or any such appropriate method in the premises.
2) This consent has been recommended considering the adequacy of the pollution control devices and waste management systems/mechanism only.
3)This Consent of the State Board does not absolve the proponent of his responsibility to take pre-approvals / approvals / prior NOCs / NOCs from other deptts./agencies as the case may be, for the violation of which, the State Board bears No responsibility.

APOORV DEVGAN
Digitally signed by APOORV DEVGAN
Date: 2022.03.29 18:48:32 +05'30'

Apoorv Devgan, IAS
Member Secretary
For & on behalf of
(H. P. State Pollution Control Board)

H.P.STATE POLLUTION CONTROL BOARD

HIM PARIVESH, PHASE-III, NEW SHIMLA-171009.

Website:- http://hppcb.nic.in

HPSPCB No : 178 **Date: 25/11/2021**

Industry Registration ID: *21118* **Application No :** *3963352*

To,

Sjvnl Ltd Corporate Office Complex
Shakti Sadan, SJVN Ltd., Corporate Office Complex, Shnan, Shimla, 171006
Shimla
Shimla
171006

Subject: Renewal of 'Consent to Operate' u/s 25/26 of Water (Prevention & Control of Pollution) Act, 1974 and u/s 21 of Air (Prevention & Control of Pollution) Act, 1981.

With reference to your application for obtaining Renewal of 'Consent to Operate' u/s 25/26 of Water (Prevention & Control of Pollution) Act, 1974 and u/s 21 of Air (Prevention & Control of Pollution) Act, 1981, you are hereby, authorized to operate an industrial unit subject to the Terms and Conditions as mentioned in this Consent letter.

1.Particulars of Consent to Operate under Water Act, 1974 and Air Act, 1981 granted to the industry

Consent No.	*CTO/BOTH/RENEW/RO/2021/3963352*
Consent valid from:	*01/04/2021*
Consent valid upto:	*31/03/2024*
Certificate Type :	*RENEW*
Previous CTO No. & Validity :	

2. Particulars of the Industry

Name & Designation of the Applicant	*SUNIL CHOUDHARY, (HOD CFMD)*
Address of Industrial premises	*Sjvnl Ltd Corporate Office Complex, Shakti Sadan, SJVN Ltd., Corporate Office Complex, Shnan, Shimla, 171006, Shimla,Shimla-171006*
Category of Industry	*Orange*
Type of Industry	*2999-Miscellaneous (Orange)*
Scale of the Industry	*Large*
Office District	*Shimla*
Capacity	

Raw Materials (Name with quantity per day)

Raw Materials	Quantiry	Unit
Water	**360**	**K.L./Year**

Products (Name with quantity per day)

Name of Products	Unit	Quantity	Intermediate Product	Principal Use
Office Complex	Number/Year	1	-	-

Details of the Effluent Treatment Plant

Type of Effluent	Capacity(KLD)	Quantity(KLD)
STP	90	1

Mode of Disposal

Description	Quantity(in KLD)	Method of Treatment	Method of Disposal
Domestic	15	STP	Irrigation/Gardening

Quantity of fuel required (in TPD) and capacity of boilers/ Furnace/Thermo heater etc.

Type	No.of Boiler/'Heater/ Evaporator/Incinerator/DG Set/Other	Capacity	Type of Boiler/'Heaters /Evaporators/Incinerator/DG Sets/Others	Type of Fuel	Fuel consumption rate in MT/hour or KL/hour or M3 /hour
DG Sets	02	500 kVA & 1010 kVA	Silent DG set with Acoustics Enclosures	Diesel	121 ltr/hr for 1010 KVA and 77 ltr/ hr for 500 KVA DG set

Type of Air Pollution Control Devices installed

Equipment Type	Equipment Name	Date/proposed date of installation	Efficiency(%reduction)	Final concentration of pollution being emitted
2 Nos Acoustics Enclosures , 2 Nos. Stack with 30 meter height	DG Sets	Fri Jan 01 00:07:00 IST 2016	-	-

Sources of emissions and type of pollutants

Name and location of the process vessel to which the stack/ vent is attached	Rate of emission in Kg./hr	Concentration of pollution like SO 2 , NOX, H 2 S, Cl, HCl etc. in mg/NM 3	Height of Vent/outlet/stack from ground level in meters
500 kVA & 1010 kVA DG set at SJVN Building	1600ltrs/sec	NOx 360 ppmv, NMHC 100 mgNm3, PM 75 mgNm3, CO 150 mgNm3, Sulpher <2%	30 meter

APOORV DEVGAN Digitally signed by APOORV DEVGAN Date: 2021.11.30 14:06:20 +05'30'

Apoorv Devgan, IAS
Member Secretary
For & on behalf of
(H. P. State Pollution Control Board)

Endst. No.:

Copy To:-

1. The Regional Officer, HPSPCB, Shimla for kind information and further necessary action please.

APOORV DEVGAN Digitally signed by APOORV DEVGAN Date: 2021.11.30 14:06:34 +05'30'

Apoorv Devgan, IAS
Member Secretary
For & on behalf of
(H. P. State Pollution Control Board)

TERMS AND CONDITIONS

A. SPECIFIC CONDITIONS

1. This 'Renewal of Consent to Operate' is only for the purpose and under the provision of Water Act, 1974 and Air Act, 1981 as the case may be, and will not construed as substitute for mandatory clearances required for the project under any other law/regulation/direction/order and the applicant shall obtain any such mandatory clearance before taking any steps to establish industry/ industrial plant, operation or process or any treatment and disposal system or an extension or addition thereto.

2. Nothing in this Consent shall be deemed to neither preclude the institution of any legal action nor relieve the applicant from any responsibilities, liabilities or penalties to which the applicant is or may be subjected to under this or any other Act.

3. The unit shall apply for further renewal/extension in the validity of the Consent, before the expiry of this 'Renewal of Consent to Operate'.

4. i) The unit shall ensure compliance of Waste Management Rules i.e. Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016/ Plastic Waste Management Rules, 2016/ E-Waste (Management) Rules, 2016/Construction & Demolition Waste Management Rules, 2016 and Manufacture, Storage & Import of Hazardous Chemical Rules, 1989 and provisions made thereunder, as amended from time to time, without any adverse effect on the environment, in any manner (As Applicable).

   ii) The unit shall made provisions for the compliance Solid Waste Management Rules, 2016 and provisions made thereunder and unit shall also not practice burning activity of solid waste/waste generated from fuel within/outside premises, to avoid public nuisance.

5. This 'Renewal of Consent to Operate' is for:-

i) The emissions from all sources conforming to the norms as prescribed in Schedule-I of Environment (Protection) Rules, 1986 as amended from time to time.

ii) Noise and Ambient Air Quality shall be maintained within Ambient Air Quality Standards for noise as specified in Schedule-III of Environment (Protection) Rules, 1986 and Noise Pollution (Regulation and Control) Rules, 2000, as amended from time to time.

iii) The effluent (Domestic/Industrial) shall conform to the limits as prescribed in Schedule-I or Schedule-VI or Industry specific standards of Environment (Protection) Rules, 1986 as amended from time to time.

iv) Sewage and sullage generated from the unit to be disposed-off in a properly designed septic tank system/Sewage Treatment Plant/ Public Sewer System (as applicable).

6. The unit shall ensure regular operation and maintenance of Pollution Control Devices to achieve the norms as prescribed in Environment (Protection) Act, 1986 and the achievement of the adequacy and efficiency of the effluent treatment plant/pollution control devices/re- circulation system installed shall be the entire responsibility of the unit.

7. The unit shall ensure regular operation and maintenance of separate energy meter/flow meter for running pollution control devices and shall also maintain record with respect to operation of air pollution control device/effluent treatment plant, so as to the satisfy the Board regarding the regular operation of air pollution control device/effluent treatment plant and shall maintain log book for the monthly reading / record.

8. **CONDITIONS UNDER WATER (PREVENTION & CONTROL OF POLLUTION) ACT, 1974.**

a) The unit shall maintain the record regarding the daily water consumption as per flow meter installed.

b) The unit shall ensure that terminal manhole(s) at the end of each collection system and a manhole upstream of final outlet (s) out of the premises of the industry for measurement of flow and for taking samples.

c) The pollution control devices shall be interlocked with the manufacturing process of the industry (if applicable) and the authorized outlet and mode of disposal shall not be changed without the prior written permission of the Board. Unit shall not use any unauthorized outlet(s) for discharging effluents from its premises.

d) Solids, sludge, filter backwash or other pollutant removed from or resulting from treatment or control of waste waters shall be disposed-off in scientific manner.

9. **CONDITIONS UNDER AIR (PREVENTION & CONTROL OF POLLUTION) ACT, 1981.**

a) The unit shall ensure port-holes, platforms and/or other necessary facilities as may be required for collecting samples of emissions from any chimney, flue or duct or any other outlets as per the specifications.

b) The unit shall discharge air emissions through a stack of minimum height as specified in 'Consent to Establish' and shall follow standards laid down from time to time.

c) For industrial furnaces and kilns, the criteria for selection of stack height would be based on fuel used for the corresponding steam generation & as per specification.

d) Unit shall ensure Stack height for diesel generating sets as per specification.

e) The unit shall ensure regular operation and maintenance of installed canopy and stack of the D.G sets so as to control the noise & air pollution in order to comply with the provision of notification No GSR-371 E dated 17-5-2002 or direction as issued by MOEF from time to time, under Environment (Protection) Act, 1986.

f) The unit shall ensure disposal of boiler ash/fuel ash through authorized person or within premises in a scientific manner (as the case may be) and shall maintain proper record for the same, if applicable.

g) The unit shall ensure regular operation and maintenance of air pollution control arrangements for control emission from its coal/fuel handling area and from handling, transportation and processing of raw material & product of the industry.

10. The unit shall ensure valid and approved on-site and off-site emergency plan, approved by the Chief Inspector of Factories, Himachal Pradesh (If applicable).

11. The unit shall ensure regular operation and maintenance of real time online monitoring equipment's and provisions for the un-interrupted transfer of data as per guidelines of CPCB (if applicable).

12. The unit shall provide adequate arrangements for fighting the accidental leakages/ discharge of any air pollutant/gas/liquids from the vessels, mechanical equipment's etc. which are likely to cause environmental pollution.

13. The unit shall plant & maintain minimum three layer of trees so far possible as per plantation guide (may be download from the website http://hppcb.nic.in/plantationguide.pdf) all along the boundary of the industrial premises and check air/water/noise pollution at source.

14. Any guidelines issued by the Central Government/State Government/MoEF/CPCB/SPCB/any other authority concerned, shall be binding.

15. This 'Renewal of Consent to Operate' is subject to orders on any litigation pending in any Court of Law. Any direction/order issued by any court shall be binding (if any).

16. The Board reserves the right to revoke the 'Renewal of Consent to Operate' granted to the industry at any time, in case the industry is found violating the provisions of Water (Prevention & Control of Pollution) Act, 1974 and Air (Prevention & Control of Pollution) Act, 1981 as amended from time to time.

17. The unit shall comply with any other conditions laid down or directions issued in due course by the Board under the provisions of the Water (Prevention & Control of Pollution) Act, 1974 and Air (Prevention & Control of Pollution) Act, 1981.

B. OTHER CONDITIONS

1. The unit shall comply with the conditions imposed by the MoEF/State Level Environment Impact Assessment Authority/ District Level Environment Impact Assessment Authority in the environmental clearance granted to it as required under EIA notification dated 14-9-06, if applicable.

2. The issuance of this consent does not convey any property right in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Central, State or Local Laws or Regulations.

3. Stone Crusher units shall comply with the provisions of guidelines notified by the State Government vide Notification No. STE-E(3)-11/2012, dated 29-05-2014 (If Applicable).

4. Brick Kiln units shall comply with the provisions of guidelines notified by the MoEF vide Notification No. G.S.R.233.(E), dated-15-03-2018 and by the State Government vide Notification No. STE-E(5)-6/2013, dated-07-03-2014 (If Applicable).

5. Hydroelectric Projects shall install Online Real Time Monitoring System for the measurement of 15% of minimum discharge in lean season as per orders of Court/Government. The unit shall also ensure provisions for the regular and uninterrupted transfer of data from the real time online monitoring system for 15% of minimum discharge of flow to SPCB, failing which unit shall be liable for action on account of violation of the directions issued by Court/Government/SPCB in this regard (If Applicable).

6. Unit shall strictly adhere to the capacity approved by the Industries Department/ Department of Tourism & Civil Aviation/any other concerned Authority (As Applicable).

7. The unit shall not cause any nuisance/traffic hazard in vicinity of the area.

8. The unit shall ensure that there will not be significant visible dust emissions beyond the property line.

9. The unit shall obtain and submit Insurance cover as required under the Public Liability Insurance Act, 1991.

10. Unit shall submit all the annual/quarterly returns, as per timeline.

11. The industry shall submit a yearly certificate to the effect that no addition/up-gradation/ modification/ modernization has been carried out during the previous year otherwise the industry shall apply for the varied consent.

12. The unit shall maintain record regarding the operation of effluent treatment plant i.e. record of quantity of chemicals and energy utilized for treatment and sludge generated from treatment so as to satisfy the Board regarding regular and proper operation of pollution control equipment.

13. Any amendments/revisions made by the Board/CPCB/MOEF in the emission/stack height standards shall be applicable to the industry from the date of such amendments/revisions.

C. SPECIAL CONDITIONS

1) The unit shall carry out composting of biodegradable waste by providing pit composting/ vermin composting or any such appropriate method in the premises.
2) This consent has been issued considering the adequacy of the pollution control devices and waste management systems/mechanism only.
3)This Consent of the State Board does not absolve the proponent of his responsibility to take pre-approvals / approvals / prior NOCs / NOCs from other deptts./agencies as the case may be, for the violation of which, the State Board bears No responsibility.

APOORV DEVGAN
Digitally signed by APOORV DEVGAN
Date: 2021.11.30 14:06:51 +05'30'

Apoorv Devgan, IAS
Member Secretary
For & on behalf of
(H. P. State Pollution Control Board)

SHIMLA MUNICIPAL CORPORATION

NO:-MCS/XEN/RB/2023 – 474 DATED: 14/03/2023

From

Executive Engineer,
R&B, M.C. Shimla

To

The HOD (CFMD),
SJVN, CHQ, Shanan,
Shimla-171006

Subject:- Regarding permission for dumping of Debris/C&D Waste at Dumping Site situated near SWM Project Bharyal Totu Shimla

This is with reference to your letter dated 07.02.2023 vide which you have requested this office to extend the permission for dumping of debris. In this regard, the permission is hereby extended upto 30.04.2023 for dumping debris. The other terms and conditions will remain the same as prescribed in the permission letter No.MCS/XEN/4146/RB/22-5231 dated 23.12.2022.

Executive Engineer
(R&B) M.C. Shimla

Copy to:-

1. The Corporation Health Officer, M.C. Shimla for kind information.
2. The Assistant Engineer-I (R&B) M.C. Shimla for information and necessary action.
3. The Junior Engineer, ward No.7 (R&B) M.C. Shimla for information with the direction to maintain the record and no debris over the permission be allowed to be dumped and dumping be allowed in the authorized/ sanctioned site only.

Executive Engineer
(R&B) M.C. Shimla

GSTIN No. : 03AMLPS9476P2ZX

CHANDIGARH POLLUTION TESTING LABORATORY
(Environmental Monitoring, EIA, NOC, ETP, STP)

TC-6728

NABET accredited EIA consultant, MoEF & CC recognized
ISO 9001 : 2015, ISO 14001 : 2015 and ISO 45001 : 2018 Certified Laboratory

H.O. : #372, Sector 15-A, Chandigarh-160 015 ☎ : 0172-4669295, **Website : www.cptl.co.in**
Lab : E-126, Phase-VII, Indl. Area, Mohali - 160055 ☎ : 0172-5090312; e-mail : sital_cptlmohali@yahoo.co.in, cptle126@gmail.com, lab@cptl.co.in

TEST CERTIFICATE

Format No. CPTLF7.8-I(S)

REPORT NO. CPTL/H.P/2023/02/01(S) **REPORTING DATE: 27.02.2023**

NAME OF INDUSTRY:	**M/s. SJVN LTD., SHAKTI SADAN, SHIMLA.**

SAMPLE PARTICULARS

Date of Sample Collected:	22.02.2023
Date of Sample Received:	23.02.2023
Type of Sample:	Soil
Sampling Plan Ref. No.	CPTLF7.3-I
Sampling Method	CPTL/SM/01
Environmental Conditions	Normal
Quantity & Packaging:	500 gm in plastic bag
Point of Sample Collection:	From Garden Area (SJVN Campus)
Sample Identification No.:	CPTL/$_{H.P}$/2023/02/01(S)
Analysis Duration:	23.02.2023 to 27.02.2023
Sample Collected By:	Daljeet Singh & Team
Visual Observation:	Brown in color

TEST RESULTS

S. No.	Test Parameters	Unit	Results	Test method
1.	pH	--	7.69	IS 2720 (P-26),1987
2.	Conductivity	µmhos/cm	392	IS 14767, 2000
3.	Arsenic (as As)	mg/Kg	ND (DL-0.5)	USEPA-3050-B-1996(Acid Digestion followed by AAS (Hydride Method)
4.	Mercury (as Hg)	mg/Kg	ND (DL-0.2)	USEPA-3050-B-1996(Acid Digestion followed by AAS (Hydride Method)
5.	Lead (as Pb)	mg/Kg	ND (DL-2.0)	USEPA-3050-B-1996
6.	Chromium (as Cr)	mg/Kg	ND (DL-2.0)	USEPA-3050-B-1996
7.	Copper (as Cu)	mg/Kg	ND (DL-0.5)	USEPA-3050-B-1996
8.	Cadmium (as Cd)	mg/Kg	ND (DL-0.5)	USEPA-3050-B-1996

ND-Not Detected
DL-Detection Limit

(Chemist In-Charge)
Date: 27/2/23

Sital Singh (CEO)
(Authorized Signatory)
Date: 27/02/2023

- The results are related to test items only.
- This certificate is not to be reproduced wholly or in part and cannot be used as evidence in the court of law without approval of laboratory.
- Sample will be destroyed after retention time unless otherwise specified.

*****END OF REPORT*****

GSTIN No. : 03AMLPS9476P2ZX

CHANDIGARH POLLUTION TESTING LABORATORY
(Environmental Monitoring, EIA, NOC, ETP, STP)

TC-6728

UNITED ACCREDITATION FOUNDATION UAF

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H.O. : #372, Sector 15-A, Chandigarh-160 015 ☎ : 0172-4669295, **Website : www.cptl.co.in**
Lab : E-126, Phase-VII, Indl. Area, Mohali - 160055 ☎ : 0172-5090312; e-mail : sital_cptlmohali@yahoo.co.in, cptle126@gmail.com, lab@cptl.co.in

TEST CERTIFICATE

Format No. CPTLF7.8-I(N)

REPORT No. CPTL/HP/2023/02/11(N) **REPORTING DATE: 25-02-2023**

NAME OF INDUSTRY:	**M/s. SJVN LTD., SHAKTI, SADAN, SHIMLA.**

SAMPLE PARTICULARS

Sampling Plan Ref No.:	CPTLF 7.3-I	**Type of Sample:**	Air Quality w.r.t Noise
Sampling Method:	CPTL/SM/01	**Point of Sample:**	1.0 meter from Canopy
Date of Monitoring.:	22-02-2023	**Environmental Conditions:**	Normal
Sample Identification No.:	CPTL/$_{HP}$/2023/02/11(N)	**Sample Collected By:**	Daljeet Singh & Team
Nature of Sample:	Noise Level		

TECHNICAL DATA

1.	Source of Noise Pollution	DG Set
2.	*Make of D.G. Set	Cummins
3.	*Capacity of D.G. Set	500 KVA
4.	*S. No. of D. G. Set	25406731
5.	*Date of Manufacturing of D.G. Set	09-03-2015
6.	*Date of Installation of D.G. Set	July-2016

PARAMETERS	RESULTS dB(A)	PRESCRIBED STANDARD dB (A)	TEST METHOD
DG Set Off	50.2	--	IS 9989:1981(Rev.2002)
DG Set On (At 1.0 meter from enclosure surface)	61.2	Max. 75	IS 9989:1981(Rev.2002)

* represent the information provided by the customer.

Chemist In-Charge
Date: 25/2/2023

Sital Singh (CEO)
(Authorized Signatory)
Date: 25/02/2023

- The results are related to test items only.
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*****END OF REPORT*****

GSTIN No. : 03AMLPS9476P2ZX

CHANDIGARH POLLUTION TESTING LABORATORY
(Environmental Monitoring, EIA, NOC, ETP, STP)

TC-6728

NABET accredited EIA consultant, MoEF & CC recognized
ISO 9001 : 2015, ISO 14001 : 2015 and ISO 45001 : 2018 Certified Laboratory

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TEST CERTIFICATE

Format No. CPTLF7.8-I(N)

REPORT No. CPTL/HP/2023/02/12(AN) **REPORTING DATE: 25-02-2023**

NAME OF INDUSTRY:	**M/s. SJVN LTD., SHAKTI SADAN, SHIMLA.**

SAMPLE PARTICULARS

Sampling Plan Ref No.:	CPTLF 7.3-I	**Type of Sample:**	Air Quality w.r.t Noise
Sampling Method:	CPTL/SM/01	**Sampling Location:**	Near Guest House
Date of Monitoring:	22-02-2023	**Environmental Conditions:**	Normal
Sample Identification No.	$CPTL/_{HP}/2023/02/12(AN)$	**Monitoring Done By:**	Daljeet Singh & Team
Nature of Sample:	Noise Level Monitoring		

NOISE LEVEL

S. No.	Location	Value in dB(A) (Average) Day Time	Value in dB(A) (Average) Night Time	Test Method
01.	Near Guest House	52.6	32.4	IS 9989:1981(Rev.2002)
Prescribed Standard		**55**	**45**	--

Chemist In-Charge
Date: 25/02/23

Sital Singh (CEO)
(Authorized Signatory)
Date 25/02/2023

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TEST CERTIFICATE

Format No. CPTLF7.8-I(W)

REPORT No. CPTL/H.P/2023/02/19(W) **REPORTING DATE-:27.02.2023**

NAME OF INDUSTRY:	**M/s. SJVN LTD., SHAKTI SADAN, SHIMLA.**

SAMPLE PARTICULARS

Date of Sample Collection	22.02.2023
Sample Received in Lab	23.02.2023
Type of Sample	Treated Effluent(Grab)
Sampling Plan Ref. No.	CPTLF7.3-I
Sampling Method	CPTL/SM/01
Environmental conditions	Normal
Point of Sample Collection	Outlet of STP
Quantity & Packaging	2.0 liters in plastic bottle+1.0 Liter in Glass bottle
Sample Identification No.	$CPTL_{(H.P)}$/2023/02/19(W)
Analysis Duration	23.02.2023 to 27.02.2023
Sample Collected By	Daljeet Singh & Team
Visual Observation	Clear & colorless liquid with fine suspension

TEST RESULTS

S. No.	Parameters	Results	Limits	Test Method
1.	pH	7.64	5.5-9.0	IS: 3025 (P-11): 2022
2.	Total Suspended Solids, mg/l	10.0	200	IS: 3025 (P-17): 1984 (RA:2019)
3.	BOD (at 27°C for 3 Days), mg/l	4.3	100	IS: 3025 (P-44) 1993 (RA-2019)
4.	Oil & Grease, mg/l	ND (DL-1.0)	10	IS: 3025 (P-39): 2021

ND-Not Detected
DL-Detection Limit

(Chemist In-Charge)
Date: 27/02/23

Sital Singh (CEO)
(Authorized Signatory)
Date: 27/02/2023

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TEST CERTIFICATE

Format No. CPTLF7.8-I(M)

REPORT No. CPTL/2023/02/05m(W) **REPORTING DATE: 27.02.2023**

NAME OF INDUSTRY:	**M/s. SJVN LTD., SHAKTI SADAN, SHIMLA.**

SAMPLE PARTICULARS

Date of Sample Collection	22.02.2023
Sample Received in Lab	23.02.2023
Type of Sample	Effluent (Grab)
Sampling Plan Ref. No.	CPTLF7.3-I
Sampling Method	CPTL/SM/01
Environmental Conditions	Normal
Point of Sample Collection	Outlet of STP
Quantity & Packaging	250 ml in sterilized glass bottle
Sample Identification No.	CPTL/2023/02/05m(W)
Analysis Duration	23.02.2023 to 27.02.2023
Sample Collected By	Daljeet Singh & Team
Visual Observation	Clear and colorless liquid with fine suspension

TEST RESULTS

S. No.	Parameters	Results	Test Method
1.	Total Coliform ,MPN /100 ml	<2	IS : 1622-1981(RA 2009) ,MPN Method
2.	Fecal Coliform ,MPN /100 ml	<2	APHA 23rd Edition-2017

Analyzed By
Date: 27/2/2023

Sital Singh (CEO)
Date: 27/02/2023

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TEST CERTIFICATE

Format No. CPTLF7.8-I(W)

REPORT No. CPTL/HP/2023/02/20(W) **REPORTING DATE: - 27.02.2023**

NAME OF INDUSTRY:	**M/s. SJVN LTD., SHAKTI SADAN, SHIMLA.**

SAMPLE PARTICULARS

Date of Sample Collection	22.02.2023
Sample Received in Lab	23.02.2023
Type of Sample	Ground water
Sampling Plan Ref. No.	CPTLF7.3-I
Sampling Method	CPTL/SM/01
Environmental Conditions	Normal
Point of Sample Collection	Borewell
Quantity & Packaging	2.0 liters in Plastic bottle
Sample Identification No.	CPTL/$_{HP}$/2023/02/20(W)
Analysis Duration	23.02.2023 to 27.02.2023
Sample Collected By	Daljeet Singh & Team
Visual Observation	Clear and colorless

TEST RESULTS

S.No.	Parameters	Results	Acceptable Limit	Permissible Limit	Test Method
1.	pH	7.66	6.5-8.5	No relaxation	IS: 3025 (P-11): 2022
2.	Total Dissolved Solids, mg/l	197	500	2000	IS: 3025 (P-16): 1999 (RA-2019)
3.	Total Hardness (as $CaCO_3$), mg/l	155	200	600	IS: 3025 (P-21): 2009 (RA-2019)
4.	Total Alkalinity (as $CaCO_3$), mg/l	125	200	600	IS: 3025 (P-23): 2006
5.	Iron (as Fe), mg/l	0.10	1.0	No relaxation	IS: 3025 (P-53): 2003 & C/1, 10 Phenanthroline Method (RA-2019)
6.	Zinc (as Zn), mg/l	ND (DL-0.5)	5	15	IS: 3025 (P-49): 1994 (RA-2019)
7.	Manganese (as Mn), mg/l	ND (DL-0.09)	0.1	0.3	IS 3025 (P-53): 2006
8.	Ammonia (as total ammonia-N) , mg/l	ND (DL-0.5)	0.5	No relaxation	IS-3025 P-34 : 1988
9.	Cadmium (as Cd), mg/l	ND (DL-0.001)	0.003	No relaxation	IS: 3025 (P-41):1992 (RA-2019)
10.	Fluoride (as F), mg/l	ND (DL-0.1)	1.0	1.5	IS 3025 (P-60) : 2008
11.	Total Chromium , (as Cr), mg/l	ND (DL-0.04)	0.05	No relaxation	IS: 3025 (P-52): 2003 (RA-2019)
12.	Nickel (as Ni), mg/l	ND (DL-0.01)	0.02	No relaxation	IS: 3025 (P-54): 2003
13.	Lead (as Pb), mg/l	ND (DL-0.01)	0.01	1.	IS: 3025 (P-47): 1994 (RA-2019)
14.	Arsenic (as As), mg/l	ND (DL-0.01)	0.01	No relaxation	IS: 3025 (P-37): 2022

ND-Not Detected
DL-Detection Limit

(Chemist In-Charge)
Date: 27/2/23

Sital Singh (CEO)
(Authorized Signatory)
Date: 27/02/2023

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TEST CERTIFICATE

Format No. CPTLF7.8-I(W)

REPORT No. CPTL/HP/2023/02/20b(W) **REPORTING DATE: - 27.02.2023**

NAME OF INDUSTRY:	**M/s. SJVN LTD., SHAKTI SADAN, SHIMLA.**

SAMPLE PARTICULARS

Date of Sample Collection	22.02.2023
Sample Received in Lab	23.02.2023
Type of Sample	Ground water
Sampling Plan Ref. No.	CPTLF7.3-I
Sampling Method	CPTL/SM/01
Environmental Conditions	Normal
Point of Sample Collection	Borewell
Quantity & Packaging	2.0 liters in Plastic bottle
Sample Identification No.	CPTL/$_{HP}$/2023/02/20(W)
Analysis Duration	23.02.2023 to 27.02.2023
Sample Collected By	Daljeet Singh & Team
Visual Observation	Clear and colorless

TEST RESULTS

S.No.	Parameters	Results	Acceptable Limit	Permissible Limit	Test Method
1.	Aluminum (as Al), mg/l	ND (DL-0.002)	0.03	0.2	IS:3025:P-55:2003, (RA:2019)
2.	Mercury (as Hg), mg/l	ND (DL-0.001)	0.001	No relaxation	IS:3025:P-48:1994:RA-2003

ND-Not Detected
DL-Detection Limit

(Chemist-In-Charge)
Date: 27/2/23

Sital Singh (CEO)
Date: 27/02/2023

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TEST CERTIFICATE

Format No. CPTLF7.8-I(A)

REPORT No. CPTL/HP/2023/02/20(A) **REPORTING DATE: 27-02-2023**

NAME OF INDUSTRY:	**M/s. SJVN LTD., SHAKTI, SADAN, SHIMLA.**

SAMPLE PARTICULARS

Sampling Plan Ref No.:	CPTLF 7.3-I	**Environmental Conditions:**	Normal
Sampling Method:	CPTL/SM/01	**Type of Sample:**	Air Quality
Date of Sampling	22-02-2023	**Location of Sampling Station:**	Near Guest House
Date of Sample Received in Lab.:	23-02-2023	**Analysis Duration:**	23-02-2023 to 27-02-2023
Sample identification No.	CPTL/$_{HP}$/2023/02/20(A)	**Sample Collected By:**	Daljeet Singh &Team
Nature of Sample:	Ambient Air		

TECHNICAL DATA

1.	Location of sampling station	Near Guest House
2.	Instrument used for sampling	RDS ,FPS & Gaseous attachment
3.	Time period for sampling	1440 minutes

PARAMETERS	RESULTS	PRESCRIBED STANDARD AS PER NAAQS NOTIFICATION, 18TH NOVEMBER, 2009	TEST METHOD
Particulate Matter (PM_{10}), $\mu g/m^3$	51.4	100	IS: 5182 (P-23): 2006, (RA – 2012)
Particulate Matter ($PM_{2.5}$), $\mu g/m^3$	20.4	60	IS: 5182:(P-24):2019
Sulphur dioxide (SO_2), $\mu g/m^3$	5.8	80	IS: 5182 (P-2): 2001, (RA-2012)
Nitrogen Dioxide (NO_2), $\mu g/m^3$	15.8	80	IS: 5182 (P-6): 2006, (RA – 2012)

Chemist In-Charge
Date: 27/02/23

Sital Singh (CEO)
(Authorized Signatory)
Date: 27/02/2023

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*****END OF REPORT*****

CCC-4

Himachal Pradesh Government
I&PH Department

No. IPH-GWO-E-32 /2011- 824 Dated : 25/7/2011

The Dy. General Manager,
Corporate Construction Department,
SJVN LIMITED, SHIMLA (H.P.)

Subject: - **Construction of Corporate Office Complex for SJVN at Malyana, Shimla- availability of water.**

Reference: - Your office letter No. SJVN/CCC/CCC-12/-152 Dated 19.07.11.

Kindly refer to letter under reference vide which hydrogeological feasibility of subject cited scheme was sought. In this connection Sh. Rahul Maheshwari, STA was directed to carry out the hydrogeological investigation work for the subject cited study. Accordingly, he visited the proposed site with Dy. Manager of SJVN and submitted the report vide letter No. 8375 dated 21.07.11. As per the observations made during the field investigations and hydrogeological set up of the area under investigation, the inferences drawn therefrom, the 4 No. sites have been recommended to develop ground water resource to the tune of 45000 liters per day in the complex of SJVN by drilling 4 No. bore holes having tentative depth of 100 m and 5" dia casing. The pin pointing of these sites will be done later on so that proper spacing between the abstraction structures should be maintained.

Senior Hydrogeologist,
Ground Water Organization,
I&PH, Deptt, Una (HP).

ENERGY AUDIT REPORT
FOR
SJVN
Corporate Head Quarters
Shakti Sadan, Shanan, Shimla- 171006

Carried on
04th- 09th Feb, 2021

Carried Out By

ELION TECHNOLOGIES & CONSULTING PVT LTD
307, Third Floor, DDA LAL Market
H Block, Vikas Puri, New Delhi-110018
T: 011-28541888, E: energy@elion.co.in, W: www.elion.co.in

INDEX

EXECUTIVE SUMMARY

M/S SJVN a Mini Ratna, Category-I and Schedule –'A' CPSE under administrative control of Ministry of Power, Govt. of India, beginning with a single project and single state operation (i.e., India's largest 1500 MW Nathpa Jhakri Hydro Power Station in Himachal Pradesh), the Company has commissioned seven projects totalling 2016.51 MW of installed capacity and 86 km 400 KV Transmission Line. SJVN is presently implementing or operating power projects in Himachal Pradesh, Uttarakhand, Bihar, Maharashtra and Gujarat in India besides neighbouring countries of Nepal and Bhutan.
SJVN aims to be a 5000 MW company by 2023, 12000 MW company by 2030 and 25000 MW company by 2040. Presently, total portfolio of SJVN is 8282 MW, out of which 2016.51 MW is under operation, 3190 MW is under Construction, 786 MW is under Pre-construction and 2289 MW is under Survey and Investigation stage.

Electricity is supplied by Himachal Pradesh State Electricity Board Ltd through one transformer of 1600KVA and for backup power supply, Diesel Generators are available of rating 1010KVA & 500KVA.

100KW on grid Solar Power plant is also installed for in house power generation.

Energy cost as per data available to us is mentioned below:

Electrical Energy

Electricity Consumption for Aug 2019- Sept 2020 (KVAH)	720990
Energy Cost for Aug 2019- Sept 2020 (Rs)	4763057
Average Cost per Unit (Rs)	6.60

Actual cost per unit as per tariff plan is Rs4.70 billed on KVAH basis.

SJVN management is looking at means to reduce the high Electricity bill as well as establish standards for Electricity.

Elion Technologies and Consulting Pvt Ltd team conducted the Detailed Energy audit from 04th-09th Feb, 2021.

The detailed energy audit included detailed data collection, power measurements of major electrical energy consumers, analysis of data and identification of specific energy saving proposals.

SJVN and Elion Technologies and Consulting Pvt Ltd energy team have together identified an annual energy savings potential of Rs 2.74Lakhs per annum based on present energy cost.

The summary of annual savings identified:

Summary	
Total Annual Savings	2.74Lakhs

CHAPTER - I
INTRODUCTION

M/S SJVN evinced interest in availing the services of Elion Technologies and Consulting Pvt Ltd for conducting a detailed energy audit of their corporate head quarter building.

Elion Technologies and Consulting Pvt Ltd team conducted the Detailed Energy audit from 04th-09th Feb, 2021.

This report is on the energy audit carried out at M/S SJVN Corporate Head Quarter. The detailed energy audit comprised of the following activities:

- Data collection of power consuming equipment's.
- A brief session on energy management was conducted to seek more inputs from the personnel engaged in operation and maintenance of electro mechanical services.
- Analysis of collected data and measurements to develop specific energy saving proposals.
- Discussion with the officials on the identified proposals.
- Discussion and reporting of the findings of energy audit with the Engineers and management staff.

All the identified energy savings proposals have been discussed with the executives concerned before finalizing the Projects.

The contents of the report are based solely on the data provided by SJVN Ltd, officials and collected by Elion technologies during the detailed energy audit.

The management can implement the suggestions made in the report after verifying requisite safety and other aspects.

Methodology for Energy Audit:

The energy audit is carried out based on walkthrough type and detailed energy audit, as well as placing special focus on identifying several sections that has the potential to implement energy savings measures.

The following is a list of general procedure and information undertaken during the energy audit:

1. General information of the building.
2. Baseline energy description.
3. Past energy consumption bills which includes electricity bills.
4. On site data collection
5. Energy analysis of different sectors.
6. Recommendation of energy conservation measures.

The primary goal of the energy audit was to identify sources and areas of potential energy savings and cost saving throughout the building by measures of optimization, replacement, retrofitting, and on the other hand, to also provide recommendations on operational and maintenance practices improvements.

CHAPTER – II
ACKNOWLEDGEMENT

Elion Technologies and Consulting Pvt Ltd places on record it's thanks to M/S SJVN, Corporate Head Quarter, Shimla for entrusting the task of conducting energy audit study.

We acknowledge with gratitude the whole hearted support and cooperation extended by Shri Sunil Choudhary (HOD), Shri. O.P Bundel (Senior Manager Electrical), Shri Mahesh Singh (Electrical Engineer) and all their team members while carrying out the study.

CHAPTER - III
LIST OF ENERGY SAVING RECOMMENDATIONS

S. No.	Energy Saving Recommendations	Monetary Savings (Rs/yr)
1	Savings in Demand charges by reduction in contract demand	Considerable
2	Maintenance of present Capacitor Bank for maintaining Power Factor to 0.999	52,484
3	Saving through Variable Air Volume in AHU's	1,48,896
4	Saving by Replacement of Higher Wattage Light with Low Wattage in Building and Switching Off Lights in Various Areas of Office While Maintaining Required Lux Level	72,739
5	General Energy Savings Proposal	Considerable
	Overall Total	**2,74,119**

Total Projected Annual Savings can be achieved from these measures is Rs2.74Lakhs.

CHAPTER - IV
PROCESS DESCRIPTION & ENERGY CONSUMPTION DETAILS

Process Description

The main areas of energy consumption as observed during the audit are as follows:

- Chillers
- AHU's
- Heat Pumps
- Motors (AHU's, Lifts, Escalators etc.)
- Lighting

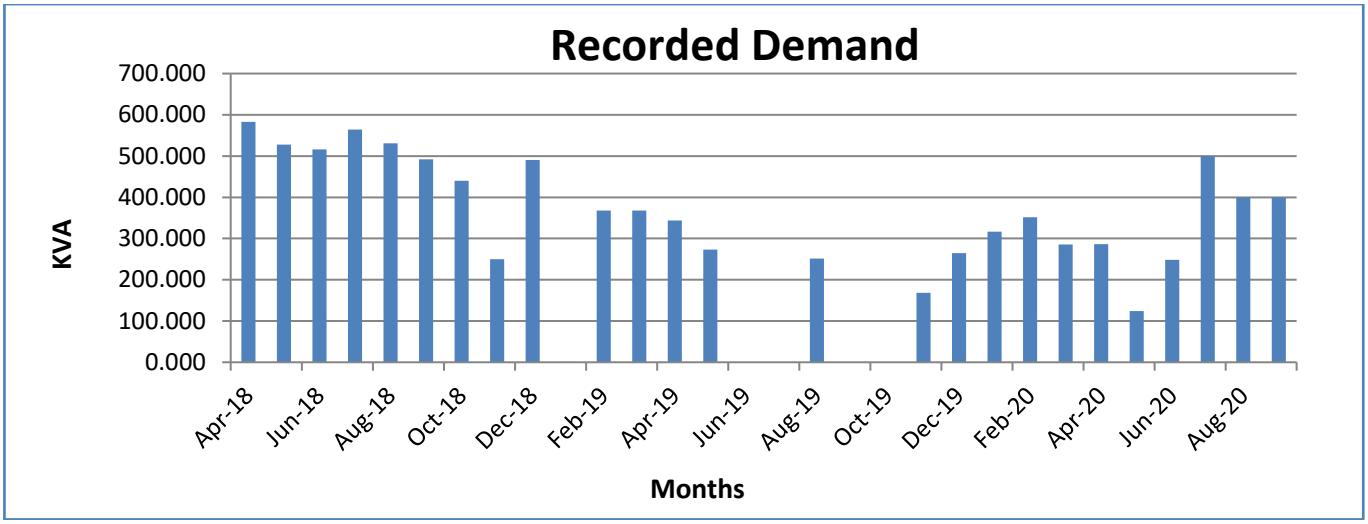
The main sources of energy to meet the required consumptions are as follows:

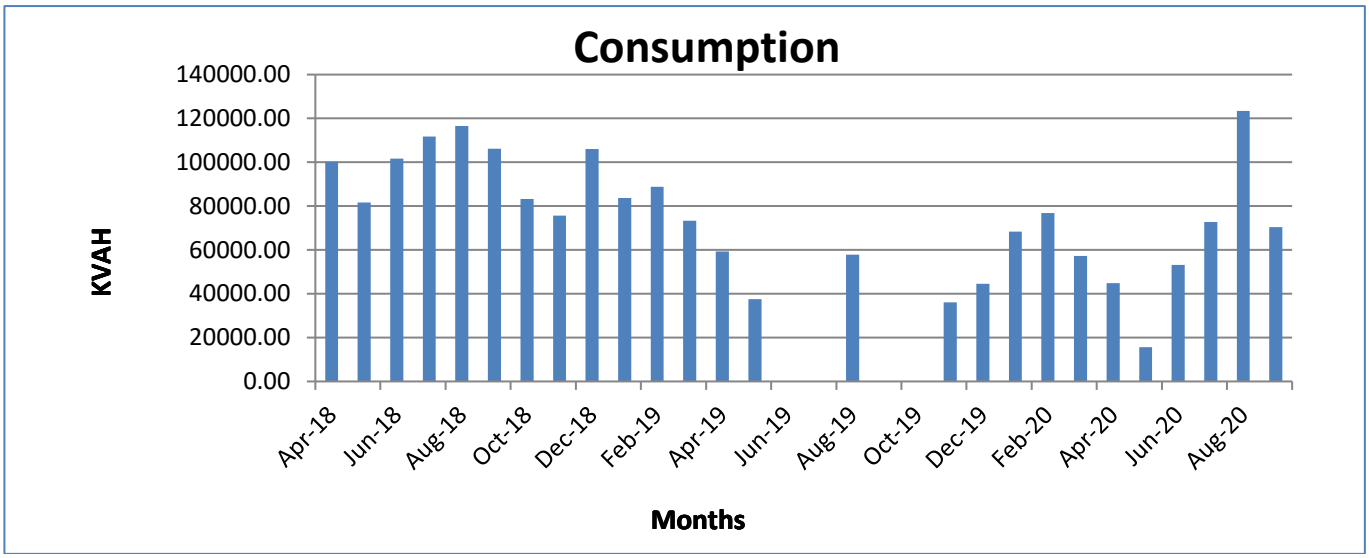
- Electricity supply from Power Distribution Company.
- 100KW ON grid solar power generation plant.
- Backup power from Diesel Generators of rating 1010KVA & 500KVA.

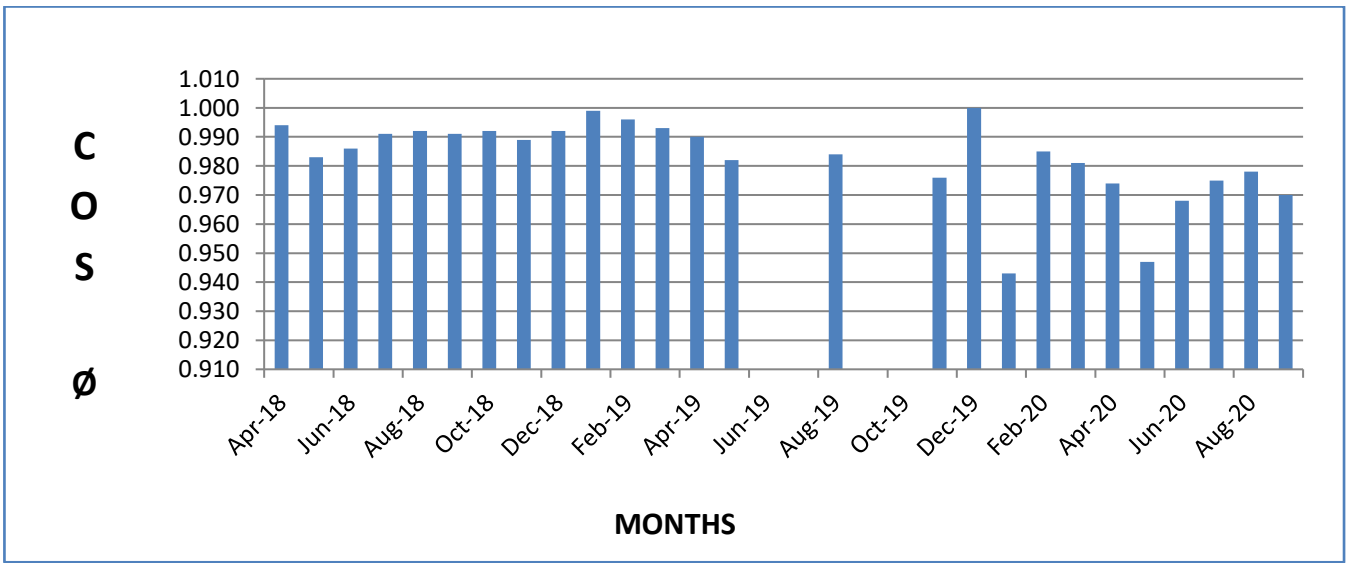
Consumption pattern for energy is given in the subsequent page:

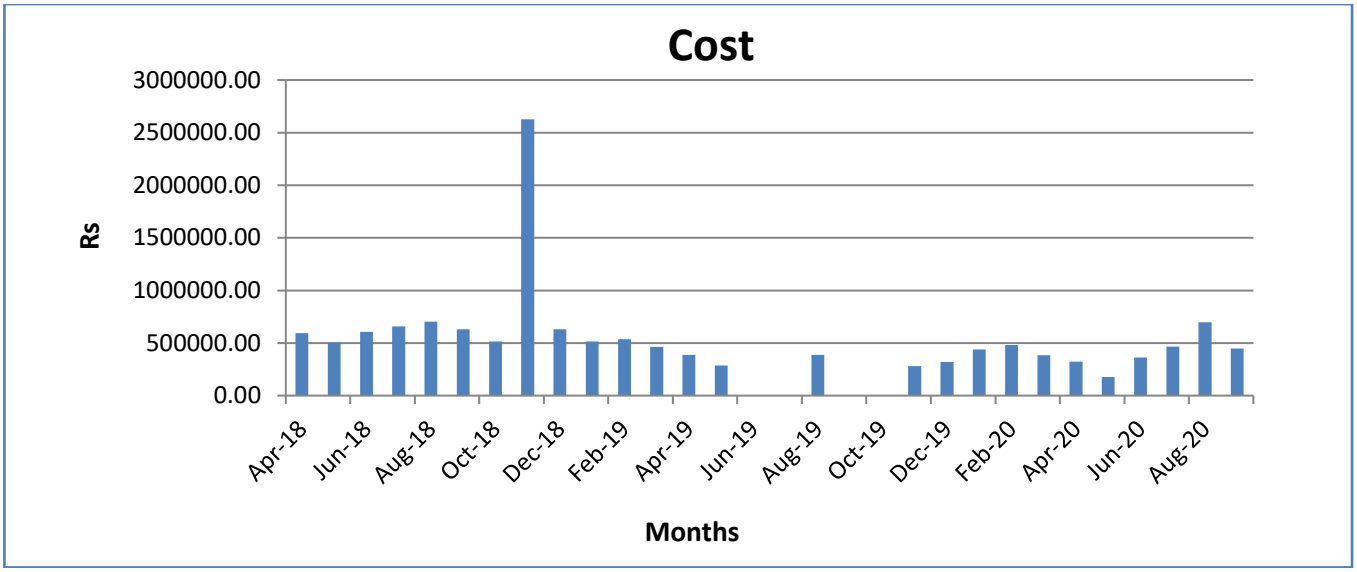
Electricity Consumption Pattern

Months	KWH	kVAH	Contract demand (KVA)	Maximum Demand (KVA)	Recorded Demand (KVA)	Power factor	Energy Charges (in ₹)	Demand Charge (in ₹)	Net Payable Bill (in ₹)
Apr-18	99500.00	100150.00	800.00	720.00	582.600	0.994	465697.50	100800.00	594497.00
May-18	80220.00	81580.00	800.00	720.00	527.700	0.983	379347.00	100800.00	503686.00
Jun-18	100220.00	101680.00	800.00	720.00	516.400	0.986	477896.00	100800.00	607202.00
Jul-18	110770.00	111770.00	800.00	720.00	564.400	0.991	525319.00	100800.00	657057.00
Aug-18	115600.00	116500.00	800.00	720.00	530.800	0.992	547550.00	100800.00	703915.00
Sep-18	105220.00	106130.00	800.00	720.00	492.200	0.991	498811.00	100800.00	629188.00
Oct-18	82570.00	83220.00	800.00	720.00	440.200	0.992	391134.00	100800.00	515990.00
Nov-18	74800.00	75610.00	800.00	720.00	249.800	0.989	355367.00	100800.00	2627815.00
Dec-18	105220.00	106060.00	800.00	720.00	490.100	0.992	498482.00	100800.00	628843.00
Jan-19	83629.00	83679.00	800.00	720.00	0.289	0.999	393291.30	100800.00	515142.00
Feb-19	88390.00	88770.00	800.00	720.00	367.800	0.996	417219.00	100800.00	537442.00
Mar-19	72830.00	73380.00	800.00	720.00	367.900	0.993	344886.00	100800.00	463921.00
Apr-19	58640.00	59240.00	800.00	720.00	343.900	0.990	278428.00	100800.00	388217.00
May-19	36860.00	37520.00	800.00	720.00	273.000	0.982	176344.00	100800.00	286484.00
Aug-19	56850.00	57780.00	800.00	720.00	251.200	0.984	271566.00	100800.00	386841.00
Nov-19	35200.00	36080.00	800.00	720.00	168.500	0.976	169576.00	100800.00	279071.00
Dec-19	46770.00	44600.00	800.00	720.00	264.500	1.000	209620.00	100800.00	321169.00
Jan-20	64450.00	68360.00	800.00	720.00	316.400	0.943	321292.00	100800.00	438567.00
Feb-20	75600.00	76790.00	800.00	720.00	351.800	0.985	360913.00	100800.00	480219.00
Mar-20	56120.00	57220.00	800.00	720.00	285.900	0.981	268934.00	100800.00	383524.00
Apr-20	43710.00	44880.00	800.00	720.00	286.300	0.974	210936.00	100800.00	322552.00
May-20	14780.00	15600.00	800.00	720.00	124.000	0.947	73320.00	100800.00	177880.00
Jun-20	51440.00	53140.00	800.00	720.00	248.000	0.968	249758.00	100800.00	363364.00
Jul-20	71000.00	72800.00	800.00	720.00	500.000	0.975	342160.00	100800.00	465764.00
Aug-20	120720.00	123400.00	800.00	720.00	400.000	0.978	579980.00	100800.00	695756.00
Sep-20	68200.00	70340.00	800.00	720.00	400.000	0.970	330598.00	100800.00	448350.00


Recorded Demand
KVA
700.000
600.000
500.000
400.000
300.000
200.000
100.000
0.000
Apr-18
Jun-18
Aug-18
Oct-18
Dec-18
Feb-19
Apr-19
Jun-19
Aug-19
Oct-19
Dec-19
Feb-20
Apr-20
Jun-20
Aug-20
Months


Consumption
KVAH
140000.00
120000.00
100000.00
80000.00
60000.00
40000.00
20000.00
0.00
Apr-18
Jun-18
Aug-18
Oct-18
Dec-18
Feb-19
Apr-19
Jun-19
Aug-19
Oct-19
Dec-19
Feb-20
Apr-20
Jun-20
Aug-20
Months


C
O
S
Ø
1.010
1.000
0.990
0.980
0.970
0.960
0.950
0.940
0.930
0.920
0.910
Apr-18
Jun-18
Aug-18
Oct-18
Dec-18
Feb-19
Apr-19
Jun-19
Aug-19
Oct-19
Dec-19
Feb-20
Apr-20
Jun-20
Aug-20
MONTHS

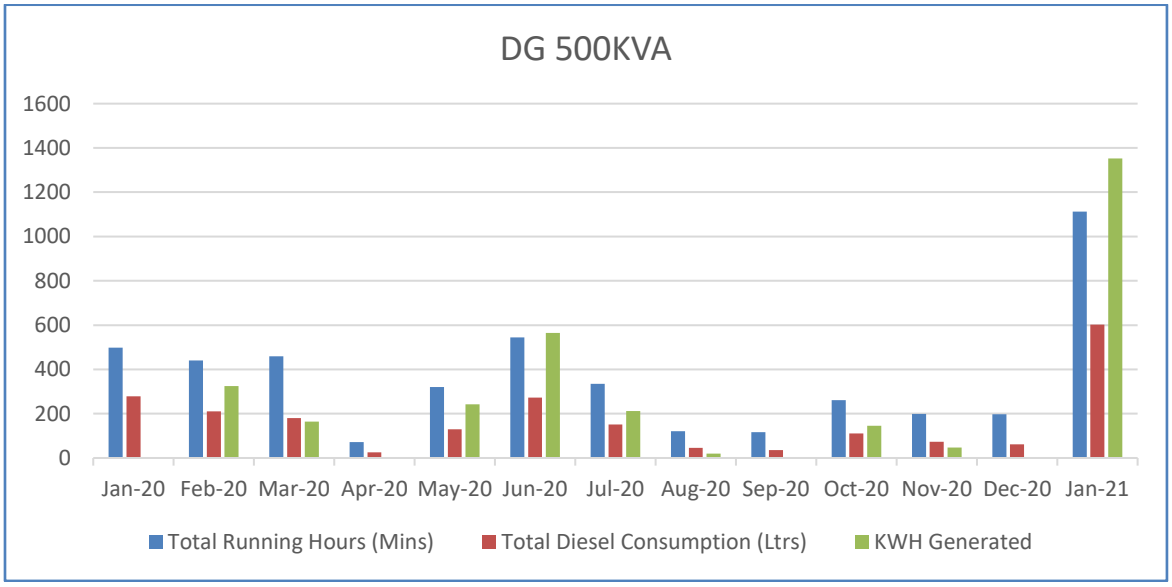


Average power consumption per month is 74856.88KVAH, while maximum recorded demand is 582.60KVA.

DG Generation:

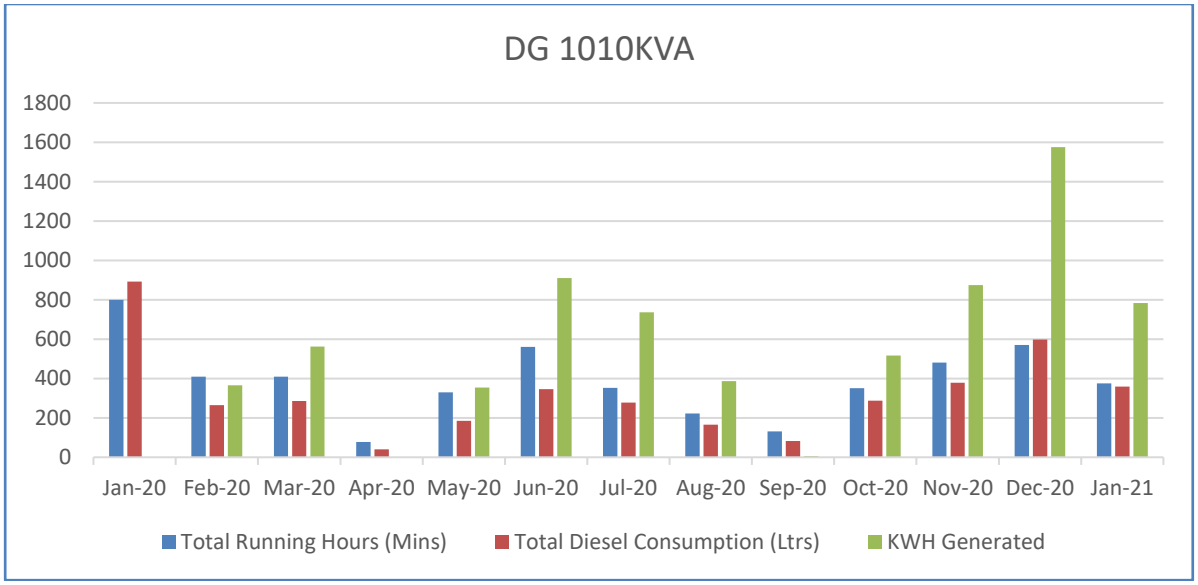
1. DG 500KVA:

Months	Total Running Hours (Mins)	Total Diesel Consumption (Ltrs)	KWH Generated
Feb-20	440	210.76	325
Mar-20	459	180.72	164
Apr-20	72	25.20	0
May-20	320	129.00	242
Jun-20	545	273.08	564
Jul-20	335	150.71	212
Aug-20	121	46.30	20
Sep-20	117	35.93	0
Oct-20	261	110.16	145
Nov-20	199	73.11	47
Dec-20	197	62.15	3
Jan-21	1112	602.26	1352



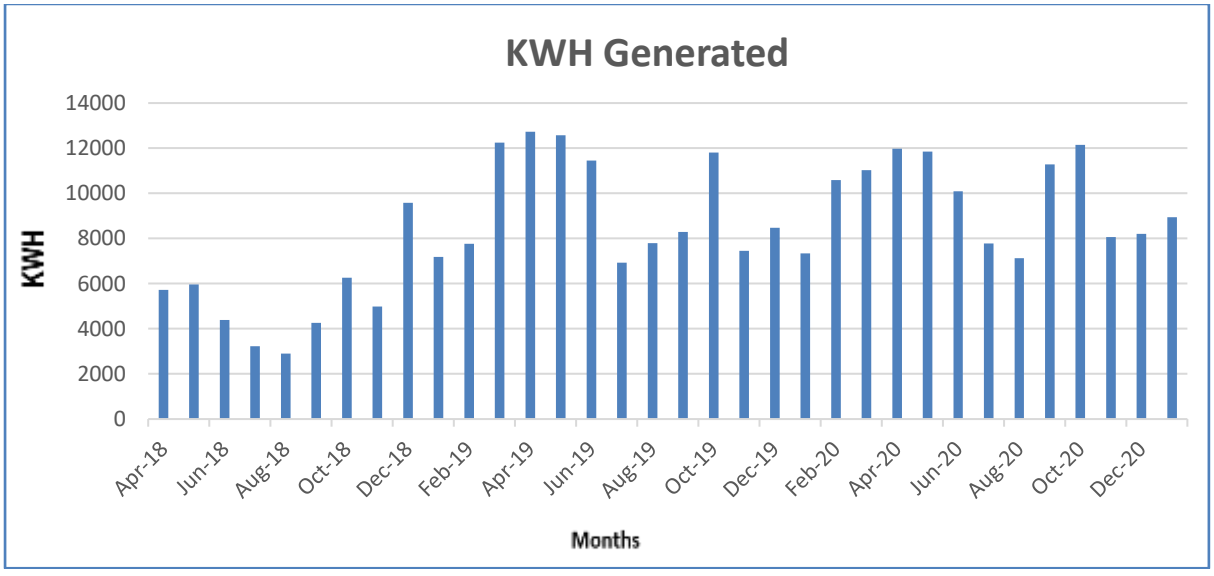
2. DG 1010KVA:

Months	Total Running Hours (Mins)	Total Diesel Consumption (Ltrs)	KWH Generated
Feb-20	410	264.70	366
Mar-20	409	286.16	563
Apr-20	78	40.41	0
May-20	330	185.75	354
Jun-20	560	345.30	911
Jul-20	352	277.38	737
Aug-20	223	165.62	386
Sep-20	132	81.88	7
Oct-20	351	287.08	517
Nov-20	481	379.28	874
Dec-20	570	597.81	1575
Jan-21	376	358.59	783



Solar Generation Data:

Solar Power Plant 100KW					
Months	**KWH Generated**	**Months**	**KWH Generated**	**Months**	**KWH Generated**
Apr-18	5725	Apr-19	12733	Apr-20	11975
May-18	5964	May-19	12574	May-20	11854
Jun-18	4390	Jun-19	11450	Jun-20	10085
Jul-18	3226	Jul-19	6931	Jul-20	7775
Aug-18	2903	Aug-19	7790	Aug-20	7126
Sep-18	4264	Sep-19	8293	Sep-20	11287
Oct-18	6255	Oct-19	11813	Oct-20	12148
Nov-18	4990	Nov-19	7452	Nov-20	8064
Dec-18	9577	Dec-19	8476	Dec-20	8202
Jan-19	7189	Jan-20	7336	Jan-21	8940
Feb-19	7769	Feb-20	10592		
Mar-19	12250	Mar-20	11033		
Total (2018-19)	**74502**	**Total (2019-20)**	**116473**	**Total (2020-21)**	**97456**

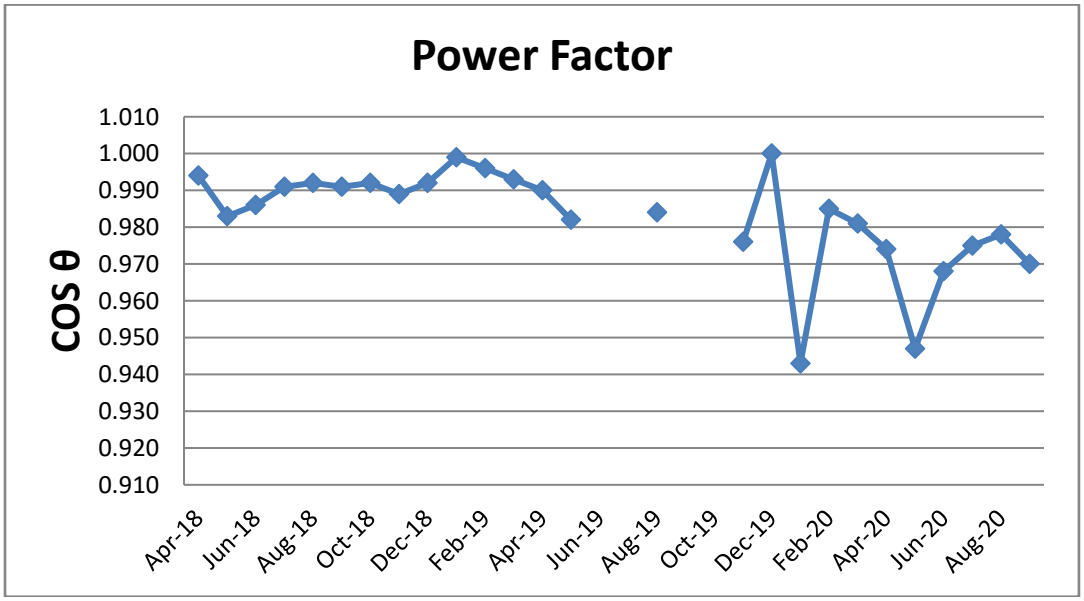


CHAPTER - V
AUDIT ACTIVITIES AND OBSERVATIONS

Following activities were carried out during the energy audit

- **Analysis of the Electricity bills**
  - ❖ Analysis of the different section of the electricity bills.
  - ❖ Study of the fixed charges and variable charges.
  - ❖ Bills for last 2 years were collected from the client and scrutinized.

- **Power Factor and Harmonic Analysis**
  - ❖ Measurement of power factor/harmonic analysis at major loads.
  - ❖ Suggesting methods to improve the present power factor.
  - ❖ Suggesting methods for improving power quality and reduction of Harmonics if any.
  - ❖ Power Factor and Harmonic Analysis was carried out at major location.
  - ❖ Power Factor is scrutinized from electricity bill and found to be varying from 0.94 to 1.



❖ Harmonics study has been carried out, following were the findings-

Feeder Names	L1 Volt	L2 Volt	L3 Volt	L1 Current	L2 Current	L3 Current	Neutral
Transformer 1600 KVA Output	240	242	241	439.4	466.6	461.0	20.7
HVAC	238	242	241	289.3	346.9	310.8	24.2
STP	237	241	239	7.9	13.9	7.8	6.1
Rising Main	238	243	242	219.4	211.5	247.7	32.4
Ground Floor	239	241	240	22.0	21.3	36.2	13.8
First Floor	237	240	239	43.3	34.6	37.2	9.3
Second Floor	229	231	230	45.0	44.2	44.9	5.5
Third Floor	241	245	243	16.7	18.2	16.0	5.2
Fourth Floor	237	241	240	29.7	29.2	41.8	12.2
Fifth Floor	238	241	240	19.2	22.5	29.4	9.4
UPS-1 Output	229	230	229	53.4	41.5	47.1	24.8
UPS-2 Output	229	230	229	26.6	23.3	24.7	11.0
Heat Pump-2	236	240	240	200.0	186.0	172.0	1.0
Heat Pump-3	236	239	239	153.0	141.0	136.0	1.7
Chiller-1	239	242	241	84.1	64.2	63.1	31.7
Lift 1	235	236	235	9.8	13.6	9.5	7.3

Feeder Names	Power Factor	KW (Avg)	KW (Max)	THD V %	THD A %	Unbalance exceeding 2 %
Transformer 1600 KVA Output	0.96	318.9	349.2	1.40	17.90	No
HVAC	0.78	174.9	188.2	0.90	6.40	No
STP	0.73	5.7	21.6	1.80	4.60	No
Rising Main	0.96	158.7	166.6	0.94	20.30	No
Ground Floor	0.89	18.4	22.4	1.60	28.30	No
First Floor	0.92	25.7	28.6	1.70	38.40	No
Second Floor	0.96	29.6	34.4	2.50	26.90	No
Third Floor	0.58	7.3	37.5	2.10	22.20	No
Fourth Floor	0.93	23.2	32.7	1.20	25.20	No
Fifth Floor	0.81	14.1	23.4	1.50	35.60	No
UPS-1 Output	0.91	31.1	36.3	0.87	24.00	No
UPS-2 Output	0.90	15.9	20.7	0.71	17.80	No
Heat Pump-2	0.95	127	797	1.10	3.50	No
Heat Pump-3	0.94	96.7	656.7	1.10	3.70	No
Chiller-1	0.54	45	150	1.30	16.20	No
Lift 1	0.55	4.6	20.4	0.96	7.10	No

Current Harmonics are higher than permissible limit in Transformer 1600 KVA Output, Rising Main, Ground Floor, First Floor, Second Floor, Third Floor, Fourth Floor, Fifth Floor, UPS-1 Output, UPS-2 Output & Chiller-1. They are due to use of excessive use of electronic component such as computers and LED Lighting. In case any problem is faced in power supply like failure of computer or fluctuation of power then harmonic filters need to be installed in the system.

- **Metering and Monitoring Status**
  - ❖ Review of existing metering system of the building.
  - ❖ KWH meters are installed at almost all major power consuming feeders.
  - ❖ During the audit it was observed that in some of the panels (installed at different floors for AHU's and Electrical distribution), Metering instruments needs to be checked and verified for obtaining precise data.

- **Transformer**
  - ❖ Study of Transformer in the building.
  - ❖ Measuring of loading pattern of the transformer. Data was collected using portable power analyser.
  - ❖ Transformer was found to be loaded at 19.6% average load and 31.6% Max load.

- **Electric Motors and Drives**

  Building has different types of motors connected to various types of equipment such as:

  - ❖ Water Pumps
  - ❖ AHU's
  - ❖ Lift
  - ❖ Escalators
  - ❖ Building Machineries (Air Scrubber, Air Washer, Exhaust Fan etc.)

  The study would cover (motors 10 kW and above) loading conditions on motors, loading analysis, drive matching by using power analyser. Operating parameters such as kW, kVA, pf, Voltage, Current, and Frequency where measured. Based on the above analysis the following practically implementable energy conservation measures recommendations would be made.

  - ❖ % loading of the motor
  - ❖ Proper sizing of motor
  - ❖ Use of energy efficient motors by replacing oversized and less efficient motors
  - ❖ Possibility of operating motors in star mode wherever motors are under loaded
  - ❖ Reactive power compensation for motors operating at low PF
  - ❖ Application speed controlling devices & smooth starting devices
  - ❖ Energy efficient transmission
  - ❖ Snapshot study would be carried out for similar equipment

Motor Name	Name plate details				
	Voltage	Ampere	KW	RPM	% Efficiency
AHU Ground Floor F-Side Motor-1	415	8.0	4.00	1445.00	86.30
AHU Ground Floor F-Side Motor-2	415	8.0	4.00	1445.00	86.30
AHU Ground Floor A-Side Motor-1	415	8.0	4.00	1445.00	86.30
AHU Ground Floor A-Side Motor-2	415	8.0	4.00	1445.00	86.30
AHU Ground Floor A-Side Motor-3	415	8.0	4.00	1445.00	86.30
AHU First Floor A-Side Motor-1	415	11.0	5.50	1449.00	87.70
AHU First Floor A-Side Motor-2	415	11.0	5.50	1449.00	87.70
AHU First Floor F-Side Motor-1	415	11.0	5.50	1449.00	87.70
AHU First Floor F-Side Motor-2	415	11.0	5.50	1449.00	87.70
AHU Second Floor F-Side Motor-1	415	11.0	5.50	1449.00	87.70
AHU Second Floor F-Side Motor-2	415	11.0	5.50	1449.00	87.70
AHU Second Floor A-Side Motor-1	415	11.0	5.50	1449.00	87.70
AHU Second Floor A-Side Motor-2	415	11.0	5.50	1449.00	87.70
AHU Third Floor A-Side Motor-1	415	11.0	5.50	1449.00	87.70
AHU Third Floor A-Side Motor-2	415	11.0	5.50	1449.00	87.70
AHU Third Floor F-Side Motor-1	415	11.0	5.50	1449.00	87.70
AHU Third Floor F-Side Motor-2	415	11.0	5.50	1449.00	87.70
AHU Fourth Floor A-Side Motor-1	415	11.0	5.50	1449.00	87.70
AHU Fourth Floor A-Side Motor-2	415	11.0	5.50	1449.00	87.70
AHU Fourth Floor F-Side Motor-1	415	11.0	5.50	1449.00	87.70
AHU Fourth Floor F-Side Motor-2	415	11.0	5.50	1449.00	87.70
AHU Fifth Floor A-Side Motor-1	415	8.0	4.00	1445.00	86.30
AHU Fifth Floor A-Side Motor-2	415	8.0	4.00	1445.00	86.30
AHU Fifth Floor A-Side Motor-3	415	8.0	4.00	1445.00	86.30
AHU Fifth Floor F-Side Motor-1	415	8.0	4.00	1445.00	86.30
AHU Fifth Floor F-Side Motor-2	415	8.0	4.00	1445.00	86.30
AHU Fifth Floor F-Side Motor-3	415	8.0	4.00	1445.00	86.30
Primary Pump Motor-1	415	10.8	5.50	1460.00	89.60
Primary Pump Motor-2	415	10.8	5.50	1460.00	89.60
Primary Pump Motor-3	415	10.8	5.50	1460.00	89.60
Primary Pump Motor-4	415	7.3	3.70	1450.00	88.80
Primary Pump Motor-5	415	7.3	3.70	1450.00	88.80
Secondary Pump Motor-1	415	27.1	15.00	1455.00	91.80
Secondary Pump Motor-2	415	27.1	15.00	1455.00	91.80
Secondary Pump Motor-3	415	27.1	15.00	1455.00	91.80
STP Air Blower-1	415	10.4	5.50	1440.00	85.80

Motor name	Measured Quantities				
	Ampere	Loading on motor (in KW)	Voltage	KVA	Power Factor
AHU Ground Floor F-Side Motor-1	7.8	5.58	416.00	5.61	0.994
AHU Ground Floor F-Side Motor-2	7.9	5.51	413.40	5.68	0.971
AHU Ground Floor A-Side Motor-1	7.8	5.58	416.00	5.61	0.994
AHU Ground Floor A-Side Motor-2	7.9	5.51	413.40	5.68	0.971
AHU Ground Floor A-Side Motor-3	7.8	5.56	414.20	5.65	0.984
AHU First Floor A-Side Motor-1	8.6	4.93	419.60	6.17	0.798
AHU First Floor A-Side Motor-2	8.5	4.91	419.10	6.13	0.800
AHU First Floor F-Side Motor-1	9.0	6.27	419.10	6.51	0.961
AHU First Floor F-Side Motor-2	9.1	6.30	417.17	6.48	0.972
AHU Second Floor F-Side Motor-1	9.0	5.52	417.40	6.16	0.900
AHU Second Floor F-Side Motor-2	9.4	5.80	420.30	6.31	0.910
AHU Second Floor A-Side Motor-1	8.5	5.96	414.00	6.00	0.990
AHU Second Floor A-Side Motor-2	8.6	5.89	413.50	5.94	0.991
AHU Third Floor A-Side Motor-1	8.5	4.90	418.50	6.15	0.796
AHU Third Floor A-Side Motor-2	8.8	4.95	419.10	6.16	0.803
AHU Third Floor F-Side Motor-1	8.7	5.78	415.10	6.15	0.939
AHU Third Floor F-Side Motor-2	8.6	5.97	415.10	6.20	0.961
AHU Fourth Floor A-Side Motor-1	8.5	5.96	414.00	6.00	0.990
AHU Fourth Floor A-Side Motor-2	8.6	4.93	419.60	6.17	0.798
AHU Fourth Floor F-Side Motor-1	9.4	5.80	420.30	6.31	0.910
AHU Fourth Floor F-Side Motor-2	9.0	5.52	417.40	6.16	0.901
AHU Fifth Floor A-Side Motor-1	8.0	5.65	415.40	6.10	0.926
AHU Fifth Floor A-Side Motor-2	8.3	5.60	416.40	6.50	0.861
AHU Fifth Floor A-Side Motor-3	8.2	5.63	415.89	6.31	0.892
AHU Fifth Floor F-Side Motor-1	8.3	5.61	416.40	6.51	0.861
AHU Fifth Floor F-Side Motor-2	8.2	5.63	415.89	6.31	0.892
AHU Fifth Floor F-Side Motor-3	8.3	5.70	417.40	6.24	0.913
Exhaust Fan	2.9	1.78	421.40	2.15	0.823
Ceiling Mounted AHU (Fifth Floor)	2.4	0.76	416.30	1.73	0.419
Lift-1 (Standstill)	9.0	1.28	416.90	6.36	0.200
Escalator L-U (5469)	24.5	11.35	419.40	17.69	0.641
Escalator U-L (5465)	6.5	2.80	419.10	4.74	0.583
Air Washer	7.2	2.99	419.20	5.23	0.571
Air Scrubber	11.7	5.82	419.30	8.48	0.685
Borewell	10.7	6.76	412.60	7.65	0.877
Booster Pump	11.3	6.91	415.00	8.15	0.849
Primary Pump Motor-1	11.2	6.35	421.20	8.23	0.767
Primary Pump Motor-4	7.6	4.30	416.90	5.60	0.767
Primary Pump Motor-5	7.7	4.23	417.60	5.56	0.760
Secondary Pump Motor-3	27.1	11.54	417.00	11.53	0.998
STP Air Blower-1	9.4	5.41	414.60	6.76	0.799

- **AHU's**

  ❖ 12 No's of AHU's are installed in the building. As follows:

AHU	Rated CFM
AHU Ground Floor F-Side	18000
AHU First Floor A-Side	19000
AHU First Floor F-Side	17000
AHU Second Floor F-Side	15000
AHU Second Floor A-Side	15000
AHU Third Floor A-Side	19000
AHU Third Floor F-Side	18000
AHU Fourth Floor A-Side	17000
AHU Fourth Floor F-Side	19000
AHU Fifth Floor A-Side	20200
AHU Fifth Floor F-Side	20200

  ❖ 8 No's of ceiling suspended AHU's are installed at some floors of different CFM capacity.

Ceiling Mounted AHU's		
Floor No.	**Quantity**	**Rating (CFM)**
5th	4No's	5500
4th	1No's	4500
1st	3No's	2500

Following are the parameters measured for calculating CFM of the respective AHU:

AHU	Rated CFM	Supply to	No. of Filters	Velocity (m/s)			Average Velocity
AHU Ground Floor F-Side	18000	Canteen, Doctor Room, Service Dispatch Area	1st Filter	5.00	3.46	3.20	3.89
			2nd Filter	4.60	4.00	2.90	3.83
			3rd Filter	4.85	4.10	3.60	4.18
			4th Filter	4.78	4.16	3.80	4.25
			5th Filter	3.60	3.20	3.10	3.30
			6th Filter	2.75	2.56	3.90	3.07
			7th Filter	4.20	3.10	3.02	3.44
			8th Filter	5.02	3.66	4.00	4.23
			9th Filter	2.87	3.55	3.40	3.27
			10th Filter	3.06	1.80	3.10	2.65
			11th Filter	4.09	2.50	3.20	3.26
			12th Filter	2.20	1.80	2.50	2.17
			13th Filter	2.36	2.10	3.60	2.69
			14th Filter	2.25	3.00	3.10	2.78
			15th Filter	1.30	1.80	0.95	1.35
AHU First Floor A-Side	19000	IA Department, Lift Lobby, Conference Room (Gate 1), Training Room, Geology Department, CM&C Department, CP Department, Gallery Area	1st Filter	2.50	2.30	3.30	2.70
			2nd Filter	5.00	3.40	3.80	4.07
			3rd Filter	5.00	3.10	2.40	3.50
			4th Filter	4.80	3.90	3.60	4.10
			5th Filter	2.00	2.40	3.60	2.67
			6th Filter	3.80	2.10	2.00	2.63
			7th Filter	4.30	2.20	2.00	2.83
			8th Filter	5.00	3.60	2.70	3.77
			9th Filter	5.00	2.80	2.90	3.57
			10th Filter	5.00	3.60	4.20	4.27
			11th Filter	3.90	2.80	3.00	3.23
			12th Filter	3.00	2.80	2.90	2.90
			13th Filter	2.50	1.80	3.80	2.70
			14th Filter	1.80	1.50	2.10	1.80
			15th Filter	2.40	2.50	3.30	2.73

AHU First Floor F-Side	17000	Gallery Area, Multipurpose Hall, Training Room (Gate 2), Conference Room (Gate 2), ERP Section, Lift Lobby	1st Filter	3.60	3.40	2.10	3.03
			2nd Filter	3.30	1.70	3.10	2.70
			3rd Filter	4.30	4.60	3.60	4.17
			4th Filter	4.70	3.80	3.70	4.07
			5th Filter	3.30	3.30	3.60	3.40
			6th Filter	3.00	2.50	2.20	2.57
			7th Filter	4.20	2.70	2.80	3.23
			8th Filter	4.40	3.80	3.80	4.00
			9th Filter	5.30	3.60	3.50	4.13
			10th Filter	4.00	3.50	3.20	3.57
			11th Filter	3.30	3.00	4.10	3.47
			12th Filter	4.70	4.50	5.30	4.83
			13th Filter	4.50	3.80	4.80	4.37
			14th Filter	1.80	1.40	3.80	2.33
			15th Filter	3.10	1.50	1.80	2.13
AHU Second Floor F-Side	15000	IT & SE Office, Commercial and Operation Office, C & SO Office, Gallery, Civil Contracts Office, Lift Lobby, Office/Room No. 305, 307, 308, 309 Meeting Room	1st Filter	7.40	3.70	3.40	4.83
			2nd Filter	4.60	4.50	3.80	4.30
			3rd Filter	5.40	4.20	4.60	4.73
			4th Filter	3.70	2.90	3.40	3.33
			5th Filter	4.50	3.40	3.80	3.90
			6th Filter	5.20	2.90	3.80	3.97
			7th Filter	4.30	3.70	4.20	4.07
			8th Filter	5.70	3.30	5.70	4.90
			9th Filter	4.60	3.30	5.80	4.57
			10th Filter	4.00	2.50	3.30	3.27
			11th Filter	2.30	3.20	3.10	2.87
			12th Filter	3.40	2.30	2.90	2.87
			13th Filter	2.70	1.80	4.00	2.83
			14th Filter	1.60	1.50	3.60	2.23
			15th Filter	2.20	1.80	1.60	1.87

AHU Second Floor A-Side	15000	Office/Room No. 306, 307 Meeting Room, CFM Department, Electrical Design Office, Vigilance Department, Electrical Contract Office, Lift Lobby, Gallery Area	1st Filter	3.10	2.70	2.10	2.63
			2nd Filter	4.00	3.40	3.30	3.57
			3rd Filter	5.60	3.30	3.50	4.13
			4th Filter	4.40	4.50	4.10	4.33
			5th Filter	5.00	4.30	5.00	4.77
			6th Filter	4.20	2.30	3.20	3.23
			7th Filter	3.50	2.60	3.30	3.13
			8th Filter	3.80	2.40	4.50	3.57
			9th Filter	3.60	2.10	4.00	3.23
			10th Filter	3.20	3.10	4.30	3.53
			11th Filter	3.00	2.40	3.40	2.93
			12th Filter	2.30	1.80	3.40	2.50
			13th Filter	3.50	2.50	3.30	3.10
			14th Filter	2.10	1.70	2.90	2.23
			15th Filter	2.30	2.20	3.40	2.63
AHU Third Floor A-Side	19000	CCD Office (Office No. 401, 403), Lift Lobby, CAD Office, Gallery Area	1st Filter	2.48	2.20	3.30	2.66
			2nd Filter	5.00	3.40	3.80	4.07
			3rd Filter	5.00	3.10	2.40	3.50
			4th Filter	4.70	3.90	3.60	4.07
			5th Filter	2.10	2.40	3.50	2.67
			6th Filter	3.80	2.10	2.00	2.63
			7th Filter	4.30	2.20	2.00	2.83
			8th Filter	5.00	3.50	2.79	3.76
			9th Filter	5.10	2.80	2.90	3.60
			10th Filter	5.00	3.60	4.20	4.27
			11th Filter	3.90	2.80	3.20	3.30
			12th Filter	3.00	2.80	2.90	2.90
			13th Filter	2.50	1.80	3.80	2.70
			14th Filter	1.80	1.40	2.10	1.77
			15th Filter	2.30	2.50	3.30	2.70

AHU Third Floor F-Side	18000	Civil Design Office, CAD Office, Cost Engineering & Environment Office, QA & I Department, Gallery Area, Lift Lobby	1st Filter	5.10	3.50	3.30	3.97
			2nd Filter	4.70	4.10	3.00	3.93
			3rd Filter	4.90	4.20	3.70	4.27
			4th Filter	4.80	4.00	3.90	4.23
			5th Filter	3.70	3.20	3.00	3.30
			6th Filter	2.80	2.60	4.00	3.13
			7th Filter	4.30	3.20	3.10	3.53
			8th Filter	5.10	3.70	4.00	4.27
			9th Filter	2.90	3.40	3.50	3.27
			10th Filter	3.00	1.90	3.20	2.70
			11th Filter	4.10	2.70	3.30	3.37
			12th Filter	2.20	1.90	2.60	2.23
			13th Filter	2.40	2.20	3.70	2.77
			14th Filter	2.30	3.10	3.20	2.87
			15th Filter	1.30	1.90	0.50	1.23
AHU Fourth Floor A-Side	17000	Corporate HR Office (Office No. 501, 502, 503 Gate-1), Gallery Area, Lift Lobby	1st Filter	3.50	3.43	2.12	3.02
			2nd Filter	3.20	1.72	3.20	2.71
			3rd Filter	4.20	4.50	3.67	4.12
			4th Filter	4.80	3.87	3.78	4.15
			5th Filter	3.20	3.20	3.65	3.35
			6th Filter	3.10	2.40	2.23	2.58
			7th Filter	4.30	2.80	2.87	3.32
			8th Filter	4.50	3.90	3.87	4.09
			9th Filter	5.30	3.40	3.55	4.08
			10th Filter	4.20	3.50	3.10	3.60
			11th Filter	3.34	3.00	4.20	3.51
			12th Filter	4.78	4.40	5.50	4.89
			13th Filter	4.55	3.75	4.50	4.27
			14th Filter	1.87	1.40	3.89	2.39
			15th Filter	3.12	1.59	1.87	2.19

AHU Fourth Floor F-Side	19000	Office No.503 Gate-2 HR Office, Corporate Finance Office (Office No. 505, 506, 507, 508), Gallery Area, Lift Lobby	1st Filter	2.58	2.22	3.50	2.77
			2nd Filter	5.10	3.43	3.87	4.13
			3rd Filter	5.20	3.17	2.42	3.60
			4th Filter	4.78	3.95	3.66	4.13
			5th Filter	2.18	2.50	3.54	2.74
			6th Filter	3.87	2.30	2.20	2.79
			7th Filter	4.35	2.10	2.32	2.92
			8th Filter	5.30	3.60	2.78	3.89
			9th Filter	5.18	2.70	2.92	3.60
			10th Filter	5.20	3.66	4.30	4.39
			11th Filter	3.94	2.87	3.27	3.36
			12th Filter	3.20	2.85	2.95	3.00
			13th Filter	2.56	1.82	3.85	2.74
			14th Filter	1.83	1.43	2.20	1.82
			15th Filter	2.30	2.60	3.30	2.73
AHU Fifth Floor A-Side	20200	CMD Secretariat, Conference Room, DC Room/Office (Secretariat), Lift Lobby, Gallery Area	1st Filter	8.60	4.10	4.20	5.63
			2nd Filter	4.60	3.00	2.60	3.40
			3rd Filter	4.00	3.20	2.90	3.37
			4th Filter	3.80	2.20	3.10	3.03
			5th Filter	3.40	2.30	3.10	2.93
			6th Filter	5.00	2.60	2.80	3.47
			7th Filter	8.20	5.20	3.80	5.73
			8th Filter	4.50	1.70	2.40	2.87
			9th Filter	3.40	2.50	3.70	3.20
			10th Filter	3.50	2.60	3.60	3.23
			11th Filter	2.80	2.30	2.60	2.57
			12th Filter	2.70	2.50	4.60	3.27
			13th Filter	5.10	1.10	1.80	2.67
			14th Filter	2.20	2.20	2.40	2.27
			15th Filter	1.80	2.20	1.80	1.93
			16th Filter	2.10	1.90	2.60	2.20
			17th Filter	2.20	2.30	2.60	2.37
			18th Filter	1.80	1.90	3.00	2.23

AHU Fifth Floor F-Side	20200	Board Room, Strategy Department, Conference Room, Office No. 621, Lift Lobby, Gallery Area	1st Filter	8.55	4.10	4.25	5.63
			2nd Filter	4.60	3.01	2.60	3.40
			3rd Filter	4.10	3.25	2.90	3.42
			4th Filter	3.80	2.20	3.10	3.03
			5th Filter	3.40	2.30	3.26	2.99
			6th Filter	5.00	2.58	2.80	3.46
			7th Filter	8.20	5.20	3.80	5.73
			8th Filter	4.50	1.70	2.40	2.87
			9th Filter	3.40	2.50	3.70	3.20
			10th Filter	3.44	2.58	3.78	3.27
			11th Filter	2.80	2.29	2.60	2.56
			12th Filter	2.70	2.50	4.33	3.18
			13th Filter	5.10	1.10	1.82	2.67
			14th Filter	2.28	2.20	2.40	2.29
			15th Filter	1.80	2.27	1.75	1.94
			16th Filter	2.10	1.90	2.60	2.20
			17th Filter	2.90	2.30	2.57	2.59
			18th Filter	1.80	1.90	3.13	2.28

AHU	Rated CFM	Total Area (inch)	Total Area (ft)	Total Velocity	Calculated CFM
AHU Ground Floor F-Side	18000	5703.75	475.31	48.36	22987.70
AHU First Floor A-Side	19000	4570.00	380.83	47.47	18076.89
AHU First Floor F-Side	17000	4590.00	382.50	52.00	19890.00
AHU Second Floor F-Side	15000	4482.00	373.50	54.53	20368.20
AHU Second Floor A-Side	15000	5510.00	459.17	49.53	22744.06
AHU Third Floor A-Side	19000	4570.00	380.83	47.42	18060.39
AHU Third Floor F-Side	18000	5568.00	464.00	49.07	22766.93
AHU Fourth Floor A-Side	17000	4590.00	382.50	52.27	19994.55
AHU Fourth Floor F-Side	19000	4570.00	380.83	48.62	18514.85
AHU Fifth Floor A-Side	20200	7590.00	632.50	56.37	35651.92
AHU Fifth Floor F-Side	20200	7590.00	632.50	56.71	35871.18

During the audit, Air flow is measured by using Testo make portable anemometer. As per BEE standards, CFM was measured by taking air flow samples at 3 points at each filter along with measurement of their length and breadth to calculate area of each section.

* CFM= Total Air Flow Velocity (m/s) x Total Area (feet)

Following are the results:

AHU	Rated CFM	Calculated CFM
AHU Ground Floor F-Side	18000	22987.70
AHU First Floor A-Side	19000	18076.89
AHU First Floor F-Side	17000	19890.00
AHU Second Floor F-Side	15000	20368.20
AHU Second Floor A-Side	15000	22744.06
AHU Third Floor A-Side	19000	18060.39
AHU Third Floor F-Side	18000	22766.93
AHU Fourth Floor A-Side	17000	19994.55
AHU Fourth Floor F-Side	19000	18514.85
AHU Fifth Floor A-Side	20200	35651.92
AHU Fifth Floor F-Side	20200	35871.18

- **Chillers**
  - ❖ 3 No's of Air-Cooled Chillers of same model and capacity are installed at the terrace of the building. All of them are of same ratings. Inlet and outlet temperatures were measured.

The detailed measurement for water flow was carried out using ultrasonic flow meter of GE make PT900.

Following are the results obtained for chiller performance:

CHILLER NO.1:

Chiller Name/No.	Measured Mass Flow Rate Q (m3/hr)	Specific Heat of Water, Cp (KCal/Kg◦C)	Temperature-Chilled Water Evaporator inlet (◦C) Tin	Temperature-Chilled Water Evaporator Outlet (◦C) Tout	Measured Power Input (KW)
Chiller-1 195TR	295	1	9.4	9.2	45

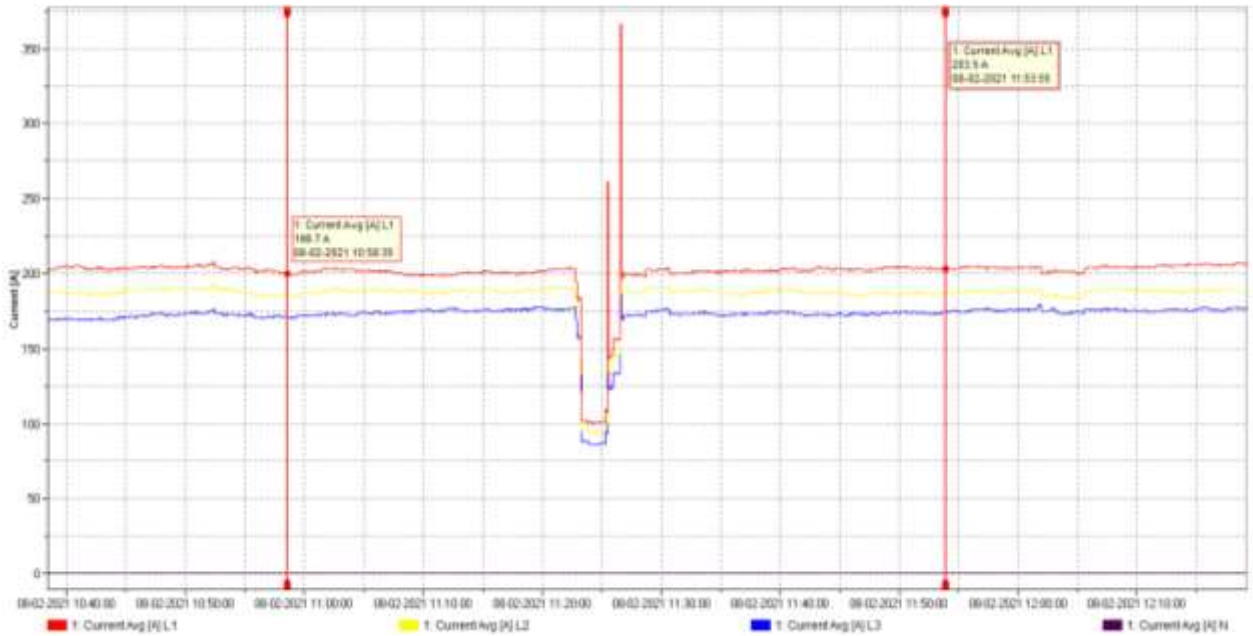
Following are formulas used to evaluate Energy Efficiency Ratio of Chiller as per BEE Guidelines:

Net refrigeration Capacity (TR) = (Q X Cp X (Tin –Tout))/3024
where
Q - Measured Mass Flow rate (m3/hr)
Cp - Specific heat of water (K Cal/Kg ◦C)
Tin- Temperature of Chilled water evaporator inlet (◦C)
Tout- Temperature of Chilled water evaporator outlet (◦C)

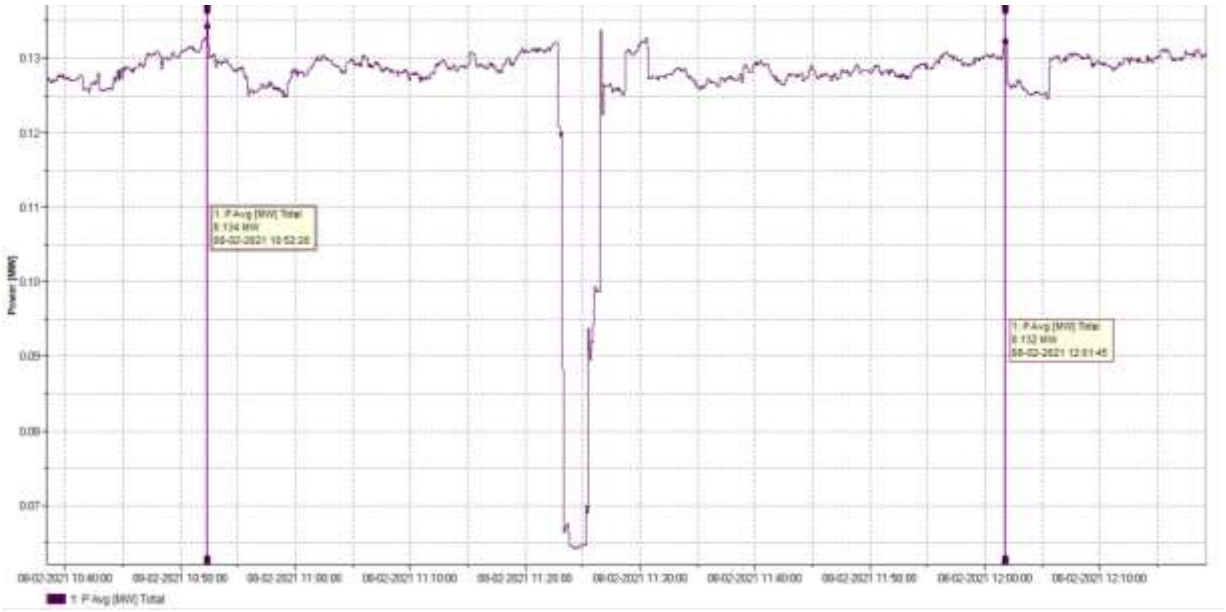
Specific Power Consumption (KW/TR) = Measured Power input P (KW)/Net Refrigeration Capacity (TR)
Coefficient of performance (COP) = 3.516/ Specific Power Consumption
Energy Efficiency Ratio (EER) = 12/ Specific Power Consumption

Chiller Name	Temperature Difference (T)	Net Refrigeration Capacity (TR)	Specific Power Consumption (KW/TR)	Coefficient of performance (COP)	Energy Efficiency Ratio (EER)
Chiller-1 195TR	0.2	19.5	2.3	1.52	5.2

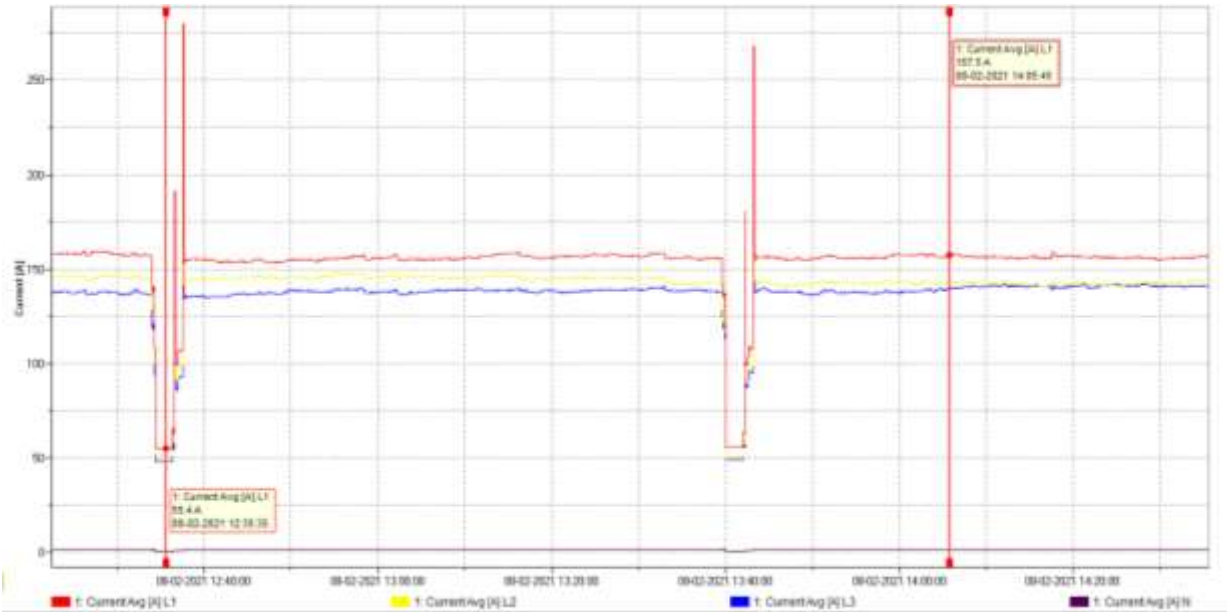
- **Heat Pumps**
  - ❖ 3 No's of Heat Pumps of same model and capacity are installed at the terrace of the building. All of them are of same ratings. Two were in operation at the time of audit.



Loading pattern of Heat Pump- 2



Power consumption pattern of Heat Pump- 2



Loading pattern of Heat Pump- 3

Power consumption pattern of Heat Pump- 3

- **Lighting System**
  - ❖ Detailed audit in lighting system normally results in considerable savings. Luminance readings with a lux meter should act as a basis for comparative purpose. The study covers measurement of lux level at work place and at various points of light usage.

  - ❖ Lux Survey is carried out at various locations, following were the findings –

Location				Lux Level
Ground Floor	F-Side	Electrical room	In Front of Panels	30, 51, 54
			Near Main Incomer	92, 40
			Near Escalator Panel	35, 46
			Near Capacitor Panel	45, 68
		UPS Room		102, 66, 105, 77
		Lift Lobby		258, 100, 135
		Passageway (Near Canteen)		495, 263, 340, 62, 45
		CCTV Room		300, 365, 240, 320
		Male Washroom		255, 271, 102
		Dispensary		267, 298
		Passage/Gallery		1020, 490, 283
		Central Dispatch		148, 280
		Canteen	Sitting Area	725, 620, 106
			HOD Sitting Area	457, 800
		Kitchen		85, 191, 157, 200
	A-Side	Reception	Near ATM Machine	906, 930, 1411
			Near Officer Sitting Area or Washroom	1037, 1142, 1470, 1560
			Sitting Area (Centre)	670, 230, 200, 180, 283
		Front Entry Gate Side		806, 860, 1840, 2048
		Fire Control Room		190, 138
		Library	R01	1830, 730
			Workstations	432, 418
			Between Shelfs	111, 182, 247
			Sitting Area	520, 280, 360, 515, 610
		Cloak Room		175, 160
		Passageway		240, 230, 100
		Maintenance Room		440, 112, 280
		Male Washroom		160, 75

		Lift Lobby		168, 189
		Record Room		148, 590, 318, 684, 389
		Electrical Room		68, 86
First Floor	F-Side	208 ERP Section		182, 240, 310
		205 Server Room	Office Area	115, 50, 108
			Server Room	345, 170, 254, 312
	A-Side	204 Internal Audit		180, 289, 343
		206 Conference Room		256, 325, 250
		207 Training Room		219, 250, 180, 203
		203 Corporate Geology		316, 321, 260
		202 Corporate Monitoring Office	Office Workstation	323, 440, 225
			R01 Cabin	716, 1200, 1395
		201 Corporate Planning Office	Office Workstation	356, 324
			R01 Cabin	1087, 916
			R02 Cabin	786, 850
Second Floor	F-Side	312 C & SO Office		305, 102, 220
		313 IT & SE Office		270, 240, 250
		314 Civil Contracts Office	Office Workstation	480, 501
			R01 Cabin	389
			R02 Cabin	350
			R03 Cabin	310
	A-Side	301 Corporate Electrical Contracts Office	Office Workstation	495, 307
			R01 & E01 Cabins	534, 1211
		302 Corporate Vigilance Office	Office Workstation	305, 299
			E01 Cabin	409
		303 CFM Office	Office Workstation	330, 655
			E01 Cabin	917, 1088
		304 CED Office	Office Workstation	275, 230
			E01, R01 & R02 Cabins	648, 350, 322
Third Floor	F-Side	405 QA & I Office	Office Workstation	325, 320
			E01 & C03 Cabins	653, 595
		404 Cost Engineering/Environment Office	Office Workstation	250, 260
			R01 Cabin	461
			R02 Cabin	350
	A-Side	403 Corporate Civil Design Office	Office Workstation	540, 450, 340, 280, 260
			R01 Cabin	375
			R02 Cabin	250, 427
			Passage	413, 178, 309

		402 CCD Office		696, 762, 802, 984, 329
		401 CCD Office		780, 472, 320, 372
Fourth Floor	F-Side	508 Corporate Finance Office		194, 278
		507 Corporate Finance Office		260, 628, 302
		506 Corporate Finance Office		304, 363, 368
	A-Side	503 Corporate HR Office		275, 523, 617, 345, 700
		502 Corporate HR Office		240, 225
		501 Corporate HR Office	Office Workstation	289, 256
			R01 & R02 Cabins	323, 290
Fifth Floor	F-Side	616-1 Director (Finance)		534, 460, 370
		615-1 Technical Officer to DF		795, 554
		615-2 Technical Officer to DE		970, 1102
		Pantry		556, 425
		617 Director Electrical Office		230
		619 Strategy Department		324
		620 Board Room		317, 492
	A-Side	Passage (Corridor)		105, 590, 860, 992, 305
		Lift Lobby		570, 545, 826
		611 CVO Secretariat		378, 420
		610 Chief Vigilance Office		349, 412
		609 CVO Ante Room		555, 424
		605 Video Conference Room		655, 773, 692
		602 CMD Secretariat		275, 282, 250
		601 Chairman & Managing Director		540, 468, 495
		CMD Ante Room		341, 375
		621 Lounge		252, 275, 285
		607 Director Personnel Office		925, 1643, 823
		Gallery		50-692
		608-1 Technical Officer to DP		1732, 915
		608-2 Technical Officer to DC		575, 700
		Workstation (Near Pantry)		705, 924, 838, 430
		Pantry		535, 345
Compound Area		Front Area		42, 37, 35, 26
		Bike Parking (Left Side)		33, 37, 34, 30, 29, 32
		Car Parking (Right Side)		33, 31, 28, 30
STP Area				150, 100, 168

CHAPTER - VI
ENERGY SAVING RECOMMENDATIONS

Energy Saving Recommendation No.1:
Savings in Demand charges by reduction in contract demand

1. Electricity consumption bills for about last two years were scrutinized and it was observed that contract demand is 800KVA and MDI varies from 0.289KVA to 582.60KVA.

2. It was observed that through last two year maximum demand is low as compared to the contract demand. This would lead to the saving in the fixed charge in future depending upon future load condition.

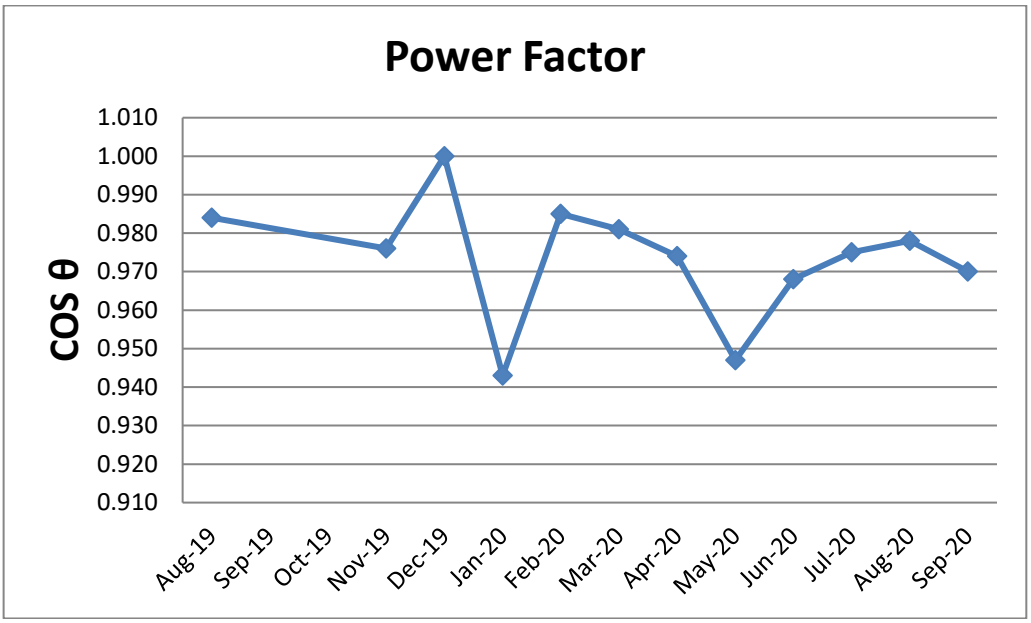
3. As per tariff of Himachal Pradesh State Electricity Board Ltd., a fixed amount @ Rs140/- KVA on a 90% of contract demand or maximum demand whichever is higher is charged every month.

4. It is advised to revise the contract demand to nearby 680KVA depending on future load condition for considerable savings on fixed charges.

Energy Saving Recommendation No.2:
Maintenance of present Capacitor Bank for maintaining Power Factor to 0.999

1. M/S SJVN getting power supply from Himachal Pradesh State Electricity Board Ltd. through an energy meter. The supply company charges NDS (Non-Domestic supply) tariff on the basis of KVAH.

2. Analysis of energy bills for last 12 months was done and it was found that power factor was varying between 0.94 to 1.00 and average power factor is 0.98. Here is the variation of power factor is shown within the graph-:



3. As tariff is charged on basis of KVAH. As the power factor reduces KVAH increases.

4. At present 600 KVAR capacitor bank is installed in substation with following sets of capacitors:
   - 50kvar=8No's.
   - 25kvar=6No's.
   - 12.5kvar=4No's.

5. It was observed that some of the capacitors were not switching. It is recommended to maintain the present capacitors in healthy condition for appropriate switching depending on load variations. This will give considerable amount of savings.

6. The value of power factor as per past energy bill is as per below:

Months	Recorded Power Factor as per Energy Bill
Aug-19	0.984
Nov-19	0.976
Dec-19	1.000
Jan-20	0.943
Feb-20	0.985
Mar-20	0.981
Apr-20	0.974
May-20	0.947
Jun-20	0.968
Jul-20	0.975
Aug-20	0.978
Sep-20	0.970

7. Following saving shall be achieved if power factor was maintained at 0.999.

Months	Recorded Power Factor as per Energy Bill	Current Unit Consumption (kVAH)	Unit Consumption if Power Factor was maintained at 0.99 (kVAH)	Difference
Aug-19	0.984	57780.00	57430	350
Nov-19	0.976	36080.00	35570	510
Dec-19	1.000	44600.00	45051	-451
Jan-20	0.943	68360.00	65115	3245
Feb-20	0.985	76790.00	76402	388
Mar-20	0.981	57220.00	56700	520
Apr-20	0.974	44880.00	44155	725
May-20	0.947	15600.00	14922	678
Jun-20	0.968	53140.00	51959	1181
Jul-20	0.975	72800.00	71697	1103
Aug-20	0.978	123400.00	121904	1496
Sep-20	0.970	70340.00	68919	1421
			Total	**11167**
			Cost per Unit	**4.70**
			Annual Savings	**52484**

Total Savings of Rs 52,484 could be done annually if power factor was maintained at 0.999.

Energy Saving Recommendation No.3:
Saving through Variable Air Volume in AHU's

1. During the audit, it was found that all AHU's are equipped with VFD with manual speed control and found to be tuned at 50Hz (Rated Frequency, Rated RPM). Hence, all these AHU's are running at fixed full RPM/Frequency that can be seen from VFD display.

2. Building management system is installed. It is recommended to reconnect AHUs with VFD in closed loop feedback system via transducers installed in AHU duct. This will maintain motor power factor and hence give considerable amount of savings by optimizing air flow as per requirement.

AHU Location	Power Consumption (KW)	Saving (KW) @8%	Annual Saving for 10 hours and 300 days (KWH)	Annual Saving in Cost per unit @ Rs 4.70 (Rs)
AHU Ground Floor F-Side (2No's of 4KW Motors)	8	0.64	1920	9024
AHU Ground Floor A-Side (3No's of 4KW Motors)	12	0.96	2880	13536
AHU First Floor A-Side (2No's of 5.50KW Motors)	11	0.88	2640	12408
AHU First Floor F-Side (2No's of 5.50KW Motors)	11	0.88	2640	12408
AHU Second Floor F-Side (2No's of 5.50KW Motors)	11	0.88	2640	12408
AHU Second Floor A-Side (2No's of 5.50KW Motors)	11	0.88	2640	12408
AHU Third Floor A-Side (2No's of 5.50KW Motors)	11	0.88	2640	12408
AHU Third Floor F-Side (2No's of 5.50KW Motors)	11	0.88	2640	12408
AHU Fourth Floor A-Side (2No's of 5.50KW Motors)	11	0.88	2640	12408
AHU Fourth Floor F-Side (2No's of 5.50KW Motors)	11	0.88	2640	12408
AHU Fifth Floor A-Side (3No's of 4KW Motors)	12	0.96	2880	13536
AHU Fifth Floor F-Side (3No's of 4KW Motors)	12	0.96	2880	13536
Total KWH Saved			**31680**	
Total Annual Savings (Rs)				**1,48,896**

Total saving of Rs 1,48,896 shall be achieved via reconnecting AHU's with VFD in closed loop feedback system through existing Building management system.

Energy Saving Recommendation No.4:
Saving by Replacement of Higher Wattage Light with Low Wattage in Building and Switching Off Lights in Various Areas of Office While Maintaining Required Lux Level

1. Replacement of existing lighting with LED

1. LED lights are up to 80% more efficient than traditional lighting such as fluorescent and incandescent lights. 95% of the energy in LEDs is converted into light and only 5% is wasted as heat. This is compared to fluorescent lights which convert 95% of energy to heat and only 5% into light! LED lights also draw much less power than traditional lighting; a typical 84-watt fluorescent can be replaced by a 36-watt LED to give the same level of light. Less energy use reduces the demand from power plants and decreases greenhouse gas emissions.

2. LED lights contain no toxic elements. Most offices currently use fluorescent strip lights which contain noxious chemicals such as mercury. This will contaminate the environment when disposed of in landfill waste. Disposal has to be arranged through a registered waste carrier so switching to LED avoids the cost and time implications required for compliant disposal and helps to protect the environment from further toxic waste.

3. A longer life span means lower carbon emissions. LED Lights last up to six times longer than other types of lights, reducing the requirement for frequent replacements. This results in using fewer lights and hence fewer resources are needed for manufacturing processes, packaging materials and transportation.

Conventional T-5 FLT Recessed Mounted Light Fixtures with choke installed in SJVN

4. It is recommended to replace current lighting lamps with LED retrofit Lamps. Following can be done in phased manner which can give substantial amount of savings:

a) Replacement of 4 X 14W T-5 FTL Recessed Mounted Light Fixtures with 36W LED Panel Light.
b) Replacement of 3 X 14W T-5 Mirror Optic Light with 36W LED Panel Light.
c) Replacement of 3 X 14W T-5 FTL Recessed mounted Light Fixtures with 36W LED Panel Light.
d) Replacement of 28W Fluorescent Tube T-5 with 18W LED Tube Light.
e) Replacement of 4 X 18W FTL Recessed Mounted Light Fixtures with 36W LED Panel Light.

2. Savings Achieved by Switching Off Excess Lights

It was observed that in many areas, lux level is found more as per requirement. So, it is recommended to switch off few lights during day. By doing so followings savings will achieve as shown in below-

Commercial buildings	
Offices	
General Offices	300
Deep Plan General Offices	500
Computer Works Station	300
Conference Rooms, Executive Offices	300
Computer and Data Preparation Rooms	300
Filing Rooms	200
Drawing Offices	
General	300
Drawing Boards	500
Print Rooms	200
Counter,Office Area	300

Lux Level requirement As per BEE Code of Lighting

i. Savings by permanently switching OFF the lights:

Location	Recommendation	Saving in Watt per fixture	Number of Fixture	Total Saving in Watt
5th Floor A-Side CMD Office	8No's of 25W LED's can be switched OFF permanently. Lux Level when blind folds were open 60% and lights were ON is 458, 476, 470.	25	8	200
5th Floor Lounge	2No's of 25W LED's and 2No's of 3*14W mirror optics panel lights (near passage) can be switched OFF permanently. Lux Level when lights are ON is 252, 255, 274.	25	2	50
		42	2	84
5th Floor A-Side Office No.607 DP Secretariat	3No's of 25W LED's can be switched OFF permanently. Lux Level when all LED's were ON and Blind fold was opened is 897, 1648, 632, 434, 819. Daylight is available.	25	3	75
Total Saving in kW				**0.409**
Hours of Working				**24**
Working Days				**300**
Annual Unit Saved				**2944.80**
Cost per unit				**4.70**
Total Saving in Rs				**13840.56**

Savings of around Rs 13,840.56 annually can be achieved with no investment required and having immediate payback period.

ii. Savings by switching OFF lights for an interval of time:

Location	Recommendation	Saving in Watt per fixture	Number of Fixture	Total Saving in Watt
Ground Floor F-Side Canteen	4No's of 3*14W Panel Light Fixtures & 4No's of 15W LED's near windows side can be switched off from 10:00AM-4:00PM. When all panel lights are ON and blind folds are open, Lux Level is 726, 750 and when lights are OFF, Lux Level is 608, 393, 219.	42	4	168
		15	4	60
Ground Floor F-Side Canteen (HOD Reserved Section)	8No's of 15W LED's can be switched OFF from 10:00AM-4:00PM. Lux Level when all these LED's are ON is 926, 937, 1120, 1372. Lux Level after switching OFF all LED's is 525, 421, 838, 657.	15	8	120
Ground Floor A-Side Reception	44No's of 25W LED's can be switched OFF from 10:00AM-4:00PM. Lux Level when all these LED's are ON is 906, 930, 1415, 1350. Lux Level at windows side after switching OFF all 44No's of LED's is 745, 561, 828, 737, 861.	25	44	1100
Ground Floor F-Side Reception (Security Check Area)	7No's of 25W LED's & 2No's of 36W LED's can be switched OFF from 10:00AM-4:00PM. Lux Level when all lights were ON is 1022, 1715, 2048, 1792. Lux Level when all these lights were OFF is 860, 1758, 1840, 1023.	25	7	175
		36	2	72
Ground Floor F-Side Passage Area	7No's of 25W LED's can be switched OFF in passage area from 10:00AM-4:00PM. These LED's can be connected with a separate switch. Lux Level when all lights were ON is 490, 981, 788. Lux Level when all these lights were OFF is 1020, 490, 285.	25	7	175

Ground Floor A-Side Passage Area	7No's of 25W LED's can be switched OFF in passage area from 10:00AM-4:00PM. These LED's can be connected with a separate switch. Lux Level when all lights were ON is 496, 991, 778. Lux Level when all these lights were OFF is 1015, 290, 480.	25	7	175
Ground Floor A-Side Library (R01 Room)	3No's of 4*14W T-5 tube light panel fixtures can be switched OFF from 10:00AM-4:00PM. Lux Level when all lights are ON is 1816, 432, 830, 730. Lux Level when lights are OFF is 1170, 528, 400.	56	3	168
Ground Floor A-Side Library (Workstations/Sitting Area)	4No's of 3*14W Panel Light Fixtures & near windows side can be switched off by 1 switch from 10:00AM-4:00PM. When all panel lights are ON, Lux Level is 519, 476, 621 and when lights are OFF, Lux Level is 280, 350, 367. Daylight is available.	42	4	168
1st Floor A-Side Office No.202 CM Office	4No's of 3*14W Mirror optics T-5 Fixtures can be switched OFF from 10:00AM-4:00PM. Lux Level when all lights were ON and blind folds were rolled up is 1400, 750, 802. Lux Level when 4No's of fixtures were OFF is 615, 442, 1250.	42	4	168
1st Floor A-Side Office No.201 CP Office	3No's of 3*14W T-5 Panel light fixtures near windows side workstations can be switched OFF from 10:00AM-4:00PM. Lux Level when all 3No's of Lights were ON is 1087, 786, 1409, 691. Lux Level when blindfolds were opened and all 3No's of lights were OFF is 449, 1212, 606, 992.	42	3	126

2nd Floor F-Side Office No. 314 Civil Contracts Office R01 Cabin	1No. of 3*14W Mirror Optic light fixture can be switched OFF through L1 Switch from 10:00AM-4:00PM. Lux Level when blindfolds were opened and light was ON is 480, 501. Lux Level when light was OFF is 389, 350, 310	42	1	42
2nd Floor A-Side Office No.301 Corporate Electrical Contract Office	12No's of 3*14W light fixtures can be switched OFF through L1 & L2 Switch from 10:00AM-4:00PM. Lux Level when all lights were ON is 1400, 1200. Lux Level when all lights were turned OFF and blind folds were rolled up is 457, 822, 520. Daylight is available.	42	12	504
2nd Floor A-Side Office No.302 Corporate Vigilance Office E01 Cabin	2No's of 3*14W Mirror Optics T-5 light fixtures can be switched OFF from 10:00AM-4:00PM. Lux Level when all lights were ON and blindfolds were rolled up is 1218, 557, 537. Lux Level when 2No's of fixtures were switched OFF diagonally by L2 Switch is 498, 1007, 368.	42	2	84
2nd Floor A-Side Office No. 303 CFM Office	4No's of 3*14W T-5 Panel lights near W01 workstation DGM Civil can be switched OFF from 10:00AM-4:00PM by L1 & L2 Switch. Lux Level when all lights near windows were ON and blindfolds were rolled up is 1116, 828, 590. Lux Level when 4No's of lights were turned OFF is 918, 705, 340.	42	4	168
3rd Floor F-Side Office No.405 QA & I Office C03 Cabin	Daylight opportunity is available. 4No's of 3*14W T-5 panel lights can be switched OFF from 10:00AM-4:00PM. Lux Level when blindfolds were rolled up and lights were ON is 672, 683, 925, 927. Lux Level when 4No's of fixtures were turned OFF is 325, 320.	42	4	168

3rd Floor F-Side Office No.405 QA & I Office E01 HOD Cabin	4No's of 3*14W Mirror optics T-5 Fixtures can be switched OFF from 10:00AM-4:00PM. Lux Level when all lights were ON and blind folds were rolled up is 820, 930, 980. Lux Level when 4No's of fixtures were OFF is 653, 360.	42	4	168
3rd Floor A-Side Office No.403 Corporate Civil Design Office R01 Cabin	1No. of 3*14W T-5 Panel light fixtures can be switched OFF from 10:00AM-4:00PM. Lux Level when all lights were ON and blindfolds were rolled up is 529, 508, 449. Lux Level when 1No. of fixture was switched OFF is 375, 350, 449. Light should be connected with 2 separate keys.	42	1	42
3rd Floor A-Side Office No.403 Corporate Civil Design Office R02 Cabin	1No. of 3*14W T-5 Panel light fixtures can be switched OFF from 10:00AM-4:00PM. Lux Level when all lights were ON and blindfolds were rolled up is 540, 450. Lux Level when 1No. of fixture was switched OFF is 375, 427, 260. Light should be connected with 2 separate keys.	42	1	42
3rd Floor A-Side Office No.403 Corporate Civil Design Office E01 Cabin	2No's of 3*14W Mirror Optics T-5 light fixtures can be switched OFF from 10:00AM-4:00PM. Lux Level when all lights were ON is 565, 583. Lux Level when 2No's of fixtures were switched OFF is 350, 370. These 2 lights shall be configured on 1 switch.	42	2	84
3rd Floor A-Side Office No.402 CCD Office	4No's of 3*14W T-5 Panel Lights near windows side can be switched OFF from 10:00AM-4:00PM by single switch (Following provision shall be provided). Lux Level when all lights were ON and blindfolds were rolled up is 802, 985, 953, 754. Lux Level when 4No's of fixtures were turned OFF is 329, 762, 696, 330, 275.	42	4	168

3rd Floor A-Side Office No.401 CCD Office	4No's of 3*14W T-5 Panel Lights near windows side can be switched OFF from 10:00AM-4:00PM. Lux Level when all lights were ON and blindfolds were rolled up is 773, 1253, 525, 942. Lux Level when 4No's of fixtures were turned OFF is 372, 320, 472.	42	4	168
4th Floor A-Side Lift Lobby	6No's of 25W LED's can be switched OFF from 10:00AM-4:00PM. Lux Level when all lights were ON is 495, 535, 876. Lux Level when LED's were OFF is 193, 176, 203.	25	6	150
4th Floor A-Side Passage	Window is available for Daylight in this corridor. 9No's of 25W LED's can be switched OFF from 10:00AM-4:00PM. Lux Level when all LED's are ON is 99-525. Lux Level when all lights were OFF is 39-672.	25	9	225
4th Floor F-Side Lift Lobby	6No's of 25W LED's can be switched OFF from 10:00AM-4:00PM. Lux Level when all lights were ON is 493, 486, 562, 886. Lux Level when LED's were OFF is 178, 183, 166, 213.	25	6	150
4th Floor F-Side Passage	Window is available for Daylight in this corridor. 9No's of 25W LED's can be switched OFF from 10:00AM-4:00PM. Lux Level when all LED's are ON is 101-765. Lux Level when all lights were OFF is 43-695.	25	9	225
5th Floor A-Side Corridor	13No's of 25W LED's can be switched OFF from 10:00AM-4:00PM. More than enough daylight is available. Lux Level when all lights were ON is 1100, 305, 992, 796, 1045. Lux Level when all 13No's of LED's were OFF is 105, 587, 870, 975, 1045.	25	13	325

5th Floor A-Side Lift Lobby	6No's of 25W LED's can be switched OFF from 10:00AM-4:00PM. Lux Level when all lights were ON is 570, 545, 826. Lux Level when LED's were OFF is 162, 190, 155.	25	6	150
5th Floor A-Side Passage near Side Gallery (Director Secretariat)	Window is available for Daylight in this corridor. 9No's of 25W LED's can be switched OFF from 10:00AM-4:00PM. Lux Level when all LED's are ON is 75-805. Lux Level when all lights were OFF is 50-670.	25	9	225
5th Floor A-Side CMD Ante Room (Sitting and Dining Purpose)	4No's of 4*14W T-5 tube light panel fixtures can be switched OFF from 10:00AM-4:00PM. Lux level when all 4 fixtures were ON is 998, 333, 376, 635. Lux Level when all 4 fixtures were OFF is 204, 146, 832.	56	4	224
5th Floor A-Side Office No.608-1 Technical Officer to DP	5No's of 25W LED's can be switched OFF from 10:00AM-4:00PM. Window is available for Daylight utilisation. Lux Level when all lights were ON is 1732, 1758, 916, 1015. Lux Level when the 5No's of LED's were switched OFF is 408, 1197	25	5	125
5th Floor A-Side Office No.608-2 Technical Officer to DC	7No's of 25W LED's can be switched OFF from 10:00AM-4:00PM. Window is available for Daylight utilisation. Lux Level when blind folds were opened and all LED's were ON is 1038, 580, 732, 700. Lux Level when all lights were switched OFF is 324, 916, 134.	25	7	175
5th Floor A-Side Workstation (Near Pantry)	5No's of 25W LED's in passage can be switched OFF from 10:00AM-4:00PM. Lux Level when all lights were ON is 707, 692. Lux Level when the 5No's of LED's were switched OFF is 430, 385.	25	5	125

5th Floor F-Side Lift Lobby	6No's of 25W LED's can be switched OFF from 10:00AM-4:00PM. Lux Level when all lights were ON is 560, 586, 875. Lux Level when LED's were OFF is 163, 195, 158.	25	6	150
5th Floor F-Side Passage near Side Gallery	Window is available for Daylight in this corridor. 9No's of 25W LED's can be switched OFF from 10:00AM-4:00PM. Lux Level when all LED's are ON is 89-1120. Lux Level when all lights were OFF is 55-700.	25	9	225
5th Floor F-Side Office No.616-1	3No's of panel lights can be switched OFF through L1 Switch from 10:00AM-4:00PM. Lux Level when all lights are ON is 461, 500, 368. Lux Level when all lights were OFF is 300, 295, 168.	25	3	75
5th Floor F-Side Office No.615-1 Technical Director to DF	2No's of 25W LED's near window side can be switched OFF from 10:00AM-4:00PM. Window is available for daylight utilisation. Lux Level when all LED's are ON is 744, 554. Lux Level when all lights were OFF is 436, 324.	25	2	50
5th Floor F-Side Office No.615-2 Technical Director to DE	2No's of 25W LED's near window side can be switched OFF from 10:00AM-4:00PM. Window is available for daylight utilisation. Lux Level when all LED's are ON is 970, 1102. Lux Level when all LED's were OFF is 760, 921.	25	2	50
Total Saving in kW				**6.962**
Hours of Working				**6**
Working Days				**300**
Annual Unit Saved				**12531.60**
Cost per unit				**4.70**
Total Saving in Rs				**58898.52**

Savings of around Rs 58,898.52 annually can be achieved with no investment required and having immediate payback period.

Total Savings (Rs)	72,739

Observation:

It was observed that In reception there is continuous occupancy due to security personals and other people and in all above floors corridors there is ample amount of day light available along with continuous occupancy. Due to such scenarios all lights remain ON for 9-10 Hours during day time. Thus Day light utilization is failed and lights remain continuously on defeating the purpose of Occupancy sensors.

Recommendation: Occupancy sensors can be removed from Ground floor Reception area, all floors corridors (Under Direct Day Light). It was observed that Delay time of 15 Minutes and Lux setting of 2000 Lux which was more as per requirement of switching in these areas. Manual switching in following spaces shall be planned by using dedicated MCBs. Considerable amount of saving can be easily attained.

Occupancy and vacancy sensors are ideally suited to installation in:
• Smaller, enclosed spaces.
• Larger spaces using zoned/networked or individual luminaire control.
• Spaces that operate on an unpredictable schedule.
• Spaces that are intermittently occupied—that is, left unoccupied for two or more hours per day
• Stairwells, indoor corridors and similar spaces where the lighting must remain ON all day but are frequently unoccupied (light reduction)

Delay time & Lux Settings at present

Energy Saving Recommendation No.5:
General Energy Savings Proposal

A. Energy Savings for Computers, Printers Scanner, Light, AC, Ceiling Fan etc.

1. COPY MACHINES AND PRINTERS should be turned off WHEN NOT IN USE; even in the "sleep mode" these consume power. Power Management features should be activated on all copiers and printers.
2. Monitor and other office equipment should be plugged into an occupancy sensor power strip. These devices automatically turn off equipment whenever user leaves the room for more than a few minutes that can be set by user. Occupancy power strips can control monitors and task lights.

   All Computers should be switched "OFF" at the end of the day.

B. Lightings

1. There should be proper records of cleaning for lighting fixtures so as to ensure that the full light output of Luminaries' is available for illumination.
2. Timer control or light intensity sensor-controlled lighting should be used for automatic on & off for compound lighting.

CONCLUSION

The energy audit conducted at M/S SJVN, Corporate Head Quarter, Shimla has revealed the potential of saving in terms of energy.

The recommended energy conservation measures were based on observation and experience of the energy audit team.

DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

Certificate No:
214006-2017-AQ-IND-NABCB

Initial certification date:
11, February, 2005

Valid:
11, February, 2017 - 10, February, 2020

This is to certify that the management system of

SJVN Limited

Registered & Corporate Office: Shakti Sadan, Corp. Office Complex, Shanan, Shimla - 171 006, Himachal Pradesh, India
and the sites as mentioned in the appendix accompanying this certificate

has been found to conform to the Quality Management System standard:
ISO 9001:2015

This certificate is valid for the following scope:
Providing design, contracting, quality assurance and related support to hydropower projects / hydropower stations, wind power projects / wind power farms & solar power projects / solar power farms

Place and date:
Chennai, 20, February, 2017

NABCB
QM 001

For the issuing office:
DNV GL – Business Assurance
ROMA, No. 10, GST Road, Alandur,
Chennai - 600 016, India

Sivadasan Madiyath
Management Representative

DNV·GL

Certificate No: 214006-2017-AQ-IND-NABCB
Place and date: Chennai, 20, February, 2017

Appendix to Certificate

SJVN LIMITED
Locations included in the certification are as follows:

Site Name	Site Address	Site Scope
SJVN Limited	Registered & Corporate Office: Shakti Sadan, Corp. Office Complex, Shanan, Shimla - 171 006, Himachal Pradesh, India	Providing design, contracting, quality assurance and related support to hydropower projects / hydropower stations, wind power projects / wind power farms & solar power projects / solar power farms
SJVN Limited	Expediting Office: Ircon Building, Ground Floor, C - 4, District Centre, Saket, New Delhi - 110 017, India	Business development, contracting and related support to hydropower projects / hydropower stations, wind power projects / wind power farms & solar power projects / solar power farms